

ANDAMAN & NICOBAR ADMINISTRATION

अंडमान और निकोबार प्रशासन  
DIRECTORATE OF CIVIL AVIATION  
नागरिक उड्डयन निरदेशालय, पोर्ट ब्लेयर

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Port Blair, Date: 17<sup>th</sup> April, 2023

To,  
The Member Secretary,  
Expert Appraisal Committee (EAC, Infra-1),  
Ministry of Environment, Forest and Climate Change,  
Indira Paryavaran Bhavan,  
Jor Bagh Road, New Delhi 110003

**Subject** : Submission of compliance to 304<sup>th</sup> EAC meeting held on 21<sup>st</sup> and 22<sup>nd</sup> July 2022  
**Project Details** : "Development of Water Aerodrome" located at Shaheed Dweep (erstwhile Neil Island), Village – Bharatpur, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar by Andaman & Nicobar Administration, Directorate of Civil Aviation  
**Reference** : MoM of 304<sup>th</sup> EAC meeting held on 21<sup>st</sup> and 22<sup>nd</sup> July 2022

Respected Sir,

In the view of above, we are herewith submitting compliance to the MoM of 304<sup>th</sup> EAC meeting held on 21<sup>st</sup> and 22<sup>nd</sup> July 2022 along with revised EIA report and amendment required in Form-2 for your kind perusal and consideration for the grant of environmental clearance.

Please acknowledge the copy of the same.

Thanking you,

Yours Sincerely,

For Andaman and Nicobar Administration

  
Authorized Signatory

*Encl:* 1. Compliance to the MoM of 304<sup>th</sup> EAC meeting  
2. EIA report  
3. Amendment required in Form-2

Enclosure 1: Complince to MoM of 304th EAC meeting

**Compliance to the MoM of 304<sup>th</sup> EAC meeting held on 21<sup>st</sup> and 22<sup>nd</sup> July 2022**

<b>SN</b>	<b>Point</b>	<b>Compliance</b>
1	“to realign their layout to avoid the areas where some of the activities like terminal building, roads, etc. are not permissible as per IPZ Notification 2011”	<p>A&amp;N Administration explored the possibilities to shifting embarkation/ disembarkation to the proposed new ferry terminal and as per the suggestions from the EAC, the existing shelter available at Shaheed jetty will be used as a passenger facilitation centre, passengers will be transferred via Solar operated boat transfers to the floating docking pad of seaplane and then to the Sea Planes</p> <p>In this revised proposal, A&amp;N Administration are <b>not going to develop any ancillary facilities like terminal building and floating walkway</b> which was proposed in CRZ III and CRZ IB respectively in earlier proposal, hence our <b>proposal consists of runway and pre-casting of floating dock only and which is falling in CRZ IV and which are regulated activities as per IPZ notification 2011 (clause III D 4)</b></p> <p>The proposed project will utilize existing infrastructure available at Shaheed Jetty for sea plane operation</p>
2	It was also requested to the PP to submit Form-1 for seeking clearance for projects attracting CRZ Notification, 2011/IPZ Notification, 2011 (Annexure - IV of the CRZ Notification, 2011)	<p>Form I as per IPZ Notification 2011 is given as Annexure 5 of EIA Report. Further, fresh recommendation from ANZMA has been obtained for the same and attached as Annexure 4 of the EIA Report.</p> <p>The above said documents of Form I and recommendation from ANZMA are attached to this compliance document for ready reference.</p>

Enclosure- 2: EIA report

# **Environmental Impact Assessment (EIA) Report**

of

## **“Development of Water Aerodrome”**

At

Shaheed Dweep (erstwhile Neil Island), Village – Bharatpur, Taluka –  
Port Blair, District – South Andaman, Andaman & Nicobar

### Project Proponent

**“Andaman & Nicobar Administration  
Directorate of Civil Aviation”**

### Environmental Consultant



### **ENVIRO RESOURCES**

**(NABET Certificate No: NABET/EIA/2225/RA 02277)**

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### Environmental Laboratory

### **ENVIRO-TECH SERVICES**

Plot No. 1/32, South Side G.T. Road Industrial Area,

Ghaziabad, Uttar Pradesh, India 201 001

## **Declaration**

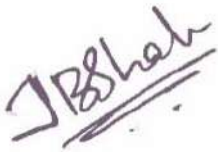
### **To Whomsoever It May Concern**

This is to confirm that, the EIA report for proposed activity of “Development of Water Aerodrome” by M/s Andaman & Nicobar Administration Directorate of Civil Aviation; at Shaheed Island Village – Bharatpur, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar has been prepared by M/s Enviro Resources.

The Standard ToR given by MoEFCC dated April 2015 and additional ToR by EAC (Infra-2), GOI; dated 16<sup>th</sup> December 2019 has been fully complied for preparing EIA report.

We also confirm that the EIA Report is prepared on project related factual data as submitted by Client - M/s Andaman & Nicobar Administration Directorate of Civil Aviation); DPR Consultant – Feedback Infra Pvt. Ltd. & Baseline Data collected by M/s. Enviro-Tech Services.

#### **For Enviro Resources**



**Mr. Timir Shah**  
**Owner/Proprietor**  
**Date: 20.04.2023**  
**Place: Mumbai**





## PROJECT TEAM

### Declaration by Experts contributing to the EIA of “Development of Water Aerodrome” at Shaheed Dweep by M/s Directorate of Civil Aviation, Andaman & Nicobar Administration

I, hereby, certify that I was a part of the EIA team in the following capacity that developed the above EIA.

EIA coordinator: 7 (a) Airports

Name: Mr. Timir Bharat Shah

Signature and Date:

20/04/2023

Team Member worked with EIA Coordinator: --

Contact information: Enviro Resources, Address: 1904 Roopnagar CHS, Opp Milap, S V Road, Kandivali West, Mumbai 400067, Maharashtra.

Functional Area Experts:

S. No.	Functional areas	Name of the expert/s	Involvement	Signature and date
1	AP*	Timir Bharat Shah	Impact Assessment of AP	
2	WP*	Pritam Kadam	Impact Assessment of WP	
3	SHW*	Timir Bharat Shah	Impact Assessment of SHW	
4	SE*	Anil Shende	Impact Assessment of SE	
5	EB*	Bhaskar Yengal	Impact Assessment of EB	



EIA Report for “Development of Water Aerodrome” at Shaheed Dweep, Village – Bharatpur, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar

**PROJECT TEAM**

6	HG*	Milind Kundal	Impact Assessment of HG	
7	Geo*	Milind Kundal	Impact Assessment of Geo	
8	SC*	Bhaskar Yengal	Impact Assessment of SC	
9	LU*	Milind Kundal	Impact Assessment of LU	

\*One TM against each FAE may be shown

Team Members:

S. No.	Functional areas	Name of the expert/s	Involvement	Signature and date

\*\*Please attach additional sheet if required



EIA Report for “Development of Water Aerodrome” at Shaheed Dweep, Village – Bharatpur, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar

**PROJECT TEAM**

**Declaration by the Head of the accredited consultant organization/ authorized person**

I, Timir B. Shah, hereby, confirm that the above mentioned experts prepared the EIA of “Development of Water Aerodrome” at Shaheed Dweep, Andaman & Nicobar Island by Directorate of Civil Aviation, Andaman & Nicobar Administration. I also confirm that the consultant organization shall be fully accountable for any mis-leading information mentioned in this statement.

Signature:

Name : **Mr. Timir B. Shah**

Designation : **Proprietor**

Name of the EIA consultant organization: **Enviro Resources, Mumbai**

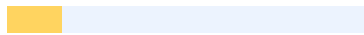
NABET Certificate No. & Issue Date: **NABET/EIA/ NABET/EIA/2225/RA0277 valid upto 6<sup>th</sup> July 2025.**



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EIA Report for “Development of Water Aerodrome” located at Shaheed Dweep, Village – Bharatpur, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar

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## **EXECUTIVE SUMMARY**

### **1.0 Introduction**

**Directorate of Civil Aviation, Andaman and Nicobar Administration**, (Project Proponent) has proposed water Aerodrome project at Shaheed Dweep, Village: Bharatpur, Tehsil: Port Blair, District: South Andaman, Andaman & Nicobar Islands.

As per Environment Impact Assessment (EIA) Notification dated 14<sup>th</sup> September 2006, and its further amendments, all projects pertaining to Airports are listed under 'Category A' with activity number 7 (a).

The proposal was submitted to MoEF&CC, New Delhi & subsequently project was considered in the 46<sup>th</sup> meeting of Expert Appraisal Committee (EAC, Infra-2) held on 25-26 November, 2019 & as per approved ToR Letter “EAC noted that Water Aerodrome is not a listed project/activity in the Schedule to the EIA Notification 2006 and its amendments. However committee opined that the activities proposed under the project would have similar types of impact as that of normal Airport”.

Considering the Water Aerodrome are just emerging in the country as a new mode of transport, involving sea/river fronts and its likely impacts on water, air and aquatic biodiversity including flora and fauna, the EAC has had taken a view to follow the EC process as per category A of item 7(a), ‘Air Ports’ of the Schedule to the EIA Notification, 2006 and accordingly, the ToR was recommended by EAC.

### **2.0 Project Location**

The project will be located at Shaheed Dweep, Village: Bharatpur, Tehsil: Port Blair, District: South Andaman, Andaman & Nicobar Islands. The geographical location of the project is 11°50'26.26"N, 93°2'15.69"E. The proposed project is approximately 39.12 km (Aerial Distance) from Veer Savarkar International Airport, Port Blair.

The Toposheet map of the study area is as shown in **Figure 1** and the Location Map is as shown in **Figure 2**.

### **3.0 Project Description**

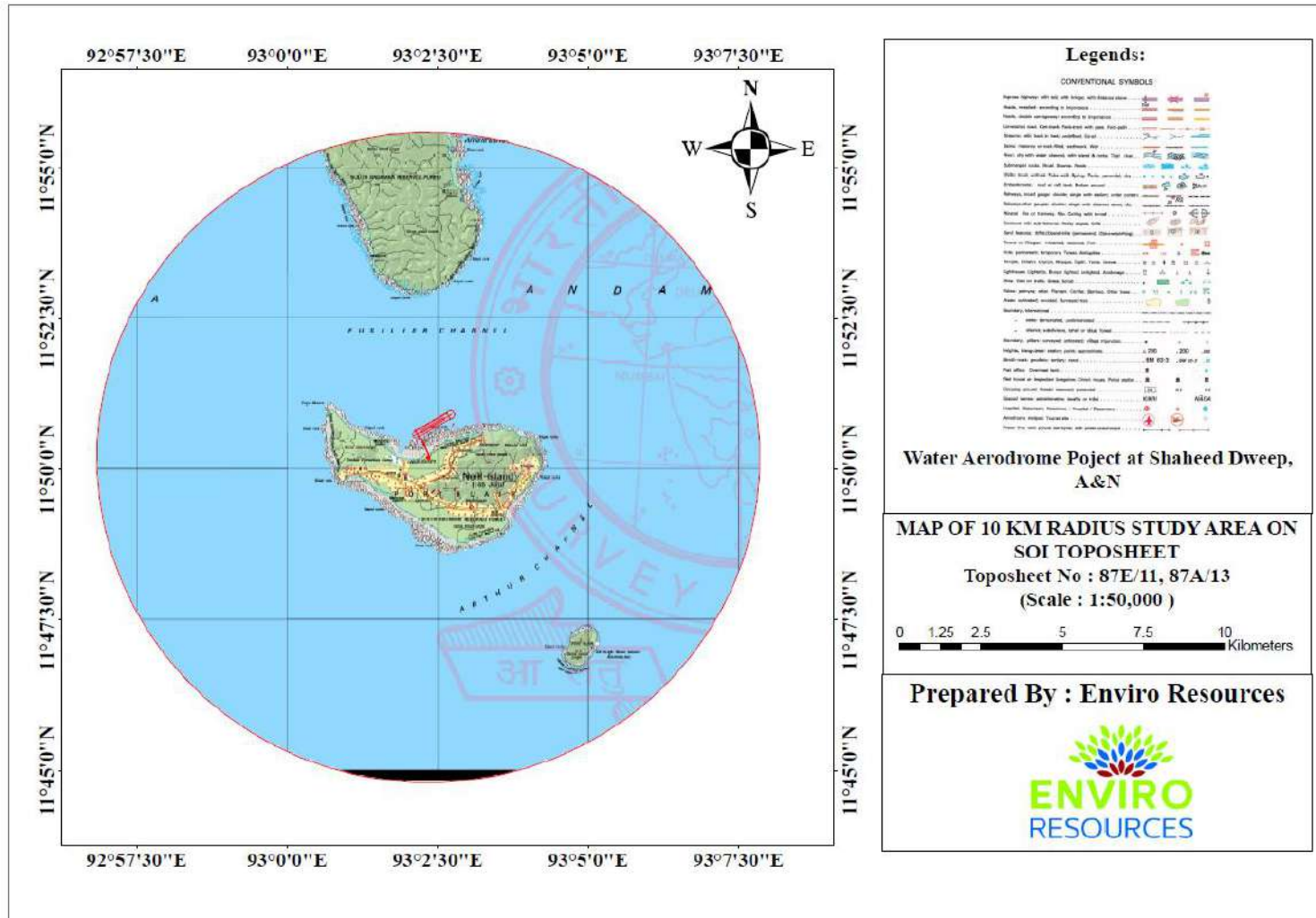
The components of Seaplane Base / Water Aerodrome will include:

- Off shore facilities such as Floating Dock, Fire and Rescue Boat, Sea Planes and a suitable water operating area, including identified approach and departure paths, etc.
- The proposal consists of runway and pre-casting of floating dock only and which is falling in CRZ IV and which are regulated activities as per IPZ notification 2011

The Site Layout of the off shore facilities is as shown in **Figure 3**.



**EXECUTIVE SUMMARY**



**Figure 1: Topographical Base Map of the Study Area**



## EXECUTIVE SUMMARY

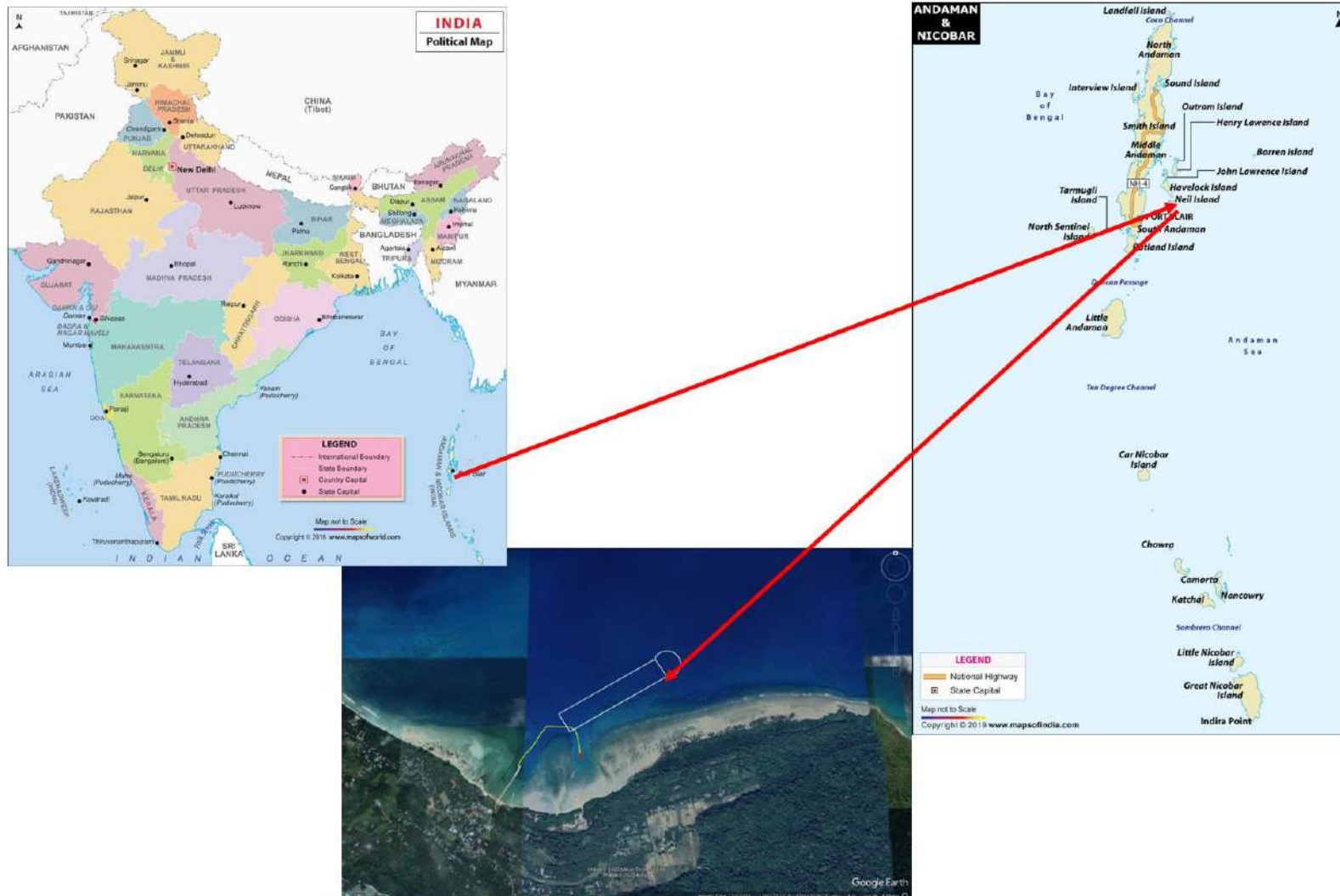
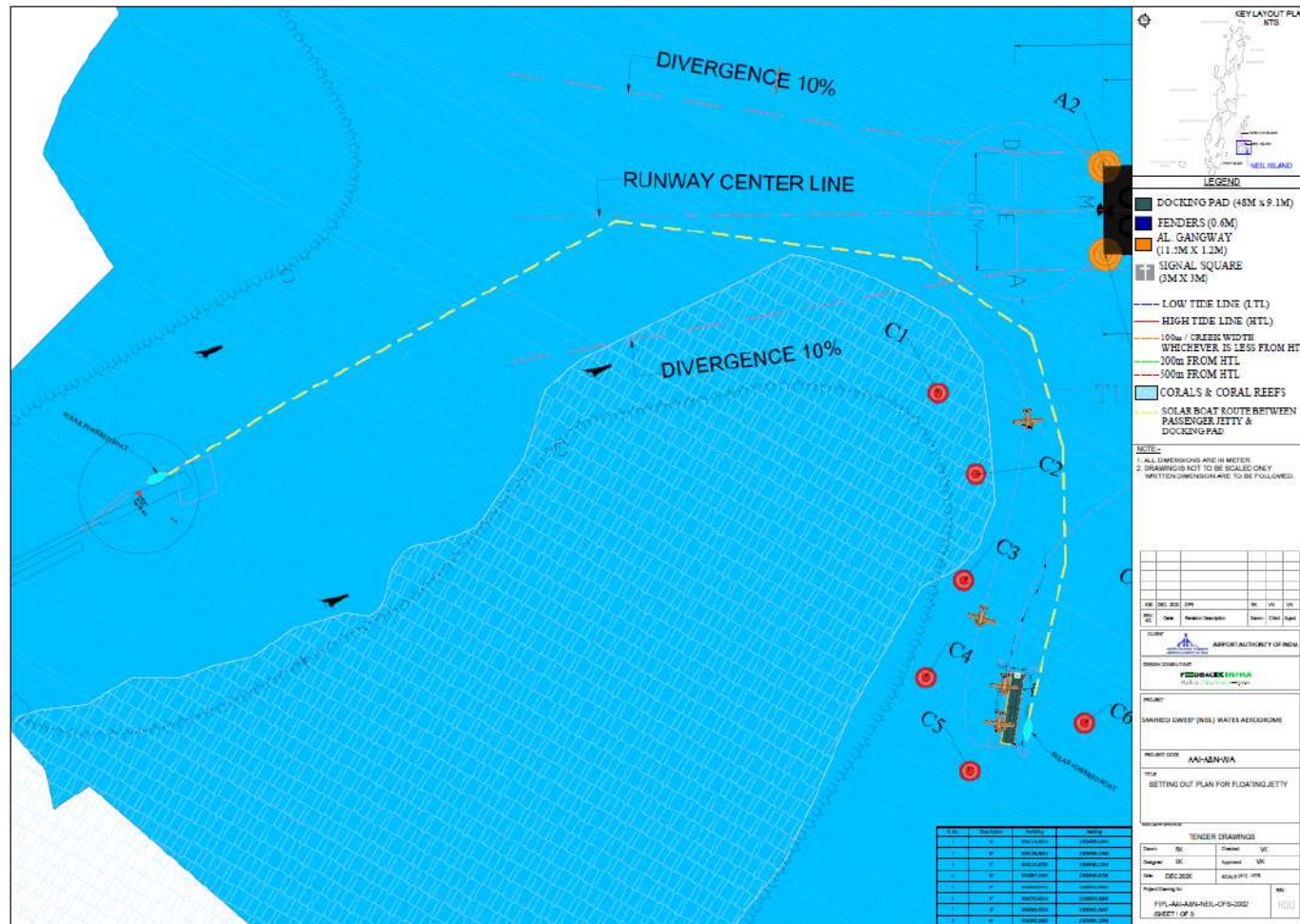


Figure 2: Location Map of the Project Site



**EXECUTIVE SUMMARY**



**Figure 3: Runway and Taxiway Layout Plan**



## EXECUTIVE SUMMARY

The sea plane proposed for use in this project is having capacity of 9 Passengers. It is proposed to develop the infrastructure facility for 180 Pax. Each round trip of seaplane will carry approx. 18 Passengers and we have considered the 5 such trips for each of the two sea planes in a day so total 180 Passengers Plus total staff of 30 members (Passenger terminal, maintenance staff, IT, security, housekeeping, sea plane operator staff etc).

Considering 2 sea planes take off & landing will happen for 5 times in a day. The proposed project envisages approximately 48,600 Passengers Per Annum (i.e 180 Pax daily for 270 non monsoon days) for two sea plane.

The seaplane recommended by AAI for the proposed project is Seaplane Cessna Caravan 208



**Figure 4: Seaplane Cessna Caravan 208**

The technical specifications are further provided in below table.

SN	Technical Parameters	Details
1	Exterior	<ul style="list-style-type: none"><li>Exterior Height: 14 ft 2 in</li><li>Wing Span: 52 ft 1 in</li><li>Length: 37 ft 7 in</li></ul>
2	Interior	<ul style="list-style-type: none"><li>Cabin Height: 4 ft 3 In</li><li>Cabin Width: 5 ft 2 In</li><li>Cabin Length: 14 ft 10 In</li><li>Cabin Volume: 271 cu ft</li><li>Door Height: 4 ft 1 In</li><li>Door Width: 4 ft 2 In</li></ul>



**EXECUTIVE SUMMARY**

		<ul style="list-style-type: none"> <li>▪ Internal Baggage: 32 cu ft</li> </ul>
3	Occupancy	<ul style="list-style-type: none"> <li>▪ Crew: 1</li> <li>▪ Passengers: 9</li> </ul>
4	Operating Weights	<ul style="list-style-type: none"> <li>▪ Max T/O Weight: 8000 Lb</li> <li>▪ Max Landing Weight: 7800 Lb</li> <li>▪ Operating Weight: 4940 Lb</li> <li>▪ Empty Weight: 3860 Lb</li> <li>▪ Fuel Capacity: 2224 lbs Lb</li> <li>▪ Payload W/Full Fuel: 871 Lb</li> <li>▪ Max Payload: 2860 Lb</li> </ul>
5	Range	<ul style="list-style-type: none"> <li>▪ Normal Range: 325 nm</li> <li>▪ Max Range: 835 nm</li> <li>▪ Service Ceiling: 25000 ft</li> </ul>
6	Distances	<ul style="list-style-type: none"> <li>▪ Balanced Field Length: 2055 ft</li> <li>▪ Landing Distance: 2508 ft</li> </ul>
7	Performance	<ul style="list-style-type: none"> <li>▪ Rate of Climb: 1234 fpm</li> <li>▪ Max Speed: 186 kts</li> <li>▪ Normal Cruise: 175 kts</li> <li>▪ Economy Cruise: 147 kts</li> <li>▪ Cost per Hour: \$ 659.12</li> </ul>
8	Power Plant	<ul style="list-style-type: none"> <li>▪ Engines: 1</li> <li>▪ Engine Mfg: Pratt &amp; Whitney Canada</li> <li>▪ Engine Model: PT6A-114A</li> </ul>

**Description:**

The Cessna 208 Caravan is a single-engine turboprop, fixed-tricycle landing gear, short-haul regional airliner and utility aircraft that is built in the United States by Cessna. The airplane typically seats nine passengers with a single pilot, although with a FAR Part 23 waiver it can seat up to fourteen passengers. The aircraft is also used for cargo feederliner operations. The prototype first flew in December 1982. The production model was certified by the FAA in October 1984. Since then, the Caravan has undergone a number of design evolutions. Working with FedEx, Cessna produced first the Cargomaster and followed that with the stretched and upgraded Super Cargomaster. The passenger model, the Grand Caravan, was derived from the Super Cargomaster. In January 2013 a higher-powered (867 shp from P&WC PT6A-140) version, the Grand Caravan EX, received FAA certification. This higher-powered version will be produced by a Cessna-AVIC joint venture in China

**Project Schedule & Cost** : The proposed project is scheduled to be commissioned within 2-6 months after Environment Clearance (EC) and other statutory approvals are granted. The estimated cost of the project is Rs. 11.41 Crores. The budget for the Environment Management Plan for the proposed project is Rs. ~ 15 Lakhs.

**Resource Requirements**

- Land** : The existing shelter available at Jetty will be used as a passenger facilitation centre and passengers will be transferred via solar operated boat to the proposed floating dock and then to the Sea Planes. Thus land requirement is not envisage.
- Water** : The proposed project consists of pre-casting of floating jetty hence water is not required for the project



- Power : The proposed project consists of pre-casting of floating jetty hence power is not required for the project
- Manpower : The total manpower envisaged is approximately 30 for the project.

#### **4.0 Description of the Environment**

Primary baseline environmental monitoring studies in 10-km radius study area were conducted through an NABL accredited and MoEF&CC approved laboratory [Enviro-Tech Services] during December 2019 to February 2020.

##### **Topography, Land use & its Classification** –

The physical setting of study area shows a contrast of immense dimensions and reveals a variety of landscapes influenced by relief, climate, vegetation and economic use by man, thus regionally, there is considerable local variation. The area is sloping variably. The Elevation from 0m MSL to 108 MSL are observed in the study area.

The land use and land cover of the study area analyzed based on multispectral satellite imagery reveals that the major land use category within the study area is represented by water bodies (~80.5%), followed by Forest land (~18.7%), Wastelands (~0.41%), Agricultural Land (~0.38%), and Built-up area (~0.01%)

**Soil** - The soil quality was monitored at seven locations within the study area. Soils in the area are classified as sandy clayey loam. Some of the important soil parameters are summarised in the below table;

Parameter	Value
pH	6.98-7.89
Nitrogen kg/ha	69-83
Phosphorus kg/ha	21-45
Potassium kg/ha	42-69
Electrical Conductivity $\mu\text{s}/\text{cm}$	334.1-357.1
Organic Carbon %	1.12-1.91

In the absence of soil standards prescribed by CPCB or MoEF&CC or ANPCC, the quality of soil parameters were assessed based on handbook of agriculture by ICAR. The soil quality of the study area is on average very low fertile soils.

**Weather and Climate** -The weather & climate recorded during the study period are as given below;

Parameter	Value
Temperature °C	19.9 – 31.8
Humidity %	32 - 99
Wind Speed m/s	2.46
Predominant wind directions	NE



**Ambient Air Quality**

The Ambient Air quality was monitored for criteria parameters viz. PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub>, SO<sub>2</sub>, CO for all seven locations in study area, whereas as additional parameters viz. NH<sub>3</sub>, C<sub>6</sub>H<sub>6</sub>, BaP, O<sub>3</sub>, HC (Methane and Non-methane), Pb & Ni were additionally monitored at all locations.

Parameter		A1	A2	A3	A4	A5	A6	A7
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Max	30.9	27.9	18.9	29.2	26.8	25.8	29.4
	Min	22.0	19.9	26.5	20.7	19.1	18.3	20.9
	Average	25.2	22.7	21.6	23.7	21.8	21.0	23.9
	98 percentile	30.64	27.66	26.28	28.91	26.59	25.53	29.12
PM <sub>10</sub> (µg/m <sup>3</sup> )	Max	63.2	55.9	53.1	58.4	53.7	51.6	58.9
	Min	51.3	46.3	44.0	48.4	44.5	42.7	48.7
	Average	56.5	50.6	48.1	52.9	48.6	46.7	53.3
	98 percentile	62.61	55.81	53.02	58.32	53.66	51.51	58.75
SO <sub>2</sub> (µg/m <sup>3</sup> )	Max	11.3	10.2	9.7	9.7	9.8	9.5	11.4
	Min	5.7	5.1	4.9	3.7	4.9	4.7	5.4
	Average	9.3	8.4	8.0	7.7	8.1	7.8	11.39
	98 percentile	11.29	10.19	9.68	9.62	9.80	9.41	9.00
NO <sub>x</sub> (µg/m <sup>3</sup> )	Max	21.9	19.8	18.8	20.6	19.0	18.2	20.8
	Min	16.6	14.9	14.2	15.6	14.4	13.8	15.7
	Average	18.3	16.5	15.7	17.3	15.9	15.2	17.4
	98 percentile	21.34	19.27	18.31	20.14	18.53	17.78	20.28
CO (mg/m <sup>3</sup> )	Max	0.90	0.92	0.93	0.93	0.77	0.81	0.64
	Min	0.48	0.50	0.55	0.51	0.43	0.54	0.35
	Average	0.72	0.74	0.81	0.76	0.63	0.71	0.52
	98 percentile	0.88	0.91	0.84	0.91	0.75	0.81	0.63

In general, the ambient air quality is satisfactory with respect to all major pollutants. The 98<sup>th</sup> percentile values of all pollutants were found to be below NAAQS. The other parameters such as Ammonia (NH<sub>3</sub>), Benzene, Benzo- $\alpha$ -Pyrene (BAP), Ozone (O<sub>3</sub>), HC (Methane and Non-methane), Lead (Pb) and Nickel (Ni) were found to be below their respective detection limits.

**Noise Quality** - The noise quality was monitored at seven locations in the study area during the study period.

Category	Leq daytime	Leq night time	Daytime Standard	Night time standard
Residential	48.6	36.9	55	45
Commercial	71.5	58.8	65	55

The noise quality in the residential areas of the study area was found to be satisfactory and well within the CPCB prescribed statutory limits. However, the noise quality was above the prescribed limits of commercial area for the project site.

**Water Quality** - Surface water samples were collected once during the study period at three locations to assess the baseline water quality in the study area. The samples were compared with



the CPCB’s surface water classification and they conform to Class E Water Quality Criteria. Some of the important parameters are summarized in the below table;

Parameter	Value
pH	7.42-8.42
Dissolved Oxygen mg/l	3 - 4.7
Biochemical Oxygen Demand mg/l	5.2-6.5
Total Coliform No./100ml	77-91
E- Coli No./100 ml	Absent

Ground water samples were collected from seven locations to assess the existing groundwater quality of the study area during the study period. The physico-chemical characteristics of Ground water are confirming to permissible limits of drinking water standards, prescribed in IS: 10500 (Test Characteristics for Drinking Water) and suitable for consumption. Some of the important parameters are summarized in the below table;

Parameter	Value
pH	7.11-7.94
Turbidity NTU	<1.0
Total Dissolved Solids mg/l	550.7-734.8
Total Hardness as CaCO <sub>3</sub> mg/l	225-281
Alkalinity	126.4-164.7
Fluoride as F mg/l	<0.1-1.6
Nitrate as NO <sub>3</sub> mg/l	2.2-4.6

### **Biotic Environment**

#### **Flora**

Study area had 55 flora species which comprised of 8 true mangrove species & 47 non mangrove species. Further of 55 flora species, the IUCN assessment of 24 species was Least Concern, 1 species as Data Deficient, 4 species viz. *Pterocarpus dalbergioide*, *Dipterocarpus gracilis*, *Myristica andamanica* & *Hopea odorata* as Vulnerable and 1 species viz. *Dipterocarpus grandiflorus* as Endangered, whereas assessment of 25 species was not available.

Though study area had presence of Vulnerable, Near Threatened & Endangered species, any of the project related activities during construction or operational phases does not associate with & alter/affect the said species in the study area.

#### **Fauna**

Except for the listed 18 bird species none other fauna was recorded during primary field surveys in and around the project site, of which IUCN assessment of 17 species seen around project site was Least Concerned & 1 species viz. *Spilonis elgini* was assessed as Vulnerable. The project activities does not alter the surrounding environs except for the dedicated 3,750 m<sup>2</sup> Project Area.



### **Flora (Sea grasses)**

4 species of sea grasses are reported from sea off Shaheed Dweep of which IUCN assessment of 3 species is Least Concerned & assessment of 1 species is not available.

### **Avifauna**

A total of 136 species of birds belonging to 15 order & 40 families were recorded in Ritchie’s Archipelago, of which 85 species were resident, 27 species were resident migrants & 24 species were migrant. Out of the 20 bird species which are endemic to Andaman Islands, 13 species were recorded in Archipelago. Highest number of species richness & abundance was recorded at Swaraj Dweep followed by Shaheed Dweep.

### **Odonata**

43 species of Odonata under 4 families & 25 genera from Ritchie’s Archipelago. Out of 43 species of Odonata, 29 species were reported from Shaheed Dweep.

### **Butterflies**

84 species of Butterflies under 5 families & 58 genera from Ritchie’s Archipelago, out of 84 species of butterflies, 56 species were reported from Shaheed Dweep.

### **Reptiles & Amphibians**

16 reptile species are reported from Shaheed Dweep of which the IUCN assessment of 4 species was Least Concern, 1 species viz. *Ophiophagus hannah* was assessed as Vulnerable, 1 species *Eretmochelys imbricate* was assessed as Critically endangered and 1 species *Chelonia mydas* was assessed as Endangered whereas 9 species were Not Assessed. 2 species of reported amphibians from Shaheed Dweep were assessed as Least Concern.

Off the reported reptiles & amphibians 3 species of reptiles viz. Salt water crocodile (*Crocodylus porosus*), Hawks bills sea turtle (*Eretmochelys imbricate*) & Green sea turtle (*Chelonia mydas*) are listed in Schedule I of WPA 1972.

### **Mammals**

6 species of mammals were reported Shaheed Dweep 4 species were assessed as Least Concern 1 species viz. Sea cow (*Dugong dugong*) were assessed as Vulnerable and assessment of 1 species is not available. Sea Cow (*Dugong dugong*) is listed as Schedule I species.

### **Echinodermata (Other than Holothuroidae)**

14 species of echinoderms are reported from Shaheed Dweep of which 1 species is assessed as Least concern, 1 species is assessed as Data Deficient, 1 species viz. Surf redfish (*Actinopyga mauritiana*) is assessed as Vulnerable & assessment of 11 species is not available.

### **Corals (Sclerectinians – Stony Corals)**



106 species of stony corals are reported from Shaheed Dweep, of which the IUCN assessment of 5 species is as Data Deficient, 51 species as Least concern, 31 species as Near Threatened, 10 species as Vulnerable & 1 species as Endangered, whereas as assessment of 8 species was not available.

All of the reported coral species are listed in Schedule I of WPA 1972.

### **Brachyuran crabs**

19 species are reported from Shaheed Dweep of which IUCN assessment is not available.

*Socio-economic Environment* – The socio economics of study area is studied through primary and secondary survey. The socio-economic aspects of the study area is summarised in the table given below;

Parameters	Study area (10 km)
Total No. of Villages	5
Total no. of Households	680
Total Population	2766
Sex ratio	866
SC/ST population	0% (SC) & 0.11% (ST)
Literacy Rate	75.96%

The survey revealed that educational facility at the minimum level of senior secondary education is available. Further there is also availability of Primary Health Centre (PHC), Pucca Road (Sadak), Tap water (main source of drinking water) and power supply.

## **5.0 Anticipated Environment Impacts and Mitigation Measures**

### *Construction Phase:*

On shore facilities such as Passenger Facilitation Centre (PFC). The existing shelter available at Shaheed jetty will be used as a passenger facilitation centre, passengers will be transferred via Solar operated boat transfers to the floating docking pad of seaplane and then to the Sea Planes

Off shore facilities such as Floating Dock, Fire and Rescue Boat, Sea Planes and a suitable water operating area, including identified approach and departure paths, etc.

Since there is no construction activities involved in the proposed project the impacts during construction phase is negligible.

### *Operational Phase:*

The potential environmental impacts due to the proposed water aerodrome operations have been assessed in detail. These include impact on air quality, noise, water quality, solid waste, ecology and socio economics, etc. The modelling and analysis of the data indicate that the predicted impacts are minimal and are within the prescribed norms and standards. Comprehensive



mitigation measures have been incorporated in the environment management plan to mitigate the anticipated impacts. These have been summarised below.

*Air Environment:*

The following probable sources are identified in operation phase:

- Emissions from fuel burning for plane operations at different speed and altitude.

The prediction of the Ground Level Concentrations (GLC’s) due to emissions of pollutants such as PM, SO<sub>2</sub>, NO<sub>x</sub> and CO from the operation phase has been computed by AERMODCloud5 as per CPCB guidelines.

The predicted 24 hour Max. GLC of PM, SO<sub>2</sub>, NO<sub>x</sub> and CO for proposed project is 0.09 µg/m<sup>3</sup>, 0.12 µg/m<sup>3</sup>, 9.73 µg/m<sup>3</sup> and 0.0013 mg/m<sup>3</sup> at a distance of ~40m in the E directions.

The modelled concentrations for all the pollutants have been found to remain within the corresponding National Ambient and Air Quality Standards (NAAQS). Mitigation measures will be in place to minimize potential adverse impacts of air emissions on health of receptors. In view of this, the atmospheric emissions during the operation phase are anticipated to be localised and the impact significance is assessed as negligible.

*Mitigations*

- Sea Plane engine shall be maintained in good condition

*Noise Environment*

Noise generating sources are due to the following activities:

1. Seaplane noise during takeoff and landing
2. Noise producing from seaplane passenger boarding and arrival

The prediction of ambient noise from the proposed project was carried out using software tool “Custic 3.2.”. During takeoff and landing of seaplane noise at terminal building and boarding point will be 38.96 dB(A) & 48.91 dB(A) respectively.

Therefore, these noise levels will remain well within acceptable limits and will not have any impact outside the boundary from the proposed project.

*Mitigation*

- Selection of the new equipment’s should be made with specification of low noise levels, wherever possible;
- Regular maintenance of equipment, pumps should be undertaken to mitigate the noise generation.
- Employees should be provided with personal protective equipment’s such as ear plugs or ear muffs;



- Regular Noise monitoring shall be carried out all around the periphery of the project boundary facility & records maintained;
- Due to attenuation phenomena take-off noise will less in near community. No major local community within 500 m vicinity
- Idle running of sea planes and vehicles to be avoided

#### *Water Environment*

The proposed project consists of pre-casting of floating jetty hence water is not required for the project. No additional water is envisaged. No ground water shall be withdrawn for this proposed project. Thus, no any major impact is envisaged on water environment due to this project

#### *Land Environment*

The existing passenger shed available at Jetty will be used as a passenger facilitation centre and passengers will be transferred via solar operated boat to the proposed floating dock and then to the Sea Planes. Thus, land requirement is not envisaged.

#### *Biotic Environment*

The project during operational phase does not envisage discharge/disposal of any sort of liquid (effluent) or solid (hazardous waste) on the ground or in the water bodies within the study area thus no any impact envisages on biotic environment.

#### *Socio-Economic Environment*

The project activity doesn't involve any R&R and the proposed project will generate local direct & indirect employment in terms of contracts, tourism related activities etc. Therefore, impact on socio economics due to proposed project activities is seen as a positive impact.

### **6.0 Analysis of Alternatives**

Alternative Site adjacent to selected project site in west direction was considered for proposed aerodrome activity. However, due to absence of access and due to high chances of flooding at that point the proposed project site was selected, considering availability of land and access.

### **7.0 Risk Assessment and Emergency Response Plan**

Risk Assessment has been prepared for the Hazard identified by comparative and/or fundamental methods leading to qualitative or quantitative results. While identifying the hazard(s) a filtering process is carried and only portions with potential risk are involved for risk analysis. Hazard is not considered for further analysis, if it is; Unrealizable, and Not very significant.

Preliminary Hazard Analysis has been carried out for site operations covering the safety aspects during construction as well as operation phase.

As an outcome of this identification of hazards exercise credible events are listed and used for carrying out consequence analysis. Leakage of hazardous material due to accidents has been



assessed by models and Maximum Credible Accident Analysis (MCAA). The outputs are damage distances of heat radiation, toxic releases, vapour cloud explosion etc. Consequence Analyses are carried out modeling relevant models in handling fuels. Accidental spill/ fire is considered as worst possible scenarios having potential for serious consequence are considered for further quantities risk estimation.

The individual risk assessment considering the probability of the events is carried out considering approx. 90 number of occupants/ users of the facility on daily basis.

On the basis of above risk mitigation measures are suggested and are of two types; to reduce the probability of undesired event and reducing the severity of the consequences.

At the project site, a robust and elaborate safety & fire protection systems shall be in place and with detailed procedures laid out. Further, an emergency response and disaster management plan is being prepared and shall be practiced. As a part of risk mitigation measures SOP's are provided for natural and manmade disasters. These systems and procedures for emergency response shall be strengthened from time to time.

## **8.0 Post Project Environmental Monitoring Plan**

The sampling, analysis and frequency of environmental attributes including monitoring locations will be as per the guidelines provided by MoEF&CC/CPCB/ANPCC. The monitoring shall be carried out by third party laboratories that are accredited by NABL & MoEF&CC recognized.

## **9.0 Environmental Management Plan**

The proposed terminal will be certified for internationally accepted Environmental Management System based on ISO-14001, Quality Management and Occupational Health & Safety Management Systems. An environmental monitoring program shall be put in place, periodic review & audits shall be carried out for effective environmental management. The terminal shall have an Environmental Management Cell which shall ensure overall effective implementation of the management plan.

In general, systems shall be in place to ensure compliance with respect to environmental statutory requirements and Environment Policy are strongly adhered to all time.

## **10.0 Project Benefits**

The following benefits are expected from the proposed project:

- This project will connect Islands to Port Blair and ultimately it will promote tourism, resulting into growth in economic condition of these remote areas.
- This project will serve job opportunities to local people in terms of direct and indirect employment.



- Considering clean ecosystem of this island, foreign tourists are assumed to be attracted at these places, resulting into good foreign exchange amount.

### **11.0 Corporate Environment Responsibility (CER) Action Plan**

The proposed project has been funded by the Central Funding and will provide to boost the tourism and increase in employment.

### **12.0 Project Schedule and Cost**

The proposed project is scheduled to be commissioned within 2-6 months after Environment Clearance (EC) and other statutory approvals are granted. The estimated project cost is Rs. 11.41 Crores. For protection of environment, it is proposed to spend 15.0 Lakhs as capital cost of EMP budget, while 29.0 Lacs will be spent as recurring cost per year.

### **13.0 Conclusion**

This impact assessment study indicates that the overall impacts from the proposed project activities will be short term, reversible, localised and are not expected to contribute significantly to the surrounding environment. Also, with the implementation of the pollution control and the environment management measures, these anticipated impacts due to construction and operation of the proposed project will be significantly mitigated.

Project proponent will also ensure that the environmental performances of all the activities are monitored throughout execution of the project during both construction and operation phase. The project proponent will also report environmental performance and monitoring reports regularly to statutory authorities.

Project Proponent shall develop systems and procedures for effective environmental management. The effective management system coupled with monitoring of environmental components and efforts for continual improvements will result in exemplary environmental performance.



## **CHAPTER 1. INTRODUCTION**

### **1.1 Purpose of the Report**

**Directorate of Civil Aviation, Andaman and Nicobar Administration** (Project Proponent) has proposed Water Aerodrome project at Village: Shaheed Dweep, Tehsil: Port Blair, District: South Andaman, Andaman & Nicobar Islands.

As per Environment Impact Assessment (EIA) Notification dated 14<sup>th</sup> September 2006, and its further amendments, all projects pertaining to Airports are listed under 'Category A' with activity number 7 (a).

The proposal was submitted to MoEF&CC, New Delhi & subsequently project was considered in the 46<sup>th</sup> meeting of Expert Appraisal Committee (EAC, Infra-2) held on 25-26 November, 2019 & as per approved ToR Letter “EAC noted that Water Aerodrome is not a listed project/activity in the Schedule to the EIA Notification 2006 and its amendments. However, committee opined that the activities proposed under the project would have similar types of impact as that of normal Airport”.

Considering the Water Aerodrome are just emerging in the country as a new mode of transport, involving sea/river fronts and its likely impacts on water, air and aquatic biodiversity including flora and fauna, the EAC has had taken a view to follow the EC process as per category A of item 7(a), ‘Air Ports’ of the Schedule to the EIA Notification, 2006 and accordingly, the ToR was recommended by EAC (*copy of TOR enclosed as Annexure I*).

### **1.2 Identification of Project & Project Proponent**

Project proponent is Directorate of Civil Aviation, Andaman & Nicobar Administration. The Project involves development of Water Aerodrome

The proposed project envisages approximately 48,600 Passengers Per Annum. The total manpower envisaged is approximately 30 for the project. The Project cost is Rs. 11.41 Crores. The Project Brief is as provided in **Table 1.1**.

**Table 1.1: Project Brief**

<b>Name of Project</b>	“Development of Water Aerodrome”
<b>Name, contact number &amp; address of Proponent</b>	Mr. Ravichandran Directorate of Civil Aviation Andaman & Nicobar Administration Helicopter Terminal Building, Port Blair, Andaman & Nicobar; E mail: <a href="mailto:civilaviation.and@nic.in">civilaviation.and@nic.in</a>
<b>Name, contact number &amp; address of Consultant</b>	M/s Enviro Resources C-305 Crystal Plaza, Off New Link Road, Opp. Infiniti Mall, Andheri west, Mumbai 400053, Maharashtra Tel: +91 9867898844 Email: <a href="mailto:info@enviroresources.in">info@enviroresources.in</a> Website: <a href="http://www.enviroresources.in">www.enviroresources.in</a>



<b>Area for Sea plane runway</b>	54,000 m <sup>2</sup>
<b>Area for floating dock</b>	432 m <sup>2</sup>
<b>Litigation pending</b>	Not any

The project is being undertaken by Directorate of Civil Aviation, Andaman and Nicobar Administration. The project is being facilitated by Airport Authority of India (AAI).

AAI manages a total of 125 Airports, which include 11 International Airports, 08 Customs Airports, 81 Domestic Airports and 25 Civil Enclaves at Defense Airfields. AAI also provides Air Traffic Management Services (ATMS) over entire Indian Air Space and adjoining oceanic areas with ground installations at all Airports and 25 other locations to ensure safety of Aircraft operations.

### **1.3 Brief description of Nature, Size, Location of the Project and its Importance**

The components of Seaplane Base / Water Aerodrome will include:

On shore facilities such as Passenger Facilitation Centre (PFC). The existing shelter available at Shaheed jetty will be used as a passenger facilitation center, passengers will be transferred via Solar operated boat transfers to the floating docking pad of seaplane and then to the Sea Planes  
Off shore facilities such as Floating Dock, Fire and Rescue Boat, Sea Planes and a suitable water operating area, including identified approach and departure paths, etc.

The project will be located on Village – Shaheed Dweep, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar Island. The geographical location of the project is as mentioned in **Table 1.2**.

**Table 1.2: Geographical Location of the project**

<b>SN</b>	<b>Component</b>	<b>Description</b>
1	Latitude / Longitude	11°50'26.26"N, 93° 2'15.69"E
2	Village/ Tehsil/ District/ State (UT)	Bharatpur / Port Blair/ South Andaman / Andaman & Nicobar UT
3	Nearest Airport	Veer Savarkar International Air port~ 39.12 km (Aerial Distance)
4	Nearest Wildlife Sanctuary/ ESA/ National Park	Rani Jhansi Marine National Park is present at approx. Distance of 2.8 km from the proposed Project site Sir Hugh Ross Island Wildlife Sanctuary is present towards Southeast of project site at an approximate aerial distance of 7 km.

With the growth of aviation industry, India is also witnessing tremendous growth in aircraft operations. Seaplane operations in India are yet an untapped market even though a tremendous potential exists, being a vast country with magnificent waterfronts all across. With current growth scenario in civil aviation, particularly in India, the Central Government has launched "Ude Desh ka Aam Naagrik" Regional Connectivity Scheme (UDAN-RCS) to reach out to remote areas.



Sea plane operation from coastal waters/ rivers/ canals as well as terrestrial water fronts will extend the connectivity to those areas where there is no land based airport. The high capital investment for airside infrastructure development required in conventional land based airport can be avoided. Thus there is a necessity to establish water aerodromes for seaplane operations.

#### **1.4 Objectives and Scope of EIA Study**

EIA integrates the environmental concerns in the developmental activities so that it can enable the integration of environmental concerns and mitigation measures in project development. EIA can often prevent future liabilities or expensive alterations in project design.

The study area considered is the 10 km radial area form proposed project site for Environmental monitoring while for studying the environmental sensitivity a radius of 15 km is considered. Secondary data is also collected within the radius of 10 km around project site.

In order to get an idea about the existing state of the environment, various environmental attributes such as meteorology, air quality, water quality, soil quality, noise level, ecology and socio-economic environment are studied /monitored by respective approved Functional Area Experts. Environmental baseline monitoring has been carried out during December, 2019 to February, 2020.

The scope of the study broadly includes:

- Description of the project and associated works together with the requirements for carrying out the proposed development.
- Establishing the baseline environmental and social scenario of the projects and its surroundings.
- Identification and description of the elements of the community and environment likely to be impacted by the project.
- Identification, prediction and evaluation of environmental and social impacts during the construction and operation phase of the project.
- Studying the existing traffic scenario, prediction of the increment in traffic due the project and to suggesting the management plan for the same.
- Conservation of resources.
- Designing and specifying the monitoring and audit requirements necessary to ensure the implementation and the effectiveness of the mitigation measures adopted. Evaluation of proposed pollution control measures and delineate environmental management plan (EMP) outlining additional control measures to be adopted for mitigation of adverse impacts. Delineation of post-project environmental quality monitoring program to be pursued by **Directorate of Civil Aviation, Andaman & Nicobar Administration.**

#### **1.5 Terms of References (TOR) and their Compliances**

The project was considered in the 46<sup>th</sup> meeting of Expert Appraisal Committee (EAC- Infra-2) held on 25-26 November, 2019, wherein ToR was recommended by EAC. As per the



recommendation of the EAC, the Ministry of Environment, Forest and Climate Change accorded ToR to the project vide letter No. F.No. 10-54/2019-IA-III dated 16<sup>th</sup> December, 2019 (copy of TOR enclosed as *Annexure I*).

The collection of environmental baseline data was carried out in the period of December, 2019 to February, 2020. The TOR Compliance is as presented in **Table 1.3**.

**Table 1.3: Compliance of ToR**

SN	ToR	Compliance
<b>Project Description</b>		
1	Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental angle, resources sustainability associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weightage criteria for short-listing selected site.	<p>The proposed project site was selected based on recommendation of 304th EAC meeting held dated 21 &amp; 22 July 2022 and further approval received from A&amp;N administration</p> <p>The activities include runway and pre-casting of floating jetty near runway which is falling in CRZ IV and which are regulated activities as per IPZ notification 2011.</p> <p>Other ancillary facilities like Terminal building, and walkway (falling under CRZ IB and CRZ III) which were mentioned in earlier proposal will not be developed.</p> <p>The existing shelter available at Shaheed jetty will be used as a passenger facilitation center passengers will be transferred via boat transfers to the floating platform and then to the Sea Planes</p>
2	Details of the land use break-up for the proposed project. Details of land use around 10 km radius of the project site. Examine and submit detail of land use around 10 km radius of the project site and map of the project area and 10 km area from boundary of the proposed/existing project area, delineating project areas notified under the wild life (Protection) Act, 1972/critically polluted areas as identified by the CPCB from time to time/notified eco-sensitive areas/inter state boundaries and international boundaries. Analysis should be made based on latest satellite imagery for land use with raw images.	<p>Details of land use &amp; land cover around 10 km radial area of project site is given in Chapter 3, Section 3.3.2.</p> <p>Map of 10 km radial area from project site delineating areas notified under the wild life (Protection) Act, 1972/critically polluted areas as identified by the CPCB from time to time/notified eco-sensitive areas/interstate boundaries and international boundaries is given in Executive Summary, Section 3.0, Figure No. 1</p>
3	Submit the present land use and permission required for any conversion such as forest, agriculture etc. land acquisition status, rehabilitation of	<p>The site of Shaheed Dweep was previously under Revenue Department with none specific land use. Presently the site has been transferred to Andaman and Nicobar Islands Integrated</p>



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
	communities/ villages and present status of such activities. Check on flood plain of any river.	Development Corporation Ltd (ANIIDCO) for the Aerodrome development. There is no habitation/ community on the project location. The Land Allotment Letter is given as Annexure 2 of EIA report.
4	Examine and submit the water bodies including the seasonal ones within the corridor of impacts along with their status, volumetric capacity, quality likely impacts on them due to the project.	The details of water bodies within 10 km radial distance of project area are given in Chapter 3, Section 3.3.5.2, Figure 3.4C.  The anticipated impacts on water bodies during construction & operation phase is given in Chapter 4, Section 4.3
5	Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area, any obstruction of the same by the airport.	The Digital Elevation Map (DEM) of surrounding area is given in Chapter3, Section 3.3.5.1, Figure 3.4B & the drainage pattern is given in Chapter 3, Section 3.3.5.2, Figure 3.4C,
6	Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/ villages and present status of such activities.	The environmental sensitivity details of 15 km radial area of project site are given in Chapter 2, Table 2.2.  The proposed project site has been allocated to Andaman and Nicobar Islands Integrated Development Corporation Ltd (ANIIDCO) for the Water Aerodrome development & currently is under possession of ANIIDCO & is uninhabited, thus R&R aspects are not involved.
7	Examine the impact of proposed project on the nearest settlements.	The anticipated impacts (air pollution, water pollution, noise generation, waste generation) during construction & operational phase of proposed project activities on settlements within 10 km radial area are given in respective sections of Chapter 4.
8	Examine baseline environmental quality along with projected incremental load due to the proposed project/ activities.	The baseline environmental quality of all environmental components viz. (air, surface water, ground water, soil, noise, land, biotic – aquatic & terrestrial, socio economics) are given in Chapter 3 and the anticipated impacts (air pollution, water pollution, noise generation, waste generation) during construction & operational phase of proposed project activities on settlements within 10 km radial area are given in respective sections of Chapter 4.
9	Examine and submit details of levels, quantity required for filling, source of filling material and Transportation details etc. Submit details of a comprehensive Risk Assessment and	Not Applicable



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
	Disaster Management Plan including emergency evacuation during natural and man-made disaster integrating with existing airport.	
10	Examine road/rail connectivity to the project site and impact on the existing traffic network due to the proposed project/activities. A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic.	<p>The project location viz, Shaheed Dweep is connected to surrounding Islands by ferries, further the project site will be connected to Bharatpur Road by a proposed 5-6 m wide road.</p> <p>The existing PCU’s of Shaheed Dweep is 474 &amp; sea plane proposed for use in this project is having capacity of 9 Passengers. It is proposed to develop the infrastructure facility for 180 Passengers per day. The proposed project will create at max addition of ~ 100 trips per day of cars i.e. 10 cars per hr considering 10 hrs of daytime operations.</p> <p>The existing design capacity of road as per IRC 106-1990 guidelines is 1900 PCU’s/hr (2 lane 1 way). The additional 10 cars per hour (i.e. 10 PCU’s/hr) is very marginal to the design capacity and will not significantly affect the current traffic situation.</p> <p>Detailed traffic assessment study is given in Chapter 10, Section 10.5.</p>
11	Submit details regarding R&R involved in the project	The proposed project plot is uninhabited & has been allocated to Andaman and Nicobar Islands Integrated Development Corporation Ltd (ANIIDCO) by Andaman & Nicobar Administration, thus R&R aspects are not involved.
12	Examine the details of water requirement, use of treated waste water and prepare a water balance chart. Source of water vis-à-vis waste water to be generated along with treatment facilities to be proposed.	The proposed project consists of pre-casting of floating jetty hence water is not required for the project
13	Rain water harvesting proposals should be made with due safeguards for ground water quality. Maximize recycling of water and utilization of rain water.	Not applicable
14	Examine details of Solid waste generation treatment and its disposal	In proposed project passengers will be transferred via solar operated boat to the proposed floating dock and then to the



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
		Sea Planes thus solid waste generation is not envisaged
15	Submit the present land use and permission required for any conversion such as forest, agriculture etc	The site of Shaheed Dweep was previously under Revenue Department with no specific land use. The site has been transferred to Andaman and Nicobar Islands Integrated Development Corporation Ltd (ANIIDCO) for the Aerodrome development. There is no habitation/ community available at the project location. The Land Allotment Letter is given as Annexure 2 of EIA report.
16	Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters	The Environmental Monitoring Plan with cost and parameters for both construction & operational phases of the proposed project is given in detail in Chapter 6, Section 6.4, Table No. 6.1 & Table No. 6.2.  The Environmental Management Plan with cost & Parameters for both construction & operational phases of the proposed project are given in detail in Chapter 10, Section 10.4, Table No. 10.2 & Table No. 10.3.
17	Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.	The project specific comprehensive disaster details of Risk Assessment and Disaster Management including emergency evacuation during natural & man-made disaster is given in Chapter 7.
18	Examine baseline environmental quality along with projected incremental load due to the proposed project/ activities.	The baseline environmental quality of all environmental components viz. (air, surface water, ground water, soil, noise, land, biotic – aquatic & terrestrial, socio economics) are given in Chapter 3 and the anticipated impacts (air pollution, water pollution, noise generation, waste generation) during construction & operational phase of proposed project activities on settlements within 10 km radial area are given in respective sections of Chapter 4.
19	The air quality monitoring should be carried out as per the notification issued on 16th November, 2009.	The air quality monitoring within 10 km radial study area is carried out as per the notification issued on 16 <sup>th</sup> November, 2009, monitoring details are given in Chapter 3, Section 3.4.2 to Section 3.4.5.
20	Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and	The Environmental Monitoring Plan with cost and parameters for both construction & operational phases of the proposed project is given in detail in Chapter 6, Section 6.4, Table No. 6.1 & Table No. 6.2.



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
	parameters.	The Environmental Management Plan with cost & Parameters for both construction & operational phases of the proposed project is given in detail in Chapter 10, Section 10.4, Table No. 10.2 & Table No. 10.3.
21	Submit details of corporate social responsibilities (CSR)	The proposed project has been funded by the Central Funding and will provide the boost the tourism and increase in employment.
22	Submit details of the trees to be cut including their species and whether it also involves any protected or endangered species. Measures taken to reduce the number of the trees to be removed should be explained in detail. Submit the details of compensatory plantation. Explore the possibilities of relocating the existing trees.	The proposed project is in the sea (CRZ IV) thus tree cutting is not envisaged
23	Examine the details of afforestation measures indicating land and financial outlay. Landscape plan, green belts and open spaces may be described. A thick green belt should be planned all around the nearest settlement to mitigate noise and vibrations. The identification of species/ plants should be made based on the botanical studies	The proposed project is in the sea (CRZ IV) thus green belt is not envisaged
24	Public hearing to be conducted for the project in accordance with provisions of Environmental Impact Assessment Notification, 2006 and the issues raised by the public should be addressed in the Environmental Management Plan. The Public Hearing should be conducted based on the ToR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the web-site.	Public Hearing has been conducted on 25 <sup>th</sup> September 2020, the summary of issues raised & commitments made by project proponent are given in Chapter 7, Section 7.1. Table No. 7.1. Proceedings of the Public Hearing are given as Annexure 5 of the EIA report.
25	A detailed draft EIA/EMP report should be prepared in accordance with the above additional TOR and should be submitted to the Ministry in accordance with the Notification.	Noted and the EIA report has been prepared accordingly
26	Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.	No Pending Litigation.



**CHAPTER 1: INTRODUCTION**

<b>SN</b>	<b>ToR</b>	<b>Compliance</b>
27	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	The estimated project cost is Rs. 11.41 Crore, the Environmental Management Plan cost for construction phase is Rs. 7.34 Lakh and the Environmental Management Plan cost for operational phase is Capital - Rs. 15.0 Lakh & Recurring cost/annum - Rs. 29.0 Lakh.
28	Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website " <a href="http://moef.nic.in/Manual/Airport">http://moef.nic.in/Manual/Airport</a> ".	The same has been noted.
<b>Additional ToR</b>		
1	Importance and benefits of the project.	The proposed project importance & benefits are detailed in Chapter 2, Section 2.2, and in Chapter 8
2	The EIA will discuss the compliance to the Pollution Control Laws and the notifications under the E.P. Act 1986 and get a certified report from the Pollution Control Board.	The same has been addressed in EIA, Compliance to Pollution Control Laws will be achieved in project implementation & operational stage, certified compliance report will be timely obtained during project operational phase.
3	The E.I.A. will give a justification for land requirements along with a comparison to the guidelines established by the Airport Authority of India/Ministry of Civil Aviation in this regards.	The land requirement details are given in Chapter 2, Section 2.31.
4	A toposheet of the study area of radius of 10 km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places).	A toposheet of the study area of radius of 10 km and site location including all eco-sensitive areas and environmentally sensitive places is given in Executive Summary, Section 2, Figure 1.
5	Layout maps of proposed project indicating runway, Aerodrome building, parking, greenbelt area, utilities etc.	Layout maps of proposed project indicating runway, floating jettys etc. are given in Chapter 2, Figure 2.5
6	Cost of project and time of completion	The estimated cost of proposed project is Rs. 11.41 Crores & time of completion will be within 2-6 months, after obtaining Environment Clearance & necessary permissions from Andaman and Nicobar Pollution Control Committee (ANPCC) and other statutory approvals as required.
7	The impacts of demolition and the activities related thereto shall be examined and a management plan	This is a green field project area, hence no demolition activity required to be carried out.



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
	drawn up to conform to the Construction and Demolition rules under the E.P. Act, 1986.	
8	The report shall examine the details of excavations, its impacts and the impacts of transport of excavated material. A detailed Management Plan shall be suggested.	The excavated material will be reused for filling of proposed development area and under plinth of the terminal building.
9	Detail plan for ‘deplane waste’ and impact of noise on the sensitive environment specially the wildlife sanctuaries and national parks.	<p>In flight Trash will not be generated as food/snacks will not be served on board the sea planes. The seas planes to be operated for proposed project will not have lavatories/ toilet facilities thus toilet waste/sewage will not be generated, thus deplane waste will not be generated.</p> <p>The impact of noise during construction &amp; operational phases of proposed project on sensitive environment within 10 km radial area of project is detailed in Chapter 4, Section 4.2,</p>
10	EIA report should contain the water quality, flora and fauna details along with corals in the region.	The detailed account of water (ground & surface) quality flora & fauna within 10 radial study area are given in Chapter 3.
11	An assessment of the cumulative impact of all development and increased inhabitation being carried out or proposed to be carried out by the project or other agencies in the core area, shall be made for traffic densities and parking capabilities in a 05 kms radius from the site. A detailed traffic management and a traffic decongestion plan drawn up through an organization of repute and specializing in Transport Planning shall be submitted with the EIA. The Plan to be implemented to the satisfaction of the State Urban Development and Transport Departments shall also include the consent of all the concerned implementing agencies	<p>The project location viz, Shaheed Dweep is connected to surrounding Islands by ferries, further a 5-6 m wide road is proposed which will ultimately connect the project site to SH6.</p> <p>The existing PCU’s of Shaheed Dweep is 474 &amp; sea plane proposed for use in this project is having capacity of 9 Passengers. It is proposed to develop the infrastructure facility for 180 Passengers per day Detailed traffic assessment study is given in Chapter 10, Section 10.5.</p>
12	The E.I.A. should specifically address to vehicular traffic management as well as estimation of vehicular parking area inside the Aerodrome premises	The same has been addressed in Chapter 10, Section 10.5.
13	An onsite disaster management plan shall be drawn up to account for risks	Project activity specific risk assessment studies have been conducted & based on the findings of



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
	and accidents. This onsite plan shall be dovetailed with the onsite management plan for the district	risk assessment studies onsite disaster management plan has been prepared, given in detail in Chapter 7, Section 7.2, The onsite emergency preparedness plan has been dovetailed with the onsite management plan for the district, given in Chapter 7, Section 7.3.
14	A note on appropriate process and materials to be used to encourage reduction in carbon foot print. Optimize use of energy systems in buildings that should maintain a specified indoor environment conducive to the functional requirements of the building by following mandatory compliance measures (for all applicable buildings) as recommended in the Energy Conservation Building Code (ECBC) 2017 of the Bureau of Energy Efficiency, Government of India. The energy system includes air conditioning systems, indoor lighting systems, water heaters, air heaters and air circulation devices	Solar operated transfer boats will be used.
15	Details shall be provided regarding the solar generation proposed and the extent of substitution, along with compliance to the ECBC rules	Not applicable
16	Details of emission, effluents, solid waste and hazardous waste generation and their management. Air quality modeling and noise modeling shall be carried out for the emissions from various types of aircraft	Air quality modelling done for construction & operation phase of proposed project is given in Chapter 4, Section 4.1.1 & Section 4.1.2  Noise quality modeling done for the type of sea plane to be used in proposed project is given in Chapter 4, Section 4.2.2, Details of emissions, effluents, solid waste and hazardous waste generation & their management are given in respective sections of Chapter 4.
17	The impact of aircraft emissions in different scenarios of idling, taxiing, take off and touchdown shall be examined and a management plan suggested.	The anticipated impact of air emissions considering various scenarios of sea plane such as idling, taxiing, take off and touchdown along with respective mitigation measures are given in detail in Chapter 4, Section 4.1.2,
18	The impact of air emissions from speed controlled and other vehicles plying within the Airport shall be examined and management plan drawn up.	The anticipated impact of air emissions from speed-controlled vehicles during construction & operational phases of project & respective mitigation measures are given in Chapter 4,



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
		Section 4.1.1 & Section 4.1.2,
19	The management plan will include compliance to the provisions of the MSW Rules, 2016.	The MSW generation will not be not generated due to proposed project.
20	A detailed management plan, drawn up in consultation with the competent District Authorities, shall be submitted for the regulation of unauthorized development and encroachments within a 05 Km radians of the Aerodrome.	The details of the encroachments within 05 km radius of the Aerodrome are as provided by Andaman and Nicobar Administration as Annexure 4 of EIA Report.
21	Noise monitoring and impact assessment shall be done for each representative area (as per the Noise Rules of MoEF&CC). A noise management plan shall be submitted to conform to the guidelines of the MoEF&CC and the DGCA.	<p>The details of noise monitoring conducted within study area as per MoEF&amp;CC guidelines are given in Chapter 3, Section 3.5.2,</p> <p>Anticipated cumulative noise during construction &amp; operational phase of proposed project are assessed using Custic Software detailed in Chapter 4, Section 4.2</p> <p>The project activity specific noise mitigation measures to adhere to MoEF &amp; CC Standards are given in Chapter 4, Section 4.2.2,</p>
22	Noise monitoring shall be carried out in the funnel area of flight path	<p>Since the proposed project is a Green field Water Aerodrome project; the noise monitoring is carried out on the land side closest to the proposed funnel area of flight path.</p> <p>Details of such noise monitoring along with other locations are given in Chapter 3, Section 3.5.2,</p>
23	Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract).	<p><b>Water Requirement:</b> The proposed project consists of pre-casting of floating jetty hence water is not required for the project</p> <p><b>Power Requirement</b> The proposed project consists of pre-casting of floating jetty hence power is not required for the project</p> <p><b>Man Power Requirement</b> Construction phase: Contractual construction labours will be 10-15 Nos.</p> <p>Operational phase: Regular &amp; Contractual workforce will be 30 Nos</p>
24	Details of fuel tank farm and its risk assessment.	Not applicable
25	The report should give a detailed	The flight duration of the seaplanes in proposed



**CHAPTER 1: INTRODUCTION**

SN	ToR	Compliance
	<p>impact analysis and management plan for handling of the following wastes for the existing and proposed scenarios,</p> <ul style="list-style-type: none"> <li>a) Trash collected in flight and disposed at the Aerodrome including the segregation mechanism.</li> <li>b) Toilet wastes and sewage collected from aircrafts and disposed at the Aerodrome</li> <li>c) Maintenance and workshop wastes</li> <li>d) Wastes arising out of eateries and shops situated within the Aerodrome</li> </ul>	<p>project will be of around 13 mins. &amp; waste generation &amp; handling scenario will be as under:</p> <ul style="list-style-type: none"> <li>a) In flight Trash will not be generated as food/snacks will not be served on board the sea planes.</li> <li>b) The seas planes to be operated for proposed project will not have lavatories/ toilet facilities thus toilet waste/sewage will not be generated.</li> <li>c) The maintenance of the seaplanes to be used in proposed project as needed shall be carried out at a designated Apron at Port Blair Airport and not on the proposed project site (i.e. Shaheed Dweep) hence maintenance &amp; work shop wastes will not be generated.</li> </ul>
26	<p>Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.</p>	<p>None litigation pending against the proposed project and/or any direction/order by Court of Law is not passed against the proposed project.</p> <p>The proposed project is a new (green field) activity &amp; has not received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts.</p>
27	<p>Submit an affidavit signed by the Board of Directors, that there is no violation and no part of the project has been implemented without Environmental Clearance</p>	<p>The undertaking by Directorate of Civil Aviation - Andaman and Nicobar Administration, declaring that is no violation (of EIA Notification 14<sup>th</sup> September 2006 &amp; its Amendments) and no part of the project has been implemented is given as Annexure 7 of EIA report.</p>
28	<p>Public hearing to be conducted and issues raised and commitments made by the project proponent on the same should be included in EIA/EMP Report in the form of tabular chart with financial budget for complying with the commitments made.</p>	<p>Public Hearing has been conducted on 25<sup>th</sup> September 2020, the summary of issues raised &amp; commitments made by project proponent are given in Chapter 7, Section 7.1. Table No. 7.1. Proceedings of the Public Hearing are given as Annexure 5 of the EIA report.</p>
29	<p>Plan for Corporate Environment Responsibility (CER) as specified under Ministry’s Office Memorandum vide F.No. 22-65/2017-IA.III dated 1st May 2018 shall be prepared and</p>	<p>The proposed project has been funded by the Central Funding and will provide the boost the tourism and increase in employment.</p>



SN	ToR	Compliance
	submitted aShaheed with EIA Report.	
30	A tabular chart with index for point wise compliance of above ToR	Tabular chart with index for point wise compliance of ToR is given in Chapter 1, Section 1.5, Table No. 1.3.,
31	In addition to above, since the proposal also attract IPZ Notification, 2011, following shall also be submitted along with the EIA/EMP Report: <ul style="list-style-type: none"> <li>➤ Recommendation of A&amp;N CZMA.</li> <li>➤ Submit requisite document as per IPZ Notification, 2011 such as Form-1, CRZ map on 1:4000 scale with project activities superimposed on the map.</li> </ul>	<p>The recommendations of A&amp; N CZMA are given as Annexure 7 of EIA Report.</p> <p>Form I as per IPZ Notification 2011 is given as Annexure 8 of EIA Report.</p> <p>CRZ map on 1:4000 scale with project activities superimposed on the map is given as Annexure 9 of EIA Report.</p>

### **Compliance to MoM of 304<sup>th</sup> EAC meeting**

SN	Point	Compliance
1	“to realign their layout to avoid the areas where some of the activities like terminal building, roads, etc. are not permissible as per IPZ Notification 2011”	<p>A&amp;N Administration explored the possibilities to shifting embarkation/disembarkation to the proposed new ferry terminal and as per the suggestions from the EAC, the existing shelter available at Shaheed jetty will be used as a passenger facilitation centre, passengers will be transferred via Solar operated boat transfers to the floating docking pad of seaplane and then to the Sea Planes</p> <p>In this revised proposal, A&amp;N Administration are <b>not going to develop any ancillary facilities like terminal building and floating walkway</b> which was proposed in CRZ III and CRZ IB respectively in earlier proposal, hence our <b>proposal consists of runway and pre-casting of floating dock only and which is falling in CRZ IV and which are regulated activities as per IPZ notification 2011</b></p> <p>The proposed project will utilize existing infrastructure available at Shaheed Jetty for sea plane operation</p>
2	It was also requested to the PP to submit Form-1 for seeking clearance for projects attracting CRZ Notification, 2011/IPZ Notification, 2011 (Annexure - IV of the CRZ Notification, 2011)	<p>Form I as per IPZ Notification 2011 is given as Annexure 8 of EIA Report</p> <p>Also fresh recommendation from ANZMA has been obtained for the same</p>



## **CHAPTER 2. PROJECT DESCRIPTION**

### **2.1 Type of Project**

The seaplane is in the unique position of being able to provide air service which is practically impossible with any other kind of craft. It offers the public the speed of the airplane with the utility of the boat, allowing pilots to access areas where a conventional landing area is either unavailable or cannot feasibly be built. It has provided a variety of services which has established it as a valuable means of air transportation. Seaplane landing sites, referred to as a seaplane base, will not supplant the need for land airports to serve scheduled air carrier operations and other flying activities.

Seaplane bases / water aerodrome provides the aviation, business, and tourism community an operational base and supports the community with economic, employment, and recreational opportunities. In other cases, non-scheduled or scheduled operation of sea plane passenger-service routes have proven desirable where surface transportation by land or water vessel may not exist or is tedious and time consuming.

#### ***2.1.1 Seaplane Operations – Overview of the World Scenario***

There are a variety of different seaplane operations, offering scheduled flights with high frequency to seaports, up to flights on demand to landing places without or with limited infrastructure. Most of the operators use simple foot bridges, sometimes in double use with boat bridges for embarking and disembarking purpose.

The large operators such as Harbour Air Vancouver, Maldivian Trans Air and Kenmore operate from seaplane terminals fulfilling the IATA request for safe check-in with separate check-in areas and scanners. While the Vancouver seaport has management and check-in buildings partly built by flexible materials (like tents); Maldivian has wooden buildings.

The passengers embark and disembark by pontoon bridges which are also the mooring devices for the planes. On these seaports about 4,00,000 passengers take a flight to their destination each year.

These seaports are also equipped with fuel stations and small repair shops or in case of Kenmore with walkway lift devices for bringing seaplanes into maintenance and overhaul hangars.

Other operators like Harbour Malta hired an existing harbour building as office and check-in building and built its own pontoon bridge equipped with fuel station and necessary safety devices as firefighting equipment etc.

In our proposed water aerodromes, the fuelling facility of Veer Savarkar International Airport, Port Blair will be used for seaplane refuelling and no fuelling facility shall be provided on any of the water aerodrome.



## **2.2 Need for the Project**

With the growth of aviation industry, India is also witnessing tremendous growth in aircraft operations. Seaplane operations in India are yet an untapped market even though a tremendous potential exists, being a vast country with magnificent waterfronts all across. With current growth scenario in civil aviation, particularly in India, the Central Government has launched "Ude Desh ka Aam Naagrik" Regional Connectivity Scheme (UDAN-RCS) to reach out to remote areas.

Seaplanes can cater to a variety of air transportation requirements. The use of seaplanes in tourist destinations that are close to large water bodies like sea, lake, etc. is an obvious application. Maldives, for example, has a fairly large seaplane operation catering to the tourism industry there. Seaplanes can also be used to access remote areas that may not have runways for normal planes to land but may have suitable water bodies on which seaplanes can land.

In fact, the greatest advantage of seaplanes is that the large investments required to build airports and runways are not required for their use. The West Coast of the USA and Canada (places like Seattle, Vancouver, Alaska, etc.) has a large number of seaplanes operating in calm stretches of seas and lagoons.

There are seaplanes that operate from a water body to another or from a regular airstrip to a water body or vice versa. The latter type is versatile and will be of greater use in conditions in India. For seaplanes that operate only on water, floats can be used as the landing gear where as for the other type both floats and normal landing wheels will be required. There are planes with both floats and wheels fixed and there are others where the floats are to be removed and wheels fixed. There is a third type that does not require floats, with bottoms designed for smooth landing on water with retractable landing gear for landing on normal runways. Such seaplanes are called flying boats.

Sea plane operation from coastal waters/ river/ canal as well as terrestrial water bodies will extend the connectivity to those areas where there is no land based airport. The high capital investment for airside infrastructure development required in land based airport can be avoided. Thus there is a necessity to establish water aerodromes for seaplane operations.

## **2.3 Location of the Project**

The proposed project is located on Shaheed Dweep, A&N. T. The geographical location of the project is as mentioned in **Table 2.1**.

The Location Map and the Google Image of the proposed project are as shown in **Figure 2.1** and **Figure 2.2** respectively.



## CHAPTER 2: PROJECT DESCRIPTION

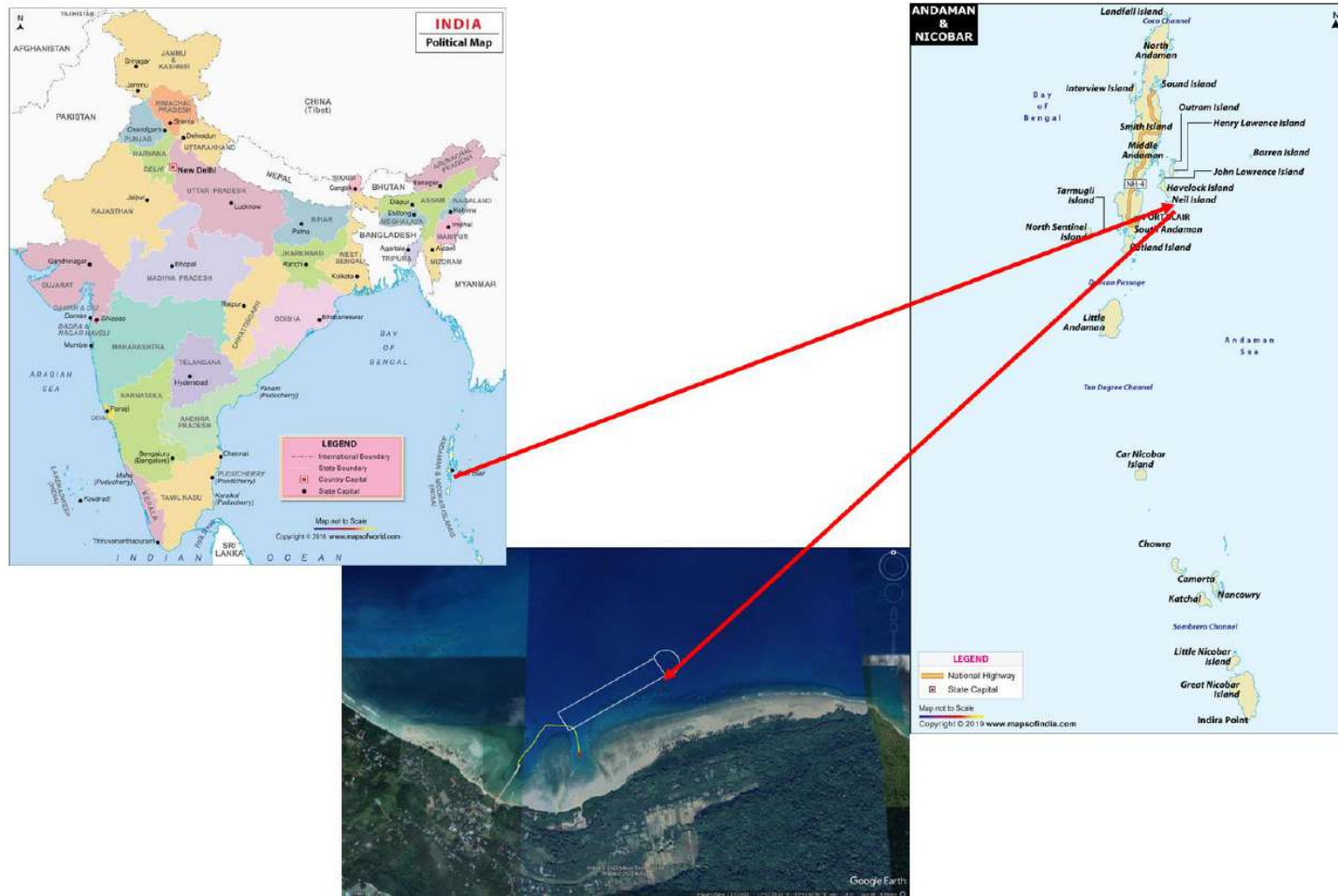
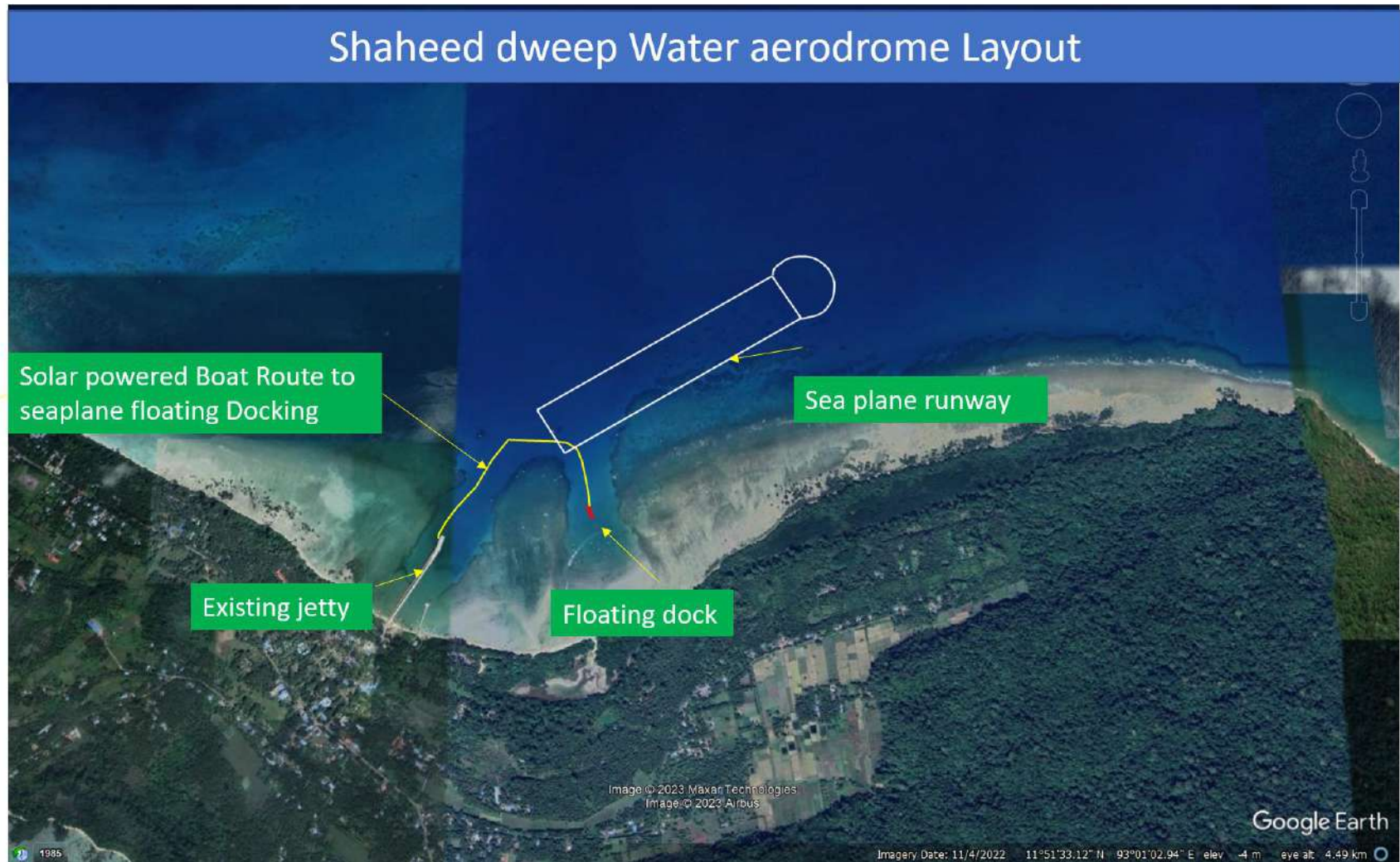


Figure 2.1: Location Map of the Project Site



**Figure 2.2: Google Image of the Project Site**



**CHAPTER 2: PROJECT DESCRIPTION**



**Figure 2.3: Site location on Khasra Map of Shaheed Dweep**



**CHAPTER 2: PROJECT DESCRIPTION**

**Table 2.1: Geographical Location of the project**

SN	Component	Description
1	Latitude / Longitude	11°50'26.26"N, 93° 2'15.69"E
2	Village/ Tehsil/ District/ State (UT)	Bharatpur / Port Blair/ South Andaman / Andaman & Nicobar UT
3	Nearest Airport	Veer Savarkar International Airport~ 39.12 km (Aerial Distance)

Environmental sensitive places within study area are given in **Table 2.2**.

**Table 2.2: Environmental Sensitive Places within 15 km**

S.No.	Areas	Present (Yes/No)	Aerial distance (within 15 km) of Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value.	Yes	Sir Hugh Ross Island Wildlife Sanctuary is present towards Southeast of project site at an approximate aerial distance of 7 km.
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	1) The project is falling under CRZ IV as per ICRZ notification, 2011. 2) The project offshore facilities/operations will be in Andaman Sea.
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, over wintering, migration.	Yes	Mangrove Forest, Corals & Andaman Sea are in close proximity.
4	Inland, coastal, marine or underground waters.	Yes	The project offshore facilities will be located in Andaman Sea.
5	State, National boundaries	No	Not present within 15 km radius from project site.
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas.	Yes	The nearby area from project site itself serves as tourist place.
7	Defense installations	No	Not present within 15 km radius from project site.
8	Densely populated or built-up area.	Yes	The project site is in Bharatpur which is relatively densely populated.
9	Areas occupied by sensitive man-made land uses ( <i>hospitals, schools, places of worship, community facilities</i> )	Yes	Present at nearby locations.
10	Areas containing important, high quality or scarce resources ( <i>Ground water resources, surface</i>	Yes	The project offshore facilities will be located in Andaman Sea.



	<i>resources, forestry, agriculture, fisheries, tourism, minerals)</i>		
11	Areas already subjected to pollution or environmental damage. (Those where existing legal environmental standards are exceeded)	No	No Any.
12	Areas susceptible to natural hazard which could cause the project to present environmental problems (Earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)	No	The project falls under Zone V as per IS 1893 (part I): 2002 classification. Hence seismically it is a stable zone.

### 2.3.1 Area Statement of Project Site

The project site on the land side is approximately 3, 750 m<sup>2</sup> and its detailed breakup of land utilization/Area Statement is tabulated below in **Table 2.3**.

**Table 2.3: Area Statement of Project**

SN	Description	CRZ Classification	Area in Sq.m	Dimensions (m)
1	Runway	CRZ- IV	54000	900 x 60
2	Floating dock	CRZ- IV	432	48 x 6

### 2.3.2 Site Photographs

The existing Site Photographs of unit are as provided in **Figure 2.4**.



**CHAPTER 2: PROJECT DESCRIPTION**



**Location of sea plane runway and proposed Floating dock**



**Existing passenger shed will be used as passenger facilitation centre**

**Figure 2.4: Existing Site Pictures**



## 2.4 Size or Magnitude of Operation

The sea plane proposed for use in this project is having capacity of 9 Passengers. It is proposed to develop the infrastructure facility for 380 Pax. Each round trip of seaplane will carry approx. 18 Passengers and we have considered the 5 such trips in a day so total 180 Passengers Plus total staff of 30 members (38 Passengers maintenance staff, IT, security, housekeeping, sea plane operator staff etc).

Considering 2 sea planes take off & landing will happen for 5 times in a day. The proposed project envisages approximately 48,600 Passengers Per Annum (i.e 180 Pax daily for 270 non monsoon days). The total manpower envisaged is approximately 30 for the project. The estimated Project Cost is Rs. 11.41 Crores. The cost break up is as provided in **Table 2.4**.

**Table 2.4: Cost Break-up Details**

SN	Description of Item	Cost (INR )
1	Electrical Works	36,77,633.2
2	CCTV, Fire alarm & Public Address System	33,51,340
3	Fire Fighting System	14,40,244
4	HVAC System	13,76,773
5	Misc Offshore works	10,42,24,237
	<b>Total</b>	<b>11,40,70,228</b> <b>Say 11.41 Crores</b>

## 2.5 Proposed Schedule for Approval and Implementation

The proposed project activities are expected to get started within 2-6 months, after obtaining Environment Clearance, necessary permissions from Andaman and Nicobar Pollution Control Committee (ANPCC) and other statutory approvals as required.

## 2.6 Technology and Process Description

The components of Seaplane Base / Water Aerodrome will include:

On shore facilities such as Passenger Facilitation Centre (PFC). The existing shelter available at Shaheed jetty will be used as a passenger facilitation center, passengers will be transferred via Solar operated boat transfers to the floating docking pad of seaplane and then to the Sea Planes

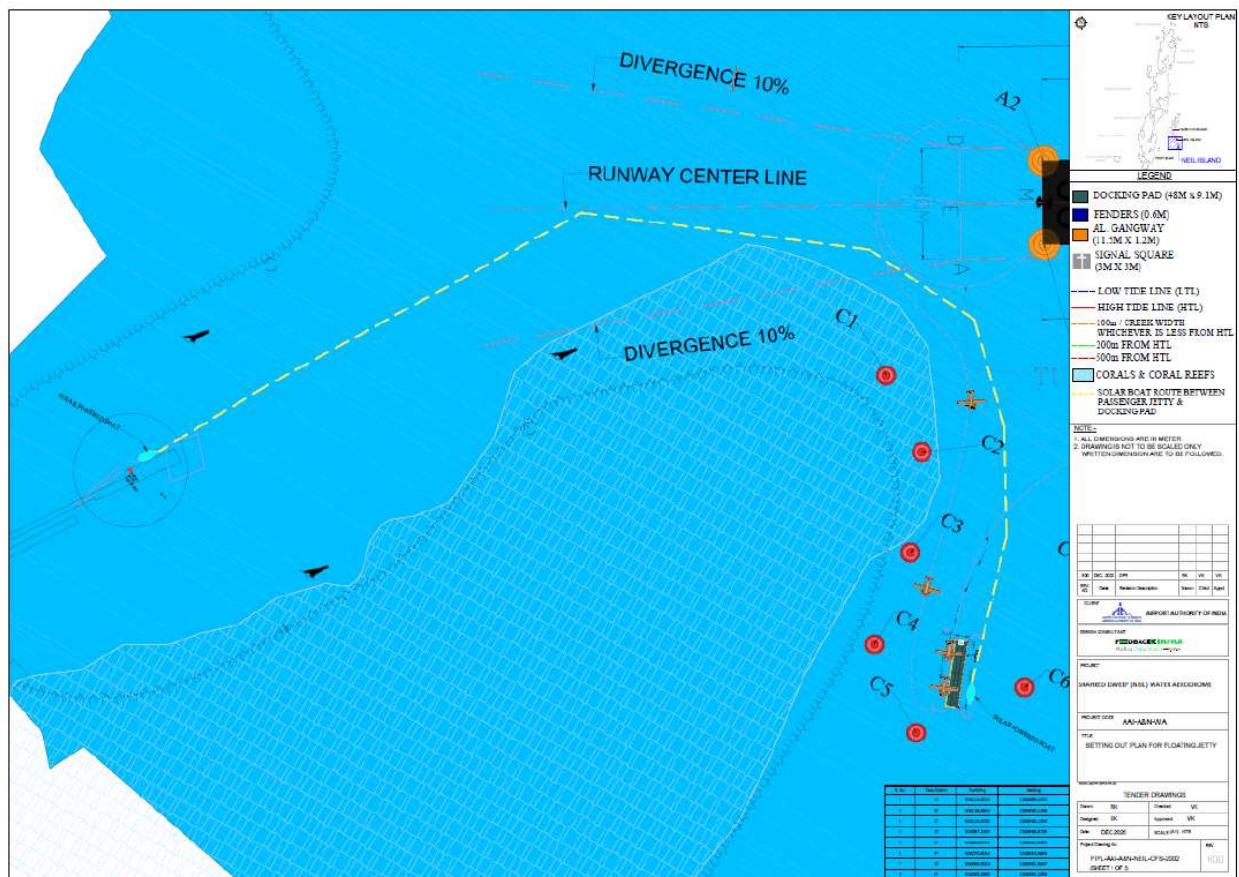
- Off shore facilities such as Floating Dock, Fire and Rescue Boat, Sea Planes and a suitable water operating area, including identified approach and departure paths, etc.

The Site Layout of the off shore facilities is as shown in **Figure 2.5**

### 2.6.1 On Shore Infrastructure Development



**CHAPTER 2: PROJECT DESCRIPTION**



**Figure 2.5: Runway and Taxiway Layout Plan**



### **2.6.1.1 Passenger facilitation center**

The existing shelter available at Shaheed jetty will be used as a passenger facilitation center, passengers will be transferred via Solar operated boat transfers to the floating docking pad of seaplane and then to the Sea Planes

#### **Facilities in arrival Area for Arrival Passenger**

- Arrival Lounge –
- Inward passengers will be coming to the arrival lounge located adjacent of the security hold area, the arrival lounge will have an area of 51.94 sq. m. Limited sitting arrangements has been provisioned in the arrival lounge area (approx. 9 people), as maximum inward passengers will not require waiting after arrival. Baggage claim area has been earmarked within this area.

- Toilet Block

Existing toilet block available at jetty will use for this project. No new construction of toilet blocks is envisaged

#### **Other Facilities in Passenger Terminal Building**

- Ticketing counter
- Two numbers ticketing counter at the front side of the centre for current ticket booking/printing as well as enquiry.
- Medical Room
- Taxi booking Kiosk
- Office
- VIP Lounge
- Backup Room
- CCTV Room
- Back Office
- Security office

### **2.6.1.2 External Road**

#### **Road Access**

The access or entrance road is available with adequate width of 6m which will serve the anticipated traffic, and permit safe and easy circulation throughout the landside of the facility.

### **2.6.1.3 Parking Areas**

Existing Parking area near jetty will be used.

## **2.6.2 Off Shore Infrastructure Development**



### 2.6.2.1 Access Gangway

An access gangway is connected to land by some means, typically a ramp. This type of facility rises and falls with wave actions, tides and seasonal variations in water-level.

It remains in a relatively fixed position either tied to a shoreline or to the waterbed on the floating jetty with roller and channel assembly.



**Figure 2.6: Typical Access Gangway (Aluminium)**

### 2.6.2.2 Sea Planes

The seaplane recommended by AAI is Cessna Caravan 208 to seaplane operator.



**Figure 2.7: Seaplane Cessna Caravan 208**

The technical specifications are further provided in **Table 2.5**.

**Table 2.5: Technical Parameters of Seaplane Cessna Caravan 208**

SN	Technical Parameters	Details
1	<b>Exterior</b>	<ul style="list-style-type: none"> <li>▪ Exterior Height: 14 ft 2 in</li> <li>▪ Wing Span: 52 ft 1 in</li> </ul>



**CHAPTER 2: PROJECT DESCRIPTION**

		<ul style="list-style-type: none"> <li>▪ Length: 37 ft 7 in</li> </ul>
2	Interior	<ul style="list-style-type: none"> <li>▪ Cabin Height: 4 ft 3 In</li> <li>▪ Cabin Width: 5 ft 2 In</li> <li>▪ Cabin Length: 14 ft 10 In</li> <li>▪ Cabin Volume: 271 cu ft</li> <li>▪ Door Height: 4 ft 1 In</li> <li>▪ Door Width: 4 ft 2 In</li> <li>▪ Internal Baggage: 32 cu ft</li> </ul>
3	Occupancy	<ul style="list-style-type: none"> <li>▪ Crew: 1</li> <li>▪ Passengers: 9</li> </ul>
4	Operating Weights	<ul style="list-style-type: none"> <li>▪ Max T/O Weight: 8000 Lb</li> <li>▪ Max Landing Weight: 7800 Lb</li> <li>▪ Operating Weight: 4940 Lb</li> <li>▪ Empty Weight: 3860 Lb</li> <li>▪ Fuel Capacity: 2224 lbs Lb</li> <li>▪ Payload W/Full Fuel: 871 Lb</li> <li>▪ Max Payload: 2860 Lb</li> </ul>
5	Range	<ul style="list-style-type: none"> <li>▪ Normal Range: 325 nm</li> <li>▪ Max Range: 835 nm</li> <li>▪ Service Ceiling: 25000 ft</li> </ul>
6	Distances	<ul style="list-style-type: none"> <li>▪ Balanced Field Length: 2055 ft</li> <li>▪ Landing Distance: 2508 ft</li> </ul>
7	Performance	<ul style="list-style-type: none"> <li>▪ Rate of Climb: 1234 fpm</li> <li>▪ Max Speed: 186 kts</li> <li>▪ Normal Cruise: 175 kts</li> <li>▪ Economy Cruise: 147 kts</li> <li>▪ Cost per Hour: \$ 659.12</li> </ul>
8	Power Plant	<ul style="list-style-type: none"> <li>▪ Engines: 1</li> <li>▪ Engine Mfg: Pratt &amp; Whitney Canada</li> <li>▪ Engine Model: PT6A-114A</li> </ul>

**Description:**

The Cessna 208 Caravan is a single-engine turboprop, fixed-tricycle landing gear, short-haul regional airliner and utility aircraft that is built in the United States by Cessna. The airplane typically seats nine passengers with a single pilot, although with a FAR Part 23 waiver it can seat up to fourteen passengers. The aircraft is also used for cargo feederliner operations. The prototype first flew in December 1982. The production model was certified by the FAA in October 1984. Since then, the Caravan has undergone a number of design evolutions. Working with FedEx, Cessna produced first the Cargomaster and followed that with the stretched and upgraded Super Cargomaster. The passenger model, the Grand Caravan, was derived from the Super Cargomaster. In January 2013 a higher-powered (867 shp from P&WC PT6A-140) version, the Grand Caravan EX, received FAA certification. This higher-powered version will be produced by a Cessna-AVIC joint venture in China

**2.6.2.3 Provision of Taxiway**

Source: As per FAA (Federation Aviation Administration), minimum width of taxiway is 125 feet & recommended is 150 feet whereas wingtip to wingtip clearance for passing seaplanes is 50 feet.



### 2.6.2.5 Lighting Within the Water Operating Area

A simple and inexpensive lighting method for a sea lane, taxi channel, etc., is to install a sequence of portable, battery-operated lights on top of buoys or other appropriate floatation devices.

FAA-H-8083-23 informs seaplane pilots that a night water landing should generally be considered only in an emergency. They can be extremely dangerous due to the difficulty of seeing objects in the water, judging surface conditions, and avoiding large waves or swell.

Source: See AC 91-69 for preflight briefings, passenger floating devices, and other Federal requirements.

### 2.6.2.6 Water Runway and Runway Strip

The landing area should be rectangular in shape and should encompass all parts of the water surface intended for the taking off and landing of seaplanes.

Comparison of Runway as per DGCA requirement & as per Bathymetric Survey (actual provided) is as provided in **Table 2.6**.

**Table 2.6: Comparison of Runway Design**

SN	Requirement as per DGCA	Provision as per Bathymetric Survey (Actual Provided)	Remark
1	Runway Strip– 800m x 60m	Runway Strip– 900m x 60m	Buffer is provided as per actual site condition.
2	Runway Safety Strip including Runway Strip – 920m x 120m	Runway Safety Strip including Runway Strip – 1100m x 80m	Buffer is provided as per actual site condition.
3	Minimum Depth of Water – 1.8m	Minimum Depth of Water – 2m	Natural Water Depth available.

### 2.6.3 Utilities/ Resource Requirement

#### 2.6.3.1 Power and Fuel Requirement

The proposed project consists of pre-casting of floating jetty hence power is not required for the project

The fuelling for the sea planes shall be met at the Veer Savarkar International Airport, Port Blair Airport. No fuelling facility shall be provided at the proposed Project Site.

#### 2.6.3.2 Water Requirement and Wastewater Management

The proposed project consists of pre-casting of floating jetty hence water is not required for the project



### 2.6.3.3 Manpower Requirement

During construction phase, it is expected to generate direct & indirect employment of about 10-15 nos. of people of various skills. Local businessmen will get opportunity to supply construction materials and demand generated from the temporary workers colony for the basic needs. This will increase local business of the area and thereby improve the local economy.

During the operation phase, Approx. 30 Nos. of people will get direct employment at the proposed facility. Apart from this, local vendors/businesses and other related population shall be indirectly employed due to the implementation of the project with improved tourism infrastructure.

### 2.6.3.4 Waste Generated from Aircrafts, Workshops and Eateries

During construction phase, portable toilets will be used to keep hygienic conditions at site. During construction phase, the top soil shall be stored separately and shall be used in the green belt area. Further, the excavated material shall be used for backfilling purpose. No disposal of solid waste is envisaged during construction phase.

Handling and disposal practices of the wastes generated from landing aircrafts, workshops and eateries at the airport are given in **Table 2.7**.

**Table 2.7: Waste Generated from Aircrafts, Workshops & Eateries**

Source of Waste Generation	Management Practices
<b>Aircraft</b> Trash collected in flight and disposed at the airport including the segregation mechanism.	Food/beverages will be served for the short duration of the flight as envisaged in proposed project. However; minimal trash such as paper, etc. if any will be collected by the airline's ground support team and placed at a waste transfer station. Subsequently, the waste will be transported to the Centralized Waste Processing Facility within the PTB. Here, the waste will be segregated and handed over to the recyclers as per the Rules 2016.
<b>Aircraft</b> Toilet wastes and sewage collected from aircrafts and disposed at the airport.	Lavatory facility not provided on the sea planes and hence no toilet waste and sewage from aircraft is envisaged.
<b>Workshops</b> Maintenance and workshop wastes.	It is to be noted that no maintenance facility shall be provided at the proposed project site but at Port Blair Airport. Maintenance, workshop wastes (used grease, used oil and cotton wastes) shall be collected, stored in the workshop and disposed to authorized vendor by Port Blair Airport Authority as per the Hazardous Waste and other Waste (Management and Transboundary Movement) Rules, 2016.



***Shops and Eateries***

Wastes arising out of eateries and shops situated within the airport.

Not applicable

**2.7 Rescue and Fire Fighting Plan**

**Rescue And Fire Fighting Services (RFFS)**

- At a water aerodrome where the hours of operation are notified, the RFFS should be available from minimum 15 minutes before till 15 minutes after the times published. Where the hours of operation are not notified, the RFFS should be available prior to the engine start of the first departing seaplane, or to the first arriving seaplane commencing its final approach; and until the last arrival is moored, or 15 minutes after take-off of the final seaplane whichever is later.
- RFFS personnel shall receive initial and recurrent competence-based training relevant to their role and task and shall at all-time be physically capable of performing the tasks expected of them.
- Procedures for the enhancement of passenger and crew post-accident survival should be developed, and facilities in terms of staff and equipment, appropriate to the type of seaplane operations anticipated at the water aerodrome, should be provided. Within the provision of these procedures and facilities, account should be taken of the effect that variable environmental conditions might have on the ability of the rescue staff to respond rapidly to accidents and incidents.
- Where provided, a rescue vessel should be of a design and size that would allow survivors to be brought aboard, or it should be equipped with an adequate number of floatation devices of a design that would enable survivors to remove themselves from the water.
- All vessels shall be at least 200 m away from the floating platform and the maneuvering area when the seaplane is on final for landing or ready for take- off.
- The level of protection provided at a water aerodrome for rescue and firefighting shall be appropriate to the water aerodrome using principles in paragraphs 9.2.4 and 9.2.5 of CAR Section 4 Series B Part I.
- Types of extinguishing agents and the amount of water for foam production and complimentary agents shall be provided on the rescue and firefighting vessel/(s) in accordance with the water aerodrome category determined under Table 9-1 and Table 9-2 of CAR Section 4 Series B Part I.
- A discrete communication system shall be provided linking the water aerodrome fire station, control tower (if available), fire and rescue vessel/(s), fire and rescue vehicles and any other fire station.
- An alerting system for rescue and fire-fighting personnel, capable of being operated by that station, shall be provided at a fire station, any other fire station at the terminal and the water aerodrome control tower.



## 2.8 CRZ Mapping as per Island Protection Zone (IPZ) Notification 2011

The Ministry of Environment and Forests, Govt. of India issued the Coastal Regulation Zone (CRZ) Notification, 2011 for the mainland and the Island Protection Zone (IPZ) Notification, 2011, to protect the coastal environment of the Andaman & Nicobar (A&N) and Lakshadweep group of Islands. As per the IPZ Notification, 2011, Environmental Management for the Islands of Andaman and Nicobar and Lakshadweep shall be managed as per Island Coastal Regulation Zone (ICRZ) for larger islands of Middle Andaman, North Andaman, South Andaman and Greater Nicobar where as other islands of A&N and Lakshadweep shall be managed based on Integrated Island Management Plan (IIMP). Baratang, Little Andaman, Car Nicobar, Swaraj and Shaheed Dweep were amended to the list of islands under ICRZ based environmental management vide amendment to IPZ Notification dated 22<sup>nd</sup> August, 2013 of Ministry of Environment and Forests, Government of India (now MoEF&CC).

In view of the unique coastal ecosystem of coast and backwater around Andaman & Nicobar Islands, Ministry has regulated various activities in the ICRZ zones as indicated in IPZ Notification 2011. It has also declared the area up to 200mts from HTL on the landward side in case of seafront and 100mts along tidal influenced water bodies or width of the creek whichever is less is as “No Development Zone (hereinafter referred to as the NDZ) with limited permissible activities such as Airstrip and associate facilities.

Keeping in view of the requirements of notification, Institute of Remote Sensing, Anna University under took the following scope of work:

- Demarcation of HTL, LTL for Bay of Bengal, tidal influenced water bodies in the vicinity of proposed water aerodromes in Shaheed Dweep by conducting field survey using DGPS survey.
- Demarcation of ecologically sensitive entities such as Mangroves, Coral Reefs, Sand dunes, Turtle breeding grounds in the vicinity of project site using ancillary data and field verification.
- Superimposition of HTL, LTL, Ecologically Sensitive Areas along with the proposed water aerodrome and its associated facilities on to the geo referenced cadastral map
- Preparation of Local Level ICRZ Map at 1:4000 scale for the proposed Water Aerodrome in Shaheed Dweep of Port Blair Taluka, South Andaman District of Andaman & Nicobar Islands.

Accordingly, ICRZ Maps at 1:4000 scale has been prepared as show in **Figure 2.8** and it provides the following conclusion:

**Table 2.8: CRZ Classification details of the Project**

SN	Description	CRZ Classification	Area in Sq.m	Dimensions
1	Runway	CRZ- IV	54000	900 x 60
2	Floating dock	CRZ- IV	432	48 x 6



## CHAPTER 2: PROJECT DESCRIPTION

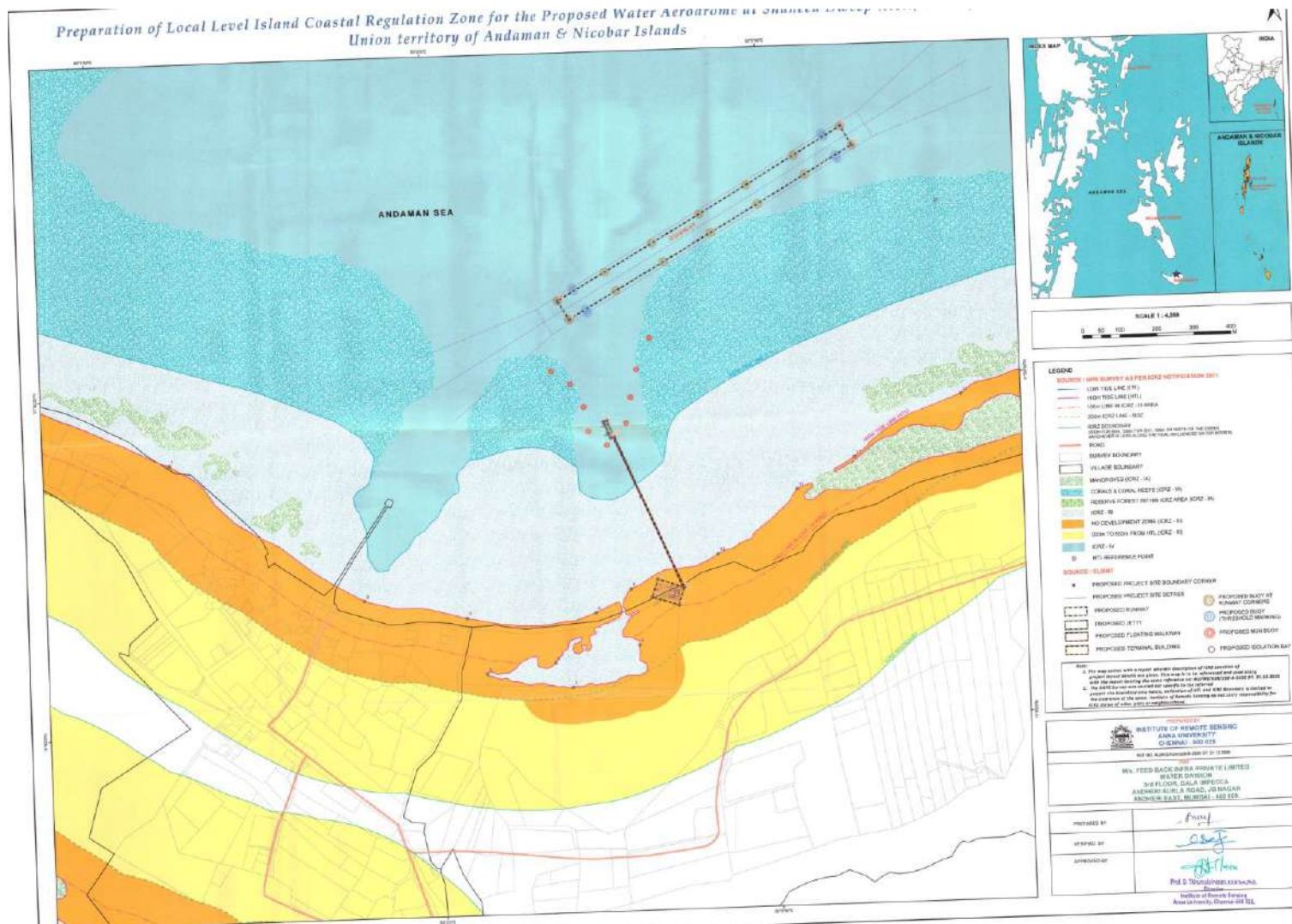


Figure 2.8: ICRZ Map at 1:4000 Scale



**CHAPTER 3. DESCRIPTION OF THE ENVIRONMENT**

**3.1 Introduction**

Information is first assembled for the Region-District and then narrowed down to 10 km radius with the Project as Centre. (The peripheral area is already discussed in Chapter two). In both the areas, the components of Environment (i.e. Natural and Man-made) are covered. This is done both for Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP). The standard methodology is adopted and discussed in this chapter.

**3.2 Materials, Method and Approach**

The Project Proponent believes strongly in “Development without pollution” and has undertaken the work of examining the project environmentally.

**3.2.1 Materials**

The work involves three activities viz. (1) collection and analysis of secondary data and statistics by literature survey, interviewing resource institutes and general public, (2) collection of primary data by sampling and laboratory analysis of ambient air, surface water, ground water, drinking water, noise, soil, etc. and (3) logically analyzing the findings of assessment studies for interpretation, extrapolation and inference. As per the project specific TOR granted by EAC (Infra-2), Government of India vide F. No: 10-54/2019-IA-III dated 16<sup>th</sup> December 2019, study area is considered to be the area up to 10 km surroundings of the site for Environmental monitoring while for studying the environmental sensitivity a radius of 15 km is considered.

Samples were collected **December 2019 to February 2020**; as follows, vide **Table 3.1 and Table 3.2**.

**Table 3.1: Summary of Sampling**

SN	Environmental Media	Stations	Parameters	Frequency
1.	Surface Water	7	37	Once
2.	Ground Water	7	39	Once
3.	Ambient Air	7	12	Twice a week
4.	Ambient Noise	7	1	Once a week
5.	Soil	4	20	Once

All the samples were collected by Standard Practices and analyzed as per Indian Standard Specifications or by APHA (USA) 21<sup>st</sup> edition of 2005.

**Table 3.2: Frequency of Sampling**

Attribute	Parameters	Frequency of Monitoring
Ambient Air Quality	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> ,	24 hourly samples twice a week during study period
	CO	8 hourly samples twice a week during study period



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Meteorology	Surface: Wind speed, Wind direction, Temperature, Relative humidity and Rainfall	Surface: Continuous monitoring station for entire study period on hourly basis and also data collection from secondary sources.
Water Quality	Physical, Chemical and Bacteriological Parameters	3 Ground Water and 3 Surface Water samples collected once during the study period
Ecology	Existing Flora and Fauna	Through field visit during the study period and substantiated through secondary sources
Noise Levels	Noise levels in db (A)	Hourly observations for 24 hours per location
Soil Characteristics	Parameters related to agricultural and afforestation potential	4 samples in a month during the study period
Land Use	Trend of land use change for different categories	Once during the Study Period, Sourced data from various Government agencies
Socio-economic aspects	Socio-economic characteristics, labour force characteristics, population statistics and existing amenities in the study area.	Through field visit during the study period and substantiated through secondary sources (Census Handbooks, 2001)

**3.2.2 Method**

To fix the scope of the study to foresee the potential environmental problems that would arise due to proposed construction activities, detail characterization of various environmental components like air, noise, water, and land biological environment and socio-economic parameters within an area of 10 km radius around the plant area is executed. The steps are as follows;

- The present human activities within 10 km radius and prepared Environmental Inventory (EI).
- The present environmental status by sampling.
- Establishing correlation between cause-effect of step 1 & 2 above.
- Effect of proposed activities in the influence zone and ancillaries especially with respect to pollution.
- Mitigation measures for anticipated environmental impacts.
- The legal provisions required to be obeyed.

**3.2.3 Approach**

For a streamline work, a standard six-step model of working is adopted for this study. The generic structure of environment impact study comprises:

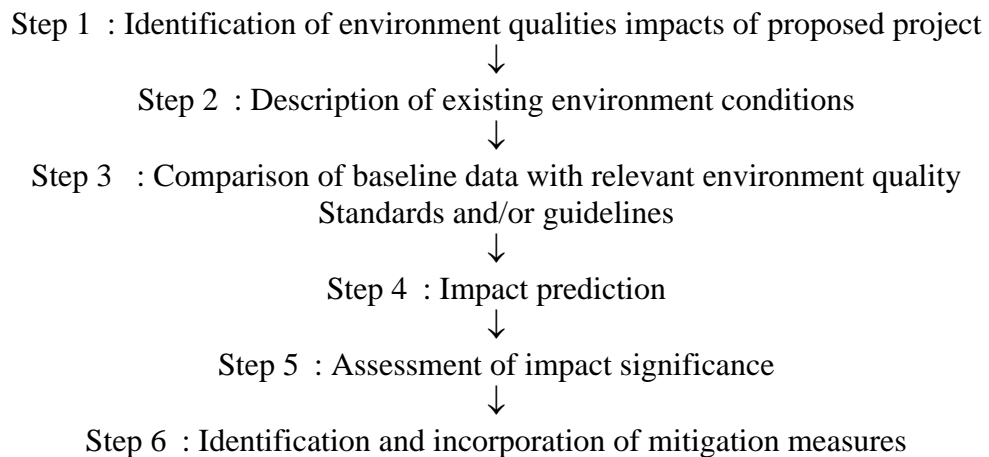
- Literature review that includes identification of relevant data and articles from various publications, various government agencies and other sources;
- Collection of available secondary data.



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- Identification of significant environmental parameters and assessing the status within the study area.
- Environmental monitoring so as to establish the baseline environmental status of the study area in terms of existing environmental quality, emission inventory, and natural data in the project study area.
- Identification of pollutant emissions and impact concerns related to the construction and operation of the project.
- Prediction of impacts on environmental attributes.
- Evaluate the predicted impacts on the various environmental attributes in the study area by using scientifically developed and widely accepted EIA Methodologies.
- Preparation of an EMP outlining the measures for improving the environmental quality.

Figure below delineates the relationship between the six steps or activities in the suggested conceptual approach of **Figure 3.1**.



**Figure 3.1: Conceptual Approach**

### 3.3 Land Environment

#### 3.3.1 Satellite Image

The digital image processing was performed on ERDAS Imagine 2014 and QGIS 2.2 software system on high-configured computer. This software package is a collection of image processing functions necessary for pre-processing, rectification, band combination, filtering, statistics, classification, etc. Apart from contrast stretching, there are large numbers of image processing functions that can be performed on this station. Arc GIS map 10.1 is used for final layout presentation.

**Table 3.3: Data Specification Used For Presents Study**

Satellite/ Image	Sensor	Spatial resolution	Date of Pass
Resource SAT-2	LISS IV	5.6 m	12 <sup>th</sup> May 2019
IRS-P-5	Cartosat-1	2.5 m	April 2016



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Since, a major part of 10 km study area comprises of Forest Area, Agricultural Area, Waste Land and Water Body thus study on land environment of ecosystem play an imperative role in identifying susceptible issues and taking appropriate action to uphold ecological equilibrium in the region. The main objective of this section is to provide a baseline status of the study area covering 10 km radius around the project site so that temporal changes due to the project activities on the surroundings can be assessed in future.

### Methodology

The land use pattern of the study area was studied by analysing the available secondary data published in the District Primary Census abstract of the year 2001 & 2011.

Salient features of the adopted methodology are given below:

1. Acquisition of satellite data
2. Preparation of base map from Survey of India topo sheets
3. Data analysis using visual interpretation techniques
4. Ground truth studies or field checks using GPS
5. Finalization of the map
6. Digitization using head up vectorisation method
7. Topology construction in GIS
8. Area calculation for statistics generation
9. Masking

Four spectral bands provide high degree of measurability through band combination including FCC generation, bands rationing, classification etc. These features of the IRS data are particularly important for better comprehension and delineation of the land use classes. Hence, LISS IV data and IRS-P5 – Cartosat-I data having 2.5 m spatial resolution having pan chromatic imagery has been used for land use mapping.

The satellite data from the compact disc is loaded on the hard disk and by studying quick look (the sampled image of the appropriate area) the sub-scene of the study area is extracted.

Supervised classification using all the spectral bands can separate fairly accurately, the different land use classes at level II on the basis of the spectral responses, which involve the following three steps:

1. Acquisition of ground truth
2. Calculation of the statistics of training area
3. Classification using maximum likelihood algorithm

The training areas for classification were homogeneous, well spread throughout the scene with bordering pixels excluded in processing. Several training sets have been used through the scene for similar land use classes. After evaluating the statistical parameters of training sets, the training areas were rectified by deleting no congruous training sets and creating new ones.

### Pre-Field Interpretation of Satellite Data

The False Color Composite (FCC) of LISS IV satellite imagery having 5.6 m spatial resolution satellite data at 1:50,000 scale was used for pre-field interpretation work. Taking the help of topo



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sheets, geology, geo-morphology and by using the image elements, the features were identified and delineated the boundaries roughly. Each feature was identified on image by their image elements like tone, texture, color, shape, size, pattern and association. A tentative legend in terms of land cover and land use was formulated. The sample area for field check is selected covering all the physiographic, land use/land cover feature cum image characteristics. Figure 3.2A shows the FCC of 10 KM radius of LISS IV Imagery.

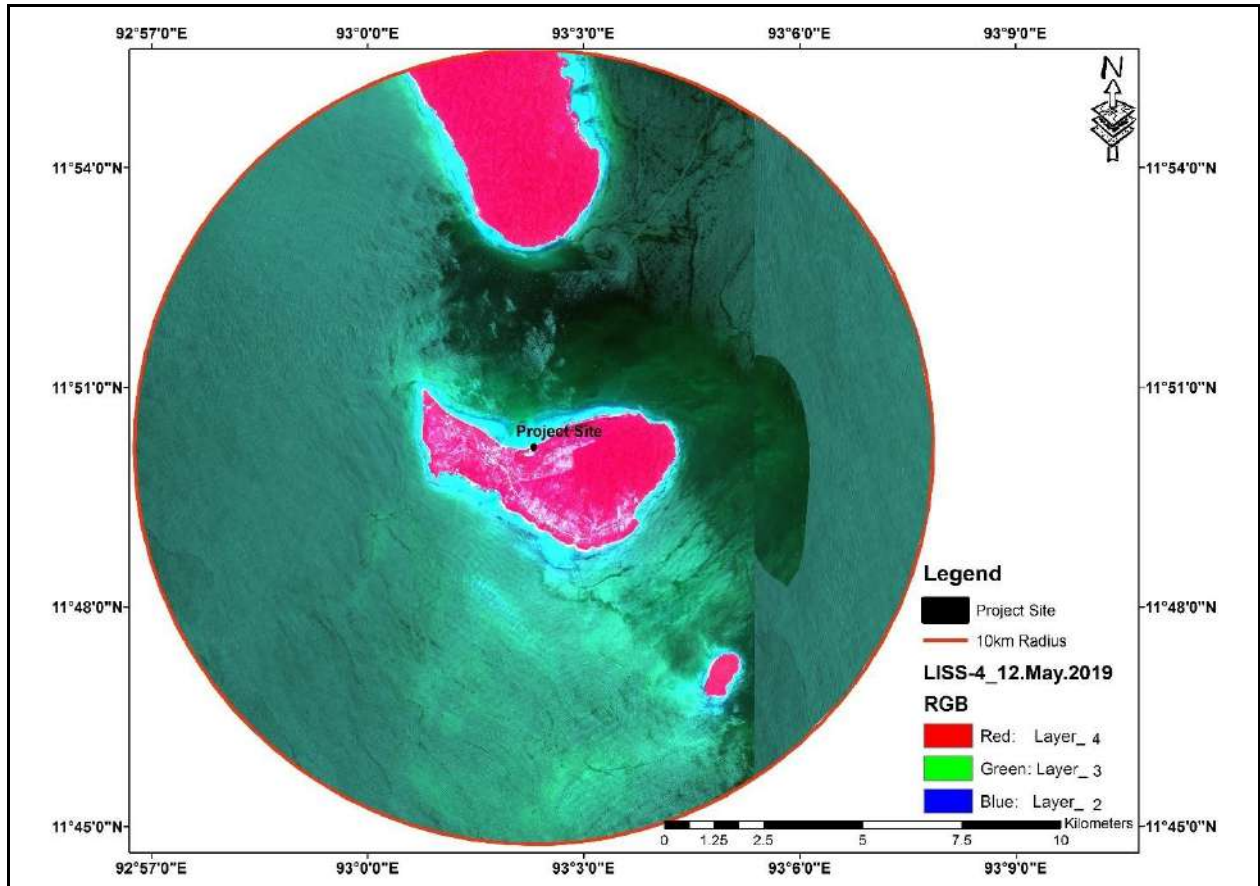


Figure 3.2: Satellite Image Map 10 km radius of Project Site

### 3.3.2 Landuse / Landcover Classes Details

Total three major land use/land cover classes were demarcated in the study area following Level I classification furthermore a level II classification also adopted as per the requirement of MoEF & CC in which total 10 classification has been classified in the study area. A thematic map of 1:50,000 scale was generated incorporating these classified categories considering the area of the project

#### CORE LAND USE:

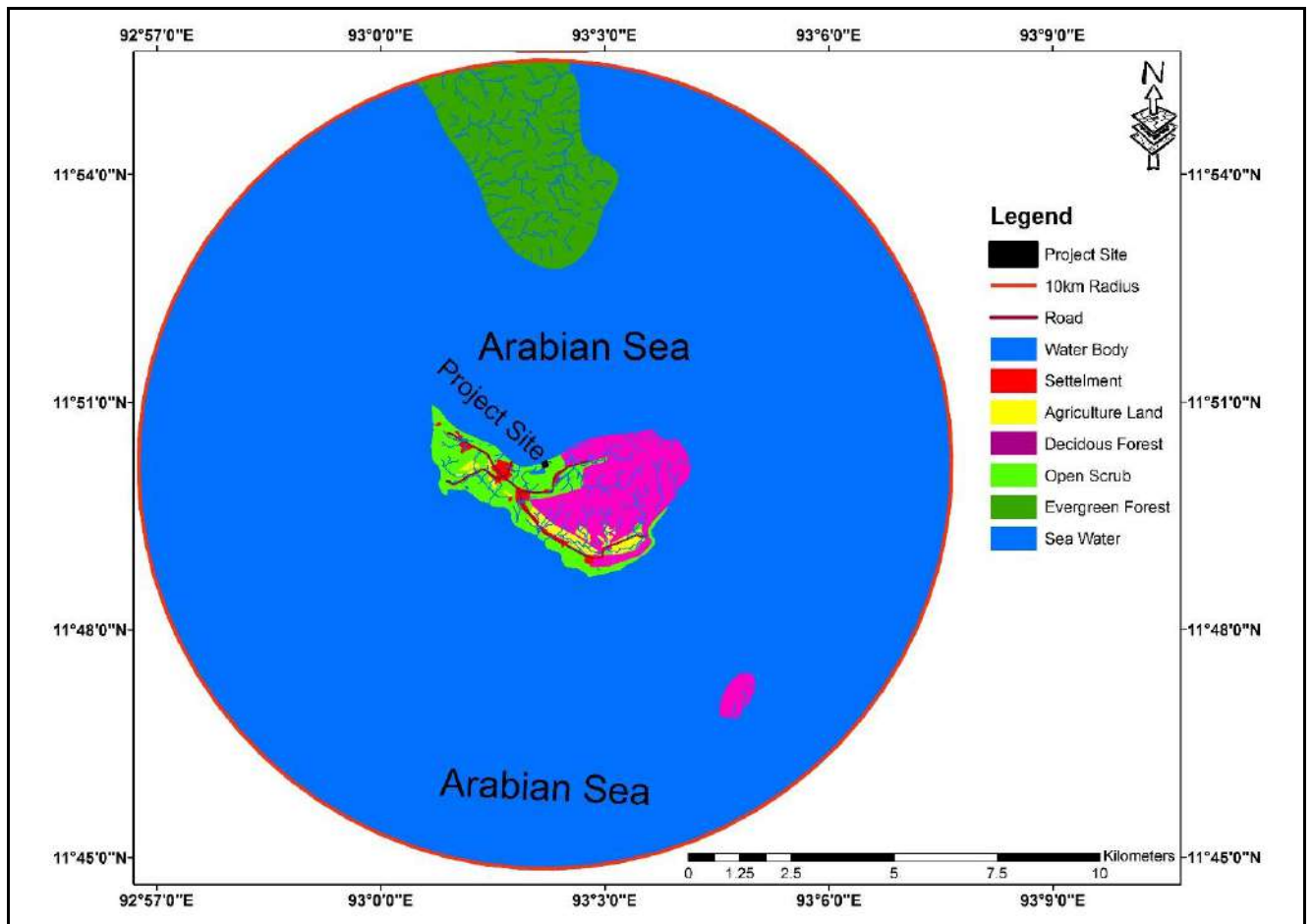
The core land use **Table 3.5** i.e. 1km radius from project site Land Use/Land Cover shown in **Figure 3.3B** is prepared separately. Of the 6 LU/LC classes as per NRSA-TR-LU & CD-01-90 Only 5 LU/LC classes are present within 1Km radius core zone as builtup land comprises of 0.1 Km<sup>2</sup>: 3.18%, water body (Sea water) is 1.52 Km<sup>2</sup>: 48.41%, Forest 0.97 Km<sup>2</sup>:30.89%, and waste land (Open Scrub) 0.5 Km<sup>2</sup>:15.92% and agriculture land 0.05 Km<sup>2</sup>:1.59%.



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**BUFFER LAND USE & LAND COVER:**

The buffer land use & land cover is given in **Table 3.4** i.e. 10 km radius from project site & the same is shown in **Figure 3.3A**. The project site surrounding 10 km radial area prevailed 2 major land use classes viz. Built-up & Agriculture and 4 land cover classes namely Wasteland, Water bodies, Wetlands & Forest. Of the 2 land use classes the Built-up was 0.03 km<sup>2</sup> (0.01%) whereas Agriculture was 1.34 km<sup>2</sup> (0.38%). Of the 4 land cover classes the Wastelands was 1.3 km<sup>2</sup> (0.41%), Water bodies was 233.23 km<sup>2</sup> (74.3%), Wetlands was 19.5 km<sup>2</sup> (6.2%) & Forest was 58.6 km<sup>2</sup> (18.7%).



**Figure 3.3A: Landuse / Landcover map of 10 km Study Area**

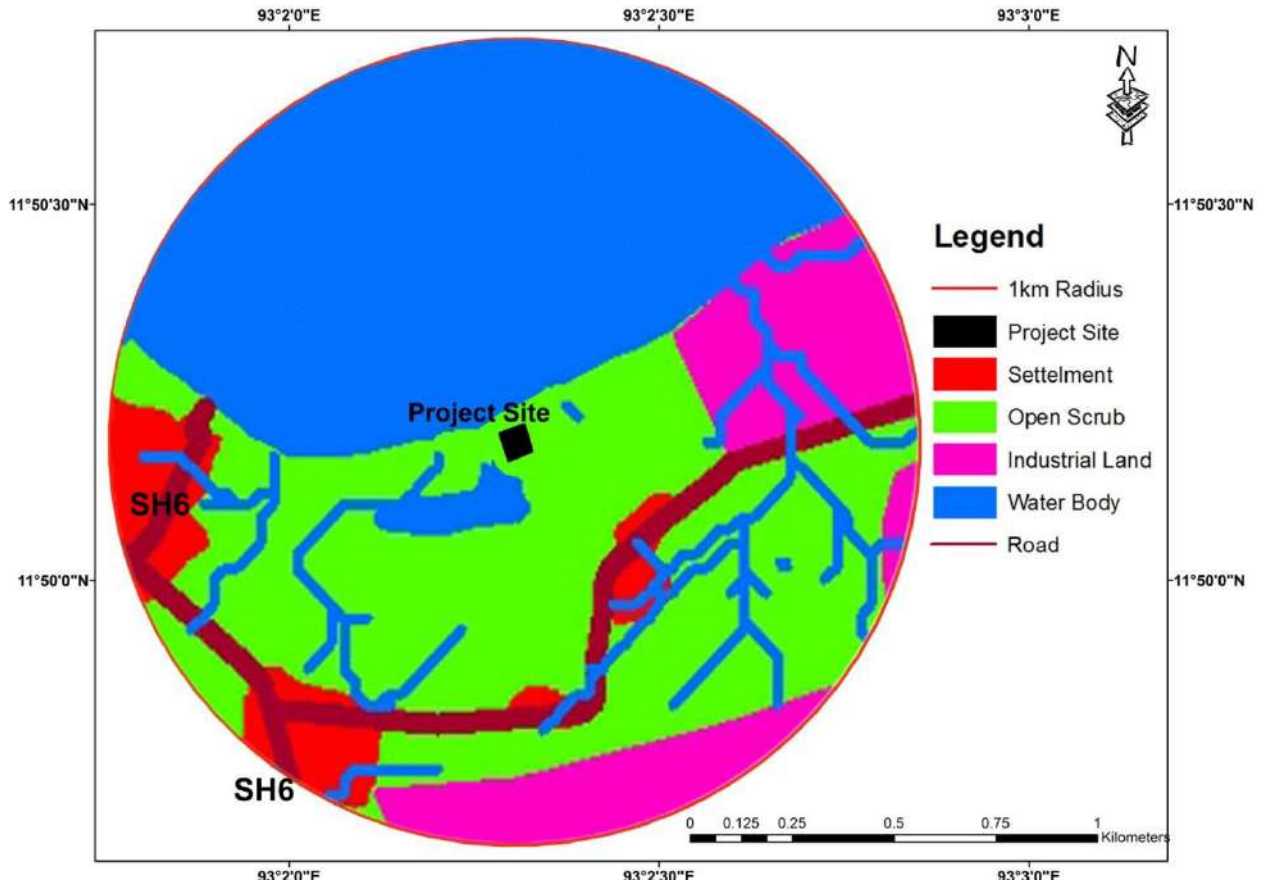
**Table 3.4: Landuse / Landcover Statistics of Area within 10 km Radius**

Level – I		Level – II	Level –III	Area (Km <sup>2</sup> )	Percentage (%)
1.	Built – up land	1.1 Built – up land	1.1.1 Urban (towns & cities)	0.03	0.01
2.	Agricultural land	2.1 Crop land Double Cropped	2.1.1 irrigated crop land	1.34	0.38
3.	Wastelands	3.1 Land with or without scrub	3.1.1 Open Scrub	1.3	0.41
4.	Water bodies	4.1 Sea Water	4.3.1 Sea Water	233.23	74.3
5.	Wetlands	5.1 Swamps	5.1.1 Littoral Swamp	19.5	6.2



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Level – I		Level – II	Level –III	Area (Km <sup>2</sup> )	Percentage (%)
6.	Forest	6.1 Forest	6.1.1 Evergreen Forest	58.6	18.7
<b>Total Area</b>				<b>314</b>	<b>100</b>



**Figure 3.3B: Landuse / Landcover map of 1 km Study Area**

**Table 3.5: Landuse / Landcover Statistics of Area within 1 km Radius**

Level – I		Level – II	Level –III	Area (Km <sup>2</sup> )	Percentage (%)
1.	Built – up land	1.1 Built – up land	1.1.1 Urban (towns & cities)	0.1	3.18
2.	Agricultural land	2.1 Crop land Double Cropped	2.1.1 irrigated crop land	0.05	1.59
3.	Water bodies	3.1 Sea Water	3.1.1 Sea Water	1.52	48.41
4.	Waste Land	4.1 Open Scrub/ Barren Land	4.1.1 Open Scrub	0.5	15.92
5.	Forest	5.1 Forest	5.1.1 Forest	0.97	30.89
<b>Total Area</b>				<b>3.14</b>	<b>100</b>

**3.3.3 Geomorphology and Soil**



### **3.3.3.1 Geomorphology**

The size, shape and height of islands control the occurrence and movement of both surface and ground water resources to a considerable extent. Either or both types of water resources are likely to be available in larger quantities in wider and larger islands when compared to smaller and narrower islands. The width of a small island has major influence on the occurrence of ground water in basal aquifers. The islands in South Andaman District have varied topographical features. In general, barring a few small Islands, all the others have undulating terrain with main ridges running North-South. There are also spurs running East – West in between the main ridges. Deep inlets and creeks are formed by the submerged valleys. Flat lands are few. Coral reefs surround most of the Islands.

The islands generally feature a mountainous terrain with long ranges of hills and narrow valleys. The maximum altitude of these islands is at Mount Kavab, which is 460m above mean sea level. Mount Ford (435m, amsl) of Rutland island, and Mount Harriet (365m, amsl ) are some of the high peaks in South Andaman The peaks i.e Mount Kavab and Mount Harriet ,are formed of marine sedimentary rocks .While Mount Ford is made of ophiolites (igneous). Geomorphology of South Andaman District is controlled by the geology and weathering characteristics of the rock types underlain.

Geomorphologically, the South Andaman District can be divided into the following five broad units.

1. Moderate to steep hill ranges having low to moderate heights. This type of geomorphology could be seen in the islands underlain by Marine Sedimentary group of rocks and Igneousophiolite rocks. Examples are South Andaman, Rutland etc. Because of low infiltration capacity of Marine sedimentary rocks, many streams are generated in the tracts underlain by such rocks. While drainage density is high in such areas, ground water potential is low and springs although preponderant lose perennality in lean periods cause water scarcity in rural areas of South Andaman with recession of monsoon. The islands with Ophiolites i.e. Rutland on the other hand have good ground water potential with perennial springs and drainage.
2. Narrow intermontane valleys. This type of landform is formed in between the hills and could be seen in said islands as mentioned. In general the valleys are formed in the structurally weak planes i.e along the lineaments and may be termed as structural valleys.
3. Narrow, gently sloping coastal tracts including swamps. These type of coastal landform could be seen in the islands underlain by Marine Sedimentaries contain mostly fine sand, silt and clays. Since the length of the streams from hill to sea is less, the fluvial action on the rocks and sediments in their courses becomes less powerful. Consequently, owing to both the reasons larger clastics (sands, gravels and boulders) are not brought to the coast. Hence, in majority of the cases the beaches in such islands remain swampy and slender with low ground water potential in the low lying areas. However, in cases where coral reefs are luxuriant around such



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islands, wide sandy beaches also could be seen. Example the Mahuadera (North Wadoo) is beach in the western coast of South Andaman Island etc.

4. Islands basically made of Coralline material (atoll) or having Clay-mudstone-chalk stone sequence in higher elevations with preponderance of coralline deposit in the low lying areas with very gentle slope and relatively wide coast encircling the islands. The uplifted atolls form low lying islands. Since the coral reefs are being denudated constantly in the shallower part of the sea because of wave action, huge quantity of coral lime sands are produced. They give rise to the formation of wider beaches. Examples of such Islands are Shaheed Dweep, Jolly buoy, Swaraj Dweep, etc. In the higher elevations good springs are generated in Chalk stone which gives rise to few perennial streams as could be seen in Krishnanagar, Radhanagar and Vijoy Nagar on the way to Kalapathar village in Swaraj Dweep. The Coralline limestone in the low lying areas form good repositories of ground water.

5. Rugged coast devoid of beaches. This type of coastal landform is visible in the islands or parts of the islands which are underlain by Ophiolitic igneous rocks. Examples are Cinque Island, Rutland Island, Barren (active) and Norcondom (dead) volcanic islands, parts of South Andaman in between Chidiyatapu to Brookshabad. As the Ophiolites are highly fractured having good potential of ground water, highly perennial as also potential springs are generated in such rocks which finally gives rise to many perennial streams like Burma Nala, Chiriyatapunala, Lalmitty Nala at Beadnabad, streams of Rutland etc.

Springs: The characteristic geological and geomorphologic conditions of the island have facilitated the origin of numerous springs in all the three major geological formations (i.e. Marine sedimentary group of rocks, volcanic and other igneous rocks and coralline limestone). The rural water supply in the entire district except Neil Island (Water supply in Neil is done from the wells) is maintained either directly from the springs or spring or spring fed perennial streams. These springs are, in general, formed in high altitudes because of good fracturing in the rocks. For this they also may be termed as fracture springs. However, the springs are highly yielding and sustainable in igneous rocks and limestone as seen in Rutland (Kalapahar) and Cinque Island underlain by igneous rocks and in Little Andaman and Swaraj Dweep, underlain by limestone.

### 3.3.3.2 Soil

Soils in South Andaman, Rutland, Cinque, North Sentinel, Viper, Flat Bay etc Islands are mainly derived from sedimentary and igneous rocks like Sandstone, Silt stone, Shale Limestone and Mudstone and Igneous Ophiolite suite of rocks comprising Pillow lava, acid and intermediate volcanics, gabbro, Peridotite, Herzbergite etc. The soils in the islands comprise alluvial soil, Sandy soil, Valley soil and Hilly soil. These soils are mostly deep to very deep, moderately to poorly drained, clay to clayey loam with angular blocky to sub angular blocky structure. Granular structure could be seen in A&B horizons. Most of the alluvial soil is seen in valleys and used for Paddy in Kharif season, vegetables, pulses and oil seeds in Rabi season. Most of the plantation crops like coconut, areca nut are mostly cultivated in coastal plain and hilly land



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where slope is less than 10%. The valley land in South Andaman is most fertile as it is enriched in organic matter coming from the hillslope.

The soils of the other islands of South Andaman District like Swaraj Dweep, Shaheed Dweep, Little Andaman, Strait Islands are derived from the sedimentary rocks like Limestone, Coral sand, Mud stone etc. These soils are well drained with rapid permeability and are texturally classified as sandy, loamy sand, sandy loam. Plantation crops like, Coconut, areca nut, guava, mango, banana, sapota etc. are very well grown in such soils. Due to coarse soil structure there is no chance of water logging even during rainy season while high permeability also assures good moisture during dry spells and facilitates luxuriant growth of coconut, areca nut and root crops along the coastal stretches.

**3.3.4 Geology**

The Islands in the South Andaman district are composed mainly of thick Eocene sediments deposited on Pre-Tertiary sandstone, silt stone and shale with intrusions of basic and ultrabasic igneous rocks (Ophiolites). In the geologically Younger Richie’s archipelago, calcareous sand stones are more common. The available geological evidence leads us to assume the possibility of a geological period when the Andaman and Nicobar Islands formed a range between Burma and Sumatra. The Andaman and Nicobar Islands with Preparis and Cocos formed a continuous hill connecting this with Burma (Myanmar) through Cape Negrais. The Tertiary sediments classified as the Mithakhari and Andaman Flysh Group comprises thinly bedded alternations of sandstones and siltstones, grit, conglomerate, limestones, shales, etc., are of Upper Cretaceous to Upper Eocene age. The Tertiary Group is overlain successively by the Archipelago Group, Nicobar Group and the Quaternary Holocene Group, intervening with unconformity. The generalized geological succession is as shown below.

<u>Age</u>	<u>Group</u>	<u>Formation</u>
Recent to sub-Recent	Quaternary Holocene Group	Beach sands, Mangrove clay, Alluvium, Coral rags and Shell limestone, loosely consolidated pebble beds
----- <b>Unconformity</b> -----		
Pleistocene to Late Pliocene	Nicobar Group	Shell limestone, Sandstone, Claystone, etc.
Miocene	Archipelago Group (Upper)	White claystone, Melville Limestone
----- <b>Unconformity</b> -----		
Oligocene to Paleocene	Andaman Flysh , Mithakhari Group	Thinly bedded alternations of Sandstones and siltstones, grit, conglomerate, Limestones, black Shales with olistoliths.
----- <b>Unconformity</b> -----		
Late Cretaceous	Ophiolite Group	Dyke swarms, acidic suite, Pillow lava with radiolarian chert and ultramafic suite.

Marine inorganic sedimentary group of rocks comprising shale, sandstone, grit and conglomerate (Flysch and Mithakhari Groups) and organic sedimentaries like Coralline atolls and limestone and extrusive and intrusive igneous rocks (volcanics and ultramafics) occupy the



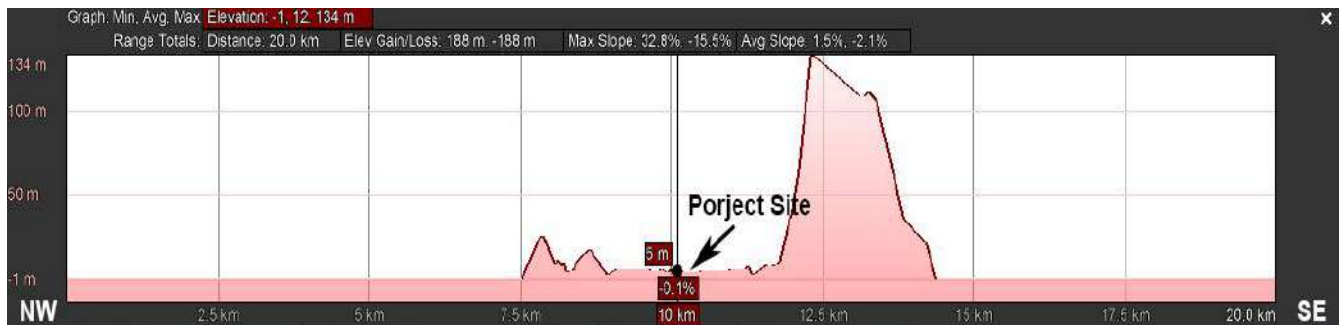
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entire geographical area. Amongst these, the former (inorganic) Sedimentary group is most pervasive and occupy nearly 70% of the entire area of the islands while the Igneous group covers nearly 15% while the rest 15% goes to the coralline and limestone formations .All these rock formations are brought under tectonism because of their alignment in a tectonically active zone, evident from the occurrence of shallow and deep focus earthquakes in the islands. The last earthquake and devastation by tsunami were also the effect of tectonic setting of this archipelago in a converging plate margin. Because of tectonism, the igneous and Sedimentary groups of rocks are highly fractured and fissured. The fracturing in hard rocks form conduits for movement of ground water in the deeper horizon. The geology of the islands is highly varied and even changes within a small distance.

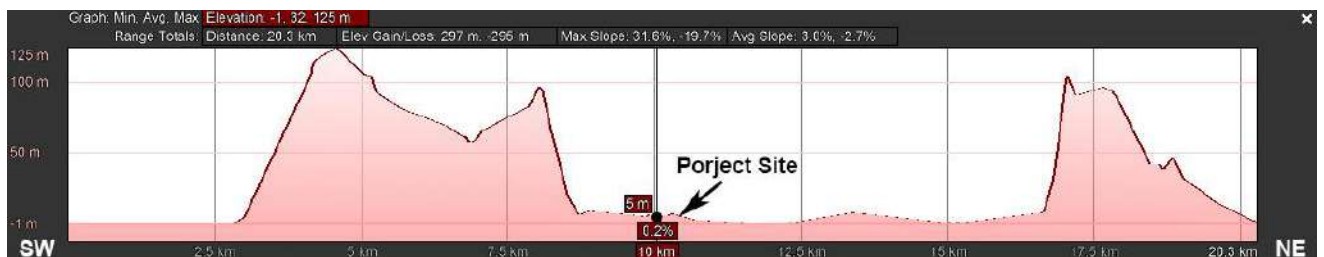
### 3.3.5 Topography and Hydrology

#### 3.3.5.1 Topography

The physical setting of study area shows a contrast of immense dimensions and reveals a variety of landscapes influenced by relief, climate, vegetation and economic use by man. But even then, regionally, there is considerable local variation. The area is sloping variably. The digital elevation map of the study area is shown in **Figure 3.4B**. The Elevation from 0m MSL to 137 MSL are observed in the study area.



**Elevation Profile of NW-SE Direction with in 10 km Radius**



**Elevation Profile of SW-NE Direction with in 10 km Radius**

**Figure 3.4A: Elevation Profile**



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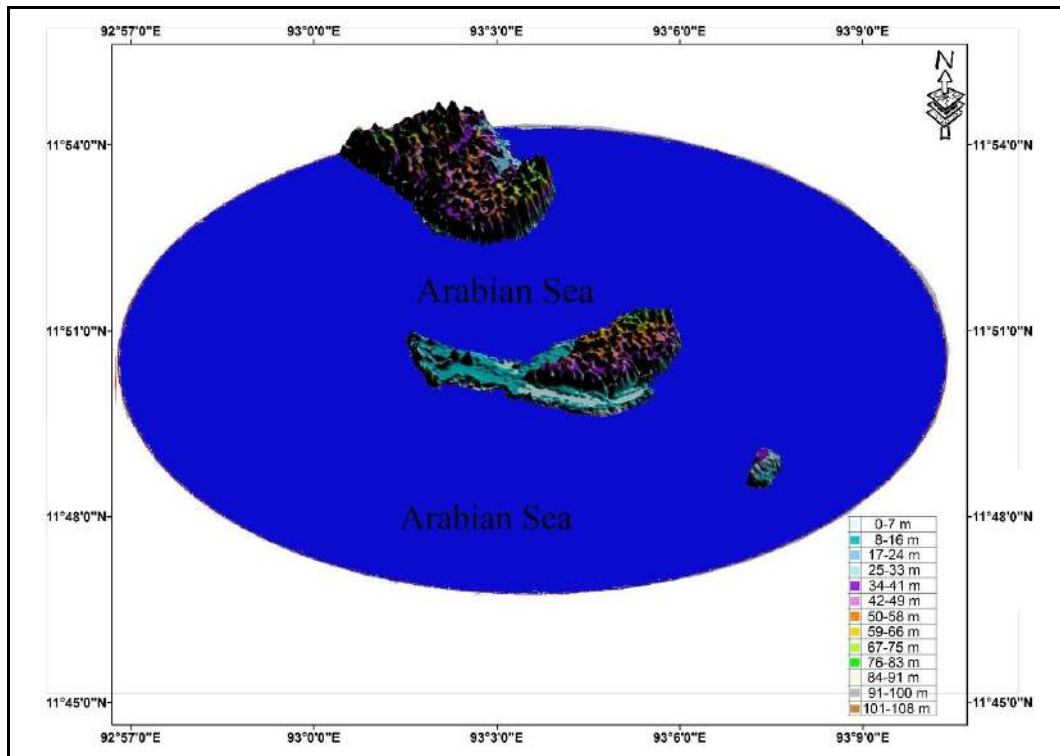


Figure 3.4B: DEM Map of 10 km Study Area

#### 3.3.5.2 Hydrology

The area around the project site is surrounded by the Arabian Sea. The nearby area is surrounded by small streams, which eventually merge into the Arabian Sea. Dendritic type of drainage pattern is observed in study area. **Figure 3.4C** represent the drainage pattern of the study area.

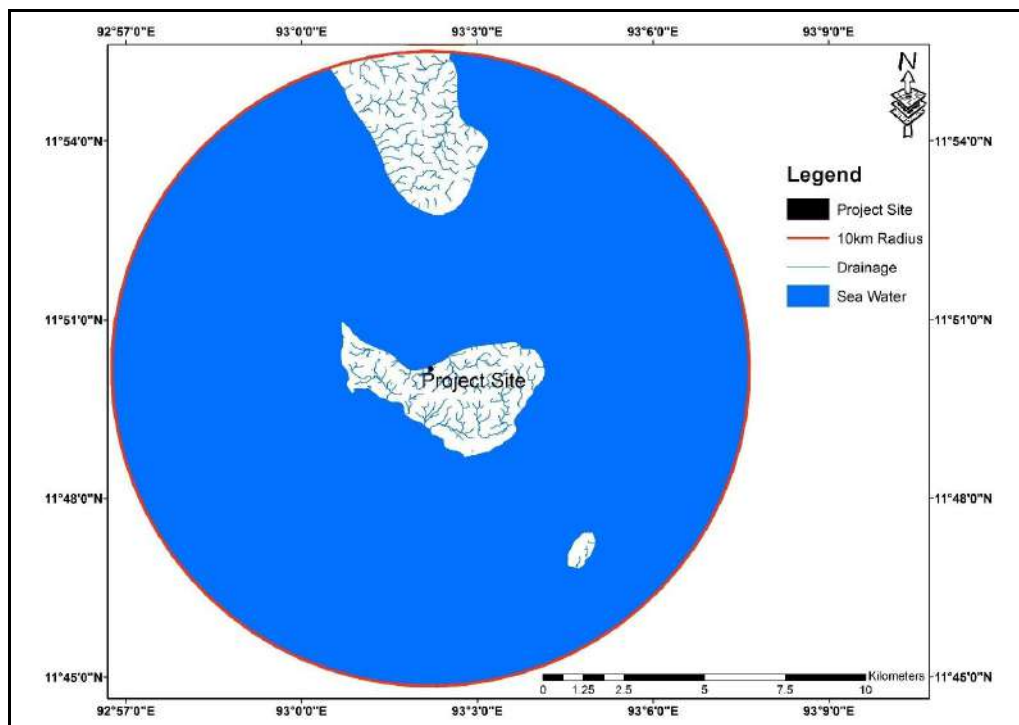


Figure 3.4C: Drainage Map of 10 km Study Area



### 3.4 Air Environment

The climate of Shaheed Dweep is humid. The cold season from November to February is followed by the hot season lasting up to early June. The periods from early June to about the beginning of October constitute the southwest monsoon season. The succeeding period up to November is the post-monsoon or transition season.

**Wind** - The predominant wind direction is from North-East and East in November to April months. In rest of the months, the predominant wind direction is from South-West and west.

**Cloud Cover** - Most of the year clouds were observed in the sky. Maximum of the rain is received in the region from Juneto October.

**Humidity** - Being a tropical humid climate high humidity is observed in all the months. The relative humidity in the region ranges between 32-99%.

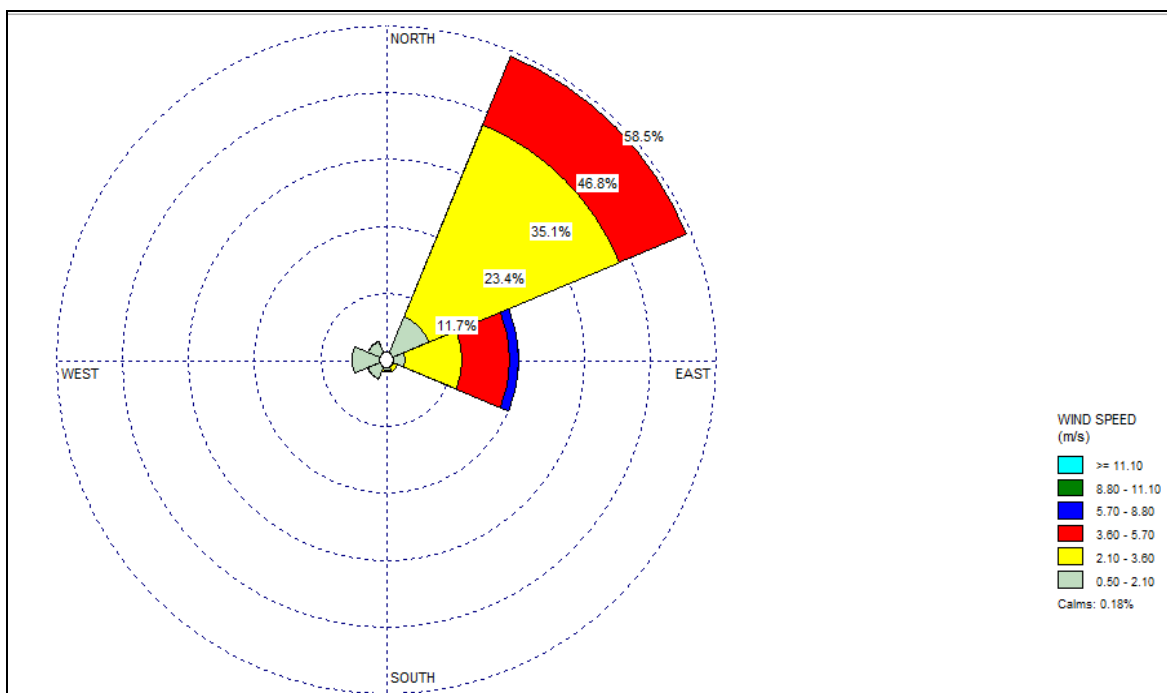
**Rainfall** - The annual total rainfall is 2968.1 mm. Over 95% of the total annual rainfall is received during the June to October month.

#### 3.4.1 Meteorology

The parameters for which data have been collected are:

- Wind speed
- Wind direction
- Temperature
- Relative humidity
- Cloud cover

Meteorological Data: The prevailing wind direction is shown through following wind roses in **Figure 2.5** and the summarized data for the Study Period is as shown in **Table 3.6**.



**Figure 3.5: Site Specific Wind Rose**



**Table 3.6: Meteorological Data**

Month	Temperature, °C		Relative Humidity, %		Wind Speed, m/s
	Min	Max	Min	Max	Mean
December 2019 to February 2020	19.9	31.8	32	99	2.46

### **3.4.2 Ambient Air Quality Monitoring**

Air is one of the most vital natural resource for existence of all the living organisms on the planet Earth. Good quality air is essential for the physiological processes such as respiration and expiration of man, animals and plants. Ambient Air Quality is an indication of overall state of environment of a particular area. Ambient air quality (AAQ) is an important criterion for healthy environment and its degradation causes various long-term impacts on the human health.

The ambient air quality can be termed to be good only if it is having proportionate concentrations of natural gases like oxygen, nitrogen etc. Nature itself maintains the balance of constituents of atmospheric air but unfortunately, over a few decades; man is disturbing the process by introducing various air pollutants through industrialization and transportation.

Toxic gases like SO<sub>2</sub>, NO<sub>x</sub>, CO, CO<sub>2</sub>, Hydrocarbons, and Chlorofluorocarbons; introduced through various polluting sources cause degradation of ambient air quality which leads to various human diseases like asthma and other respiratory diseases. For example, the carbon monoxide; if exceeded in ambient air mixes with human blood converting the haemoglobin into carboxy haemoglobin; which is toxic.

In the present study, ambient air monitoring stations were determined on the basis of meteorological conditions, human settlement and the concentration of pollutants. Among the meteorological conditions, wind speed and wind direction were considered, whereas population density was given a top priority among other population characteristics for determining the monitoring stations.

### **3.4.3 Sampling Procedure & Analysis**

The locations for Ambient Air Quality Monitoring were decided based on the guidelines given in EIA manual from MoEF&CC. The purpose is to ascertain the baseline pollutant concentrations in ambient air at residential areas and near road areas.

#### **Sources of Air Pollution:**

A major source of air pollution in the buffer zone of 10 km radius around the plant area includes:

- Private Vehicular Traffic
- Domestic Fuel Burnings
- Unpaved Roads

During this study, High Volume Sampler (HVS) is used for ambient air monitoring as usual. The equipment is designed as per the specifications of the central board for the prevention and control of water pollution, New Delhi - emission regulations (December 1985). It is used to monitor the ambient air quality for Suspended Particulate Matter (SPM). It also has provision to



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collect samples of gaseous pollutants such as SO<sub>2</sub>, Nox, CO, HCL, etc. from ambient air by absorbing them in appropriate reagents kept in impinger tubes followed by further analysis in the laboratory.

Air is drawn into a covered housing and through a filter by a flow rate blower at 1.1 - 1.5 m<sup>3</sup>/min that allows total suspended particulate matters with diameter less than 100 µm (Stokes equivalent diameter) to collect on filter surface. Particles with diameter of 0.1 - 100 µm are ordinarily collected on glass fiber filters. The particulate concentration (µg/m<sup>3</sup>) in ambient air is computed by measuring the mass of SPM collected and the volume of air sampled. All the samples are collected over a period of 24 hours each as per the CPCB norms.

The Particulate concentration (µg/m<sup>3</sup>) in ambient air is computed by measuring the mass of SPM collected and the volume of air sampled. The size of the sample collected is usually adequate for further analysis of trace elements. Sampling locations are shown in **Table 3.7** and **Figure 3.6**.



**Figure 3.6: Ambient Air Quality Monitoring Locations**



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**Table 3.7: Location of Air Sampling Stations**

SN	Station Code	Latitude	Longitude	Distance (Kms)
1	A1	11°50'4.43"N	93° 2'30.51"E	0.46
2	A2	11°50'12.33"N	93° 1'50.81"E	0.77
3	A3	11°50'8.46"N	93° 1'45.65"E	0.94
4	A4	11°50'1.31"N	93° 1'35.28"E	1.28
5	A5	11°50'34.42"N	93° 1'2.40"E	2.34
6	A6	11°49'48.03"N	93° 2'18.14"E	0.61
7	A7	11°49'25.80"N	93° 2'10.56"E	1.34

**3.4.4 Air Quality Monitoring Results**

The National Ambient Air Quality Standards are as provided in **Table 3.8** and the AAQ Results are provided in **Table 3.9**.

**Table 3.8: National Ambient Air Quality Standards**

SN	Pollutants	Time Weighted Average	National Ambient Air Quality Standards	
			Industrial, Residential, Rural and Other Area	Ecological Sensitive Area (Notified by Central Government)
1.	SO <sub>2</sub>	24 hours	80 (µg/m <sup>3</sup> )	80 (µg/m <sup>3</sup> )
2.	NO <sub>x</sub>	24 hours	80 (µg/m <sup>3</sup> )	80 (µg/m <sup>3</sup> )
3.	PM <sub>10</sub>	24 hours	100 (µg/m <sup>3</sup> )	100 (µg/m <sup>3</sup> )
4.	PM <sub>2.5</sub>	24 hours	60 (µg/m <sup>3</sup> )	60 (µg/m <sup>3</sup> )
5.	CO	8 hours	2 (mg/m <sup>3</sup> )	2 (mg/m <sup>3</sup> )
		1 hour	4 (mg/m <sup>3</sup> )	4 (mg/m <sup>3</sup> )

**Table 3.9: Ambient Air Quality Results**

Parameter		A1	A2	A3	A4	A5	A6	A7
PM <sub>2.5</sub> (µg/m <sup>3</sup> )	Max	30.9	27.9	18.9	29.2	26.8	25.8	29.4
	Min	22.0	19.9	26.5	20.7	19.1	18.3	20.9
	Average	25.2	22.7	21.6	23.7	21.8	21.0	23.9
	98 percentile	30.64	27.66	26.28	28.91	26.59	25.53	29.12
PM <sub>10</sub> (µg/m <sup>3</sup> )	Max	63.2	55.9	53.1	58.4	53.7	51.6	58.9
	Min	51.3	46.3	44.0	48.4	44.5	42.7	48.7
	Average	56.5	50.6	48.1	52.9	48.6	46.7	53.3
	98 percentile	62.61	55.81	53.02	58.32	53.66	51.51	58.75
SO <sub>2</sub> (µg/m <sup>3</sup> )	Max	11.3	10.2	9.7	9.7	9.8	9.5	11.4
	Min	5.7	5.1	4.9	3.7	4.9	4.7	5.4
	Average	9.3	8.4	8.0	7.7	8.1	7.8	11.39
	98 percentile	11.29	10.19	9.68	9.62	9.80	9.41	9.00
NO <sub>x</sub> (µg/m <sup>3</sup> )	Max	21.9	19.8	18.8	20.6	19.0	18.2	20.8
	Min	16.6	14.9	14.2	15.6	14.4	13.8	15.7
	Average	18.3	16.5	15.7	17.3	15.9	15.2	17.4
	98 percentile	21.34	19.27	18.31	20.14	18.53	17.78	20.28



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<b>CO</b> (mg/m <sup>3</sup> )	<b>Max</b>	0.90	0.92	0.93	0.93	0.77	0.81	0.64
	<b>Min</b>	0.48	0.50	0.55	0.51	0.43	0.54	0.35
	<b>Average</b>	0.72	0.74	0.81	0.76	0.63	0.71	0.52
	<b>98 percentile</b>	0.88	0.91	0.84	0.91	0.75	0.81	0.63

It shall be noted that other parameters such as Ammonia, Arsenic, Ozone, Lead, Nickel, Benzene & Benzo (a) Pyrene were Below Detection Limit. Monitoring of Benzene & Benzo (a) Pyrene was carried out twice a month.

### 3.4.5 Interpretation

#### Particulate Matter (PM<sub>10</sub>)

The study reveals that maximum concentration was observed to be in the range of 44.2-63.2 µg/m<sup>3</sup>. The highest 24-hourly concentration was recorded at sampling location A1. At the same time minimum concentration was observed at location A6. The average concentration of PM<sub>10</sub> can be said to be ranged between 46.7-56.5µg/m<sup>3</sup>. The high concentration of particulate matter recorded at project site (A1) may be due to presence of jetty and related activity nearby. It should be noted that the concentration of PM<sub>10</sub> was not observed to be exceeding the standards prescribed by the CPCB on any occasion.

#### Particulate Matter (PM<sub>2.5</sub>)

The major source of PM<sub>2.5</sub> is said to be the combustion of fossil fuels, fire wood, etc. The maximum of PM<sub>2.5</sub> (30.9 µg/m<sup>3</sup>) during the study period was recorded at location A1, whereas the minimum 18.3 µg/m<sup>3</sup> concentration was recorded at A6 location which is surrounded by dense vegetation. The minimum concentration indicates that the area experiences minimal anthropogenic activity. On the other hand high concentration at location A6 indicates that the combustion of wood and presence of vacant farm land, however other locations were surrounded by dense vegetation. The average concentration of PM<sub>2.5</sub> during the study period was computed to be in the range of 25.53-30.64 µg/m<sup>3</sup>.

#### Sulphur Dioxide (SO<sub>2</sub>)

High level of SO<sub>2</sub> in ambient air indicates the presence of combustion of fossil fuel in the vicinity. The ambient air monitoring results indicate that the highest concentration of SO<sub>2</sub> is experienced at A7. The presence of working jetty and its related activities can be considered as the principle source of emission for SO<sub>2</sub>. The average concentration of SO<sub>2</sub> recorded at all the monitoring locations during the study period ranged between 7.7-11.39 µg/m<sup>3</sup> respectively. It should be noted that maximum average concentration was recorded at location A7 while the lowest can be observed at location A4.

#### Oxides of Nitrogen (NO<sub>x</sub>)

The various forms of Nitrogen in NO, NO<sub>2</sub> and N<sub>2</sub>O are collectively called as Oxides of Nitrogen. The highest value of NO<sub>x</sub> during the monitoring period was observed at location A1



while the minimum average was recorded at A3. The average concentrations were in the range of 15.2-18.3  $\mu\text{g}/\text{m}^3$ . The maximum 24 hourly value of  $\text{NO}_x$  was recorded at the monitoring location A1 (21.9 $\mu\text{g}/\text{m}^3$ ) whereas the minimum concentration of  $\text{NO}_x$  was recorded at location A3 (14.2  $\mu\text{g}/\text{m}^3$ ).

### **Carbon Monoxide (CO)**

The anthropogenic source of CO is due to incomplete combustion of fuel majorly in absence of air. The maximum concentration of CO estimated at all locations during the study period can be observed to be within 0.81 to 0.52  $\text{mg}/\text{m}^3$  respectively. The minimum concentration was noted at A7. The highest average is calculated at location A4.

All the parameters were found to be within the desired limits specified by NAAQ Standard.

### **3.5 Noise Environment**

Noise, in general, is sound which is composed of many frequency components of various loudness distributed over the audible frequency range. Various noise scales have been instructed to describe in a single number. The response of an average human to a complex sound made up of various frequencies at different loudness levels.

The most common and universally accepted scale is the weighted scale which is measured as dB. This is more suitable for audible range of 20- 20,000 Hz and has been designed to weigh various components of noise according to the response of a human ear. The environmental impact assessment of a noise from the industrial activity, vehicular traffic can be undertaken by taking into consideration various factors like potential damage to hearing, physiological responses, annoyance and general community responses which have several effects varying from rise Noise Induced Hearing Loss (NIHL) etc. Noise survey has been conducted in the study area to assess the background noise levels in different zones viz. residential, commercial, Industrial and silence zones.

#### **3.5.1 Instrument Used For Monitoring**

Noise levels were measured using a sound level meter. The sound level meter measures the sound pressure level (SPL), the maximum sound pressure level (max) and the equivalent continuous noise level (Leq) by switching on the corresponding function mode.

#### **3.5.2 Method of Monitoring**

Sound pressure level (SPL) measurements were undertaken at all locations, with an interval of 10 seconds over a period of 10 minutes per hour for 24 hours. The day noise levels have been monitored during 6 am to 9 pm and night levels during 9 pm to 6 am at all the locations covered in 10 km radius of the study area.



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**Figure 3.7: Ambient Noise Monitoring Locations**

**Table 3.10: Noise Level Standards**

Area Code	Category of Area /Zone	Limits in dB(A) Leq	
		Day Time	Night Time
(A)	Industrial area	75	70
(B)	Commercial area	65	55
(C)	Residential area	55	45
(D)	Silence Zone	50	40

**Table 3.11: Noise Monitoring Locations**

SN	Code	Latitudes	Longitude
1	N1	11°50'11.30"N	93° 2'20.46"E
2	N2	11°50'12.33"N	93° 1'50.81"E
3	N3	11°50'8.46"N	93° 1'45.65"E
4	N4	11°50'1.31"N	93° 1'35.28"E
5	N5	11°50'34.42"N	93° 1'2.40"E
6	N6	11°49'48.03"N	93° 2'18.14"E
7	N7	11°49'25.80"N	93° 2'10.56"E



### 3.5.3 Noise Level Monitoring Results

**Table 3.12: Noise Monitoring Results**

SN	Leq (day)	Leq (night)	Category of Area/Zone	Limits in dB(A) Leq	
				Day Time	Night Time
N1	71.5	58.8	Commercial	65	55
N2	51.2	42.5	Residential	55	45
N3	52.5	41.3	Residential	55	45
N4	50.3	42.7	Residential	55	45
N5	49.8	40.7	Residential	55	45
N6	53.6	42.3	Residential	55	45
N7	48.6	36.9	Residential	55	45

### 3.5.4 Interpretation

The noise monitoring conducted at seven locations for 24 hr, once in a week and average hourly readings were recorded. The minimum noise level recorded during the daytime was observed at location N7, where as the maximum noise levels can be observed at location N1. It should be noted that the permissible limits for noise did not exceed at any of the locations.

## 3.6 Water Environment

### 3.6.1 Surface Water Sampling Locations

Surface Water samples were collected from all the available sources and were analyzed for their physico-chemical characteristics. The sampling locations and the water quality at the selected stations are presented in **Table 3.13**.



**Figure 3.8: Surface Water Monitoring Locations**



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**Table 3.13: Surface Water Sampling Locations**

SN	Code	Latitude	Longitude	Direction	Distance (Kms)
1	SW1	11°49'53.62"N	93° 2'45.72"E	SE	1.03
2	SW2	11°50'8.50"N	93° 2'16.37"E	SW	0.08
3	SW3	11°50'24.55"N	93° 2'11.50"E	N	0.52
4	SW4	11°50'5.82"N	93° 1'20.38"E	SWW	1.73
5	SW5	11°50'12.47"N	93° 1'31.28"E	W	1.42
6	SW6	11°50'0.99"N	93° 2'40.57"E	SE	0.71
7	SW7	11°49'25.61"N	93° 2'16.43"E	S	1.27

The Surface Water Quality results are as presented in **Table 3.14**.

**3.6.2 Surface Water Sampling Results**

Status of surface water quality of study zone is judged using Standard Methods. The findings are tabulated in **Table 3.14**.

**Table 3.14: Surface Water Quality Results**

SN	Parameter	SW1	SW2	SW3	SW4	SW5	SW6	SW7
1	Colour	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
3	pH	8.03	8.29	8.42	8.12	8.02	8.16	7.42
4	Turbidity	4.6	4.6	5.1	3.88	3.97	5.01	4.55
5	Total Dissolve Solid (TDS)	1978.4	1821.3	2021.4	2127.4	1828.5	2001.3	1821.1
6	Total Alkalinity (CaCO <sub>3</sub> )	473.3	460.2	491.2	556.4	543.4	573.6	521.9
7	Total Hardness (CaCO <sub>3</sub> )	521.4	508.4	631.3	602.5	589.8	709.2	645.3
8	Chloride (Cl)	125.1	130.1	129.6	135.2	128.3	132.9	120.9
9	Calcium (Ca)	82.3	74.2	82.3	89.6	79.7	85.7	77.9
10	Mineral Oil	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
11	Sulphate (SO <sub>4</sub> )	62.3	62.3	55.4	62.6	58.9	58	48.7
12	Nitrate (NO <sub>3</sub> )	2.83	2.81	3.19	2.78	2.76	2.84	2.61
13	Fluoride (F)	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
14	Iron (Fe)	<0.05	<0.05	<0.05	0.54	0.62	0.48	0.71
15	Aluminium (Al)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
16	Selenium (Se)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
17	Cyanide (Cn)	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
18	Copper(Cu)	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
19	Magnesium (Mg)	56.5	71.5	84.3	111.4	95.7	90.3	104.5
20	Manganese(Mn)	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
21	Zinc (Zn)	2.31	2.23	2.78	2.63	2.71	2.8	2.88
22	Cadmium (Cd)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
23	Lead (Pb)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
24	Mercury (Hg)	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001



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25	Nickel (Ni)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
26	Arsenic(As)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
27	Chromium (Cr+6)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
28	Conductivity (25 °C)	2742.3	2674.1	2732.4	2924	2546	2833	2521
29	Chemical Oxygen Demand (COD)	16.6	13.7	13.4	12.8	11.3	15.6	16.3
30	Biological Oxygen Demand (BOD at 27°C for 3 day)	6.1	5.2	6.5	5.9	5.4	5.8	5.7
31	Dissolve Oxygen (DO)	4.2	3.8	4.7	4	3.8	3	3.4
32	E. Coli	2.4	3.6	2.8	2.1	1.9	1.7	1.5
33	Total Coliform	79	77	91	87.2	88.6	89.3	90.6
34	Temperature	23.7	23.8	24.1	24.2	25.6	24.5	24.65
35	Magnesium Hardness (CaCO <sub>3</sub> )	276	263	362	346.8	438.6	361.2	318.4
36	Sodium (Na)	117	99.6	125	126.6	138.6	133.6	134.1
37	Faecal Coliform	Absent	Absent	ABSENT	ABSENT	ABSENT	ABSENT	ABSENT

### 3.6.3 Interpretation of Surface Water Quality Results

The values obtained are compared with the standards prescribed for the respective designated use of the water body as categorized in the earlier part of the study. The analysis helps to concluded that the pH of all the samples was found to vary between: 8.02 – 8.42. It should be noted that the values obtained were within the desirable limit for pH as prescribed by CPCB. The total hardness was observed to be ranging between 508.4-709.2 mg/l. The maximum value of hardness was recorded at SW6 and the minimum value was recorded at SW2. The concentration of Total Dissolved Solids was estimated in the range of 1821.1mg/l to 2027.4 mg/l. The maximum concentration of Total Dissolved Solids (TDS) was observed at SW4 whereas the minimum TDS concentration was observed at SW7. It should be noted that the variation observed in the concentration of TDS can be said to be marginal. The Chemical Oxygen Demand (COD) & Biochemical Oxygen Demand (BOD) values were calculated to be in the range of 11.3 mg/l to 16.6 mg/l & 5.2 mg/l to 6.5 mg/l respectively.

The microbiological samples for total coliforms were absent in all samples. It should be noted that in case of the selected water bodies (SW-1) classified under Category “E”.

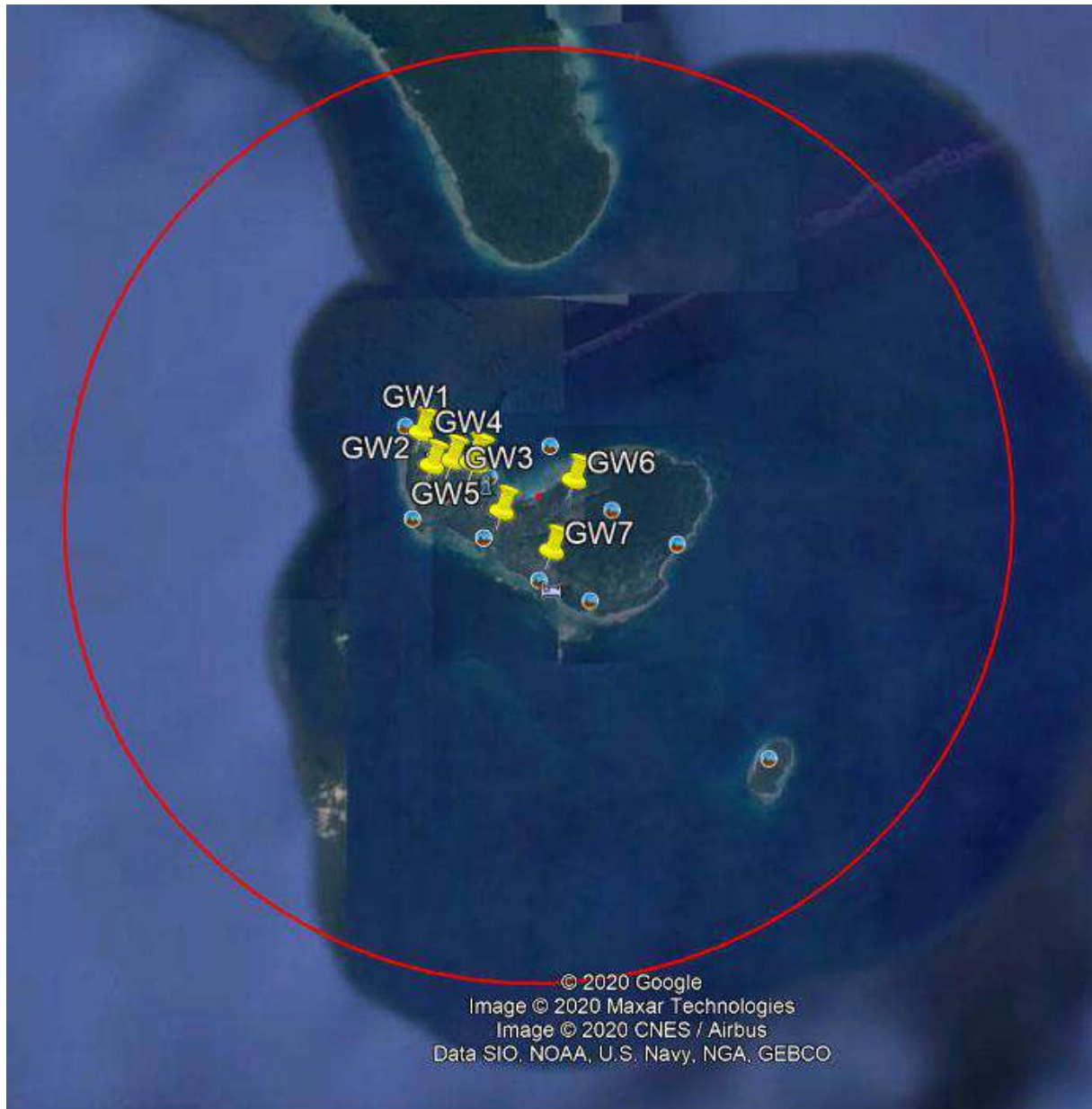
### 3.6.4 Ground Water Monitoring Locations

Ground water sampling was done to further establish the baseline characters and to assess the anticipated impacts due to the project. Drinking water within the study area will be supplied by Local body. Other requirements of water during construction phase will be met by water tankers. Ground water sample was collected and analysed.

Ground Water samples were collected from all the available sources and were analyzed for their Physico-chemical characteristics. The sampling locations and the water quality at the selected stations are presented in **Table 3.15**.



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**Figure 3.9: Ground Water Monitoring Locations**

**Table 3.15 Ground Water Monitoring Locations**

Station Code	Latitude	Longitude	Direction	Distance (Kms)
GW1	11°50'42.76"N	93° 0'52.15"E	NW	2.71
GW2	11°50'19.56"N	93° 0'59.61"E	W	2.34
GW3	11°50'22.77"N	93° 1'13.60"E	W	1.90
GW4	11°50'18.36"N	93° 1'28.45"E	W	1.46
GW5	11°49'46.98"N	93° 1'48.24"E	SW	1.07
GW6	11°50'7.42"N	93° 2'38.72"E	E	0.74
GW7	11°49'19.02"N	93° 2'22.49"E	S	1.55

The quality of groundwater is examined by drawing samples from hand pump as well as from dug well from the study area. Analysis was done by Standard Methods. The results are



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summarized below in **Table 3.16**, and compared with drinking water standards as per **IS: 10500:2012**.

#### **3.6.5 Ground Water Sampling Results**

The results of the ground water sampling at the selected stations are presented in **Table 3.16**.



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**Table 3.16: Ground Water Results**

SN	Test Parameter	Units	GW1	GW2	GW3	GW4	GW5	GW6	GW7	IS:10500		Method
										Acceptable (Permissible)		
										Desirable	Permissible	
1.	Colour	Haze n	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	<5.0	5	15	IS:3025 (Pt-4)
2.	Odour	---	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS:3025 (Pt-5)
3.	pH	---	7.11	7.43	7.22	6.92	7.11	7.94	7.94	6.5 - 8.5	NR	IS:3025 (Pt-11)
4.	Taste	---	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	IS:3025 (Pt-8)
5.	Turbidity	NTU	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	5	IS:3025 (Pt-10)
6.	Total Dissolve Solid (TDS)	mg/L	550.7	680.9	650.7	696	682.66	717.4	734.8	500	2000	IS:3025 (Pt-16)
7.	Total Alkalinity (CaCO <sub>3</sub> )	mg/L	126.4	152.3	133.4	127.6	132.8	135.1	164.7	200	600	IS:3025 (Pt-23)
8.	Total Hardness (CaCO <sub>3</sub> )	mg/L	227.5	246.7	277.5	241.7	227.3	281	225	200	600	IS:3025 (Pt-21)
9.	Chloride (Cl)	mg/L	41.5	44.5	39.1	48.2	52.6	55.4	57.4	250	1000	IS:3025 (Pt-32)
10.	Calcium (Ca)	mg/L	88.1	87.1	83.6	77.4	76.7	90.1	92.9	75	200	IS:3025 (Pt-40)
11.	Mineral Oil	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.5	NR	IS:3025 (Pt-39)
12.	Sulphate (SO <sub>4</sub> )	mg/L	25.6	28.6	30.4	33.6	36.3	34.6	36.4	200	400	IS:3025 (Pt-24)
13.	Nitrate (NO <sub>3</sub> )	mg/L	3.4	2.8	3.7	2.2	4.1	3.6	4.6	45	NR	IS:3025 (Pt-34)
14.	Fluoride (F)	mg/L	1.6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	1	1.5	IS:3025 (Pt-60)
15.	Iron (Fe)	mg/L	0.14	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.3	NR	IS:3025 (Pt-53)



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16.	Aluminium (Al)	mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.2	APHA-3500 (B)
17.	Selenium (Se)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NR	APHA-3113 (B)
18.	Cyanide (Cn)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	NR	APHA-4500 (C)
19.	Copper(Cu)	mg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	0.05	1.5	APHA-3111(B)
20.	Magnesium (Mg)	mg/L	22.4	25.1	23.5	20.2	19.4	21.5	25.7	30	100	IS:3025 (Pt-45)
21.	Manganese (Mn)	mg/L	0.04	0.02	0.03	0.01	0.01	0.04	0.04	0.1	0.3	APHA-3111(B)
22.	Zinc(Zn)	mg/L	0.78	0.73	0.91	1.02	1.07	1.15	1.21	5	15	APHA-3111 (B)
23.	Cadmium(Cd)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.003	NR	APHA-3111 (B)
24.	Lead(Pb)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	NR	APHA-3111 (B)
25.	Mercury(Hg)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	NR	APHA-3112 (B)
26.	Nickel (Ni)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	NR	APHA-3111 (B)
27.	Arsenic(As)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.01	0.05	APHA-3500 (B)
28.	Chromium (Cr+6)	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.05	NR	APHA-3500 Cr-B
29.	Phenolic Compound (C6H5OH)	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	APHA-5530
30.	Conductivity (25 °C)	µs/cm	753.4	940.3	890.3	988.5	951.2	992.6	998.1	NS	NS	APHA-2510
31.	E. Coli	Coli/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Shall Not Be Detectable	---	IS:1622-1981
32.	Total Coliform	MPN/100ml	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Shall Not Be Detectable	---	IS:1622-1981

\*NR – No Relaxation; NS – Not Specified



### **3.6.6 Interpretation of Ground Water Quality Results**

The above results indicate that the pH of all the ground water samples was within the prescribed standards.

The concentration of heavy metals like arsenic, zinc, chromium, lead, mercury, nickel & cadmium were below detection limit. Iron was detected in ground water samples. The hardness of all the ground water samples was found to be ranging between 225-281 mg/lit. The value of hardness was within the acceptable limit at all the locations.

It can be observed that the values for total dissolved solids in all the sampling locations were estimated to be under the acceptable standards for drinking water. The concentration of total dissolved solids ranged between 550.7-734.8 mg/lit. The maximum concentration was observed at location GW6 whereas the minimum concentration was observed at GW7.

It should be noted that the microbiological analysis of all the samples indicate that e-coli was absent in all the ground water samples.

The fluoride concentration is ranging between 1-1.6 mg/l. The presence of the fluoride in all the water samples is mostly due to geogenic in nature. The nitrates concentrations were ranging between 2.2-4.6 mg/l well below the acceptable limits of drinking water. The probable sources of nitrates in the ground water could be the use of fertilizers in the nearby agricultural activity.

Thus based on the above results it can be stated that the water from the said samples can be considered fit for consumption and potable purpose with basic primary treatment. The water can be used for domestic utilization and gardening without any treatment.

### **3.7 Soil Environment**

#### **3.7.1 Soil Sampling Locations**

Locations were selected for analyzing the soil quality status in the study area. The soil samples were collected from the agricultural lands from the buffer zone areas and from the area having natural vegetation in core zone. Selected locations are as follows,

**Table 3.17: Soil Sampling Locations**

<b>Station Code</b>	<b>Latitude</b>	<b>Longitude</b>	<b>Direction</b>	<b>Distance from project site (Km)</b>
S1	11°50'10.97"N	93° 2'17.64"E	Project site	00
S2	11°50'6.94"N	93° 1'55.72"E	W	0.68
S3	11°49'49.48"N	93° 1'45.87"E	SW	1.12
S4	11°50'18.70"N	93° 1'20.58"E	W	1.75
S5	11°50'33.33"N	93° 1'3.23"E	NW	2.34
S6	11°50'8.52"N	93° 2'43.47"E	E	0.86
S7	11°49'22.02"N	93° 2'15.65"E	S	1.46



**Figure 3.10: Soil Monitoring Locations**

### 3.7.2 Soil Sampling Results

The soils in study area are moderately to highly productive. The soil has favourable organic matter and potassium, moderate phosphates. The analytical results are depicted in **Table 3.18**.

**Table 3.18: Soil Sampling Results**

S.No	Parameters	Units	S1	S2	S3	S4	S5	S6	S7
1	Texture	...	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam
2	Sand	%	63.0	61.2	60.4	63.5	61.0	61.2	62.4
3	Silt	%	15.7	16.1	11.6	11.2	15.5	17.6	13.3
4	Clay	%	21.3	22.7	28.0	25.3	23.5	21.2	24.3
5	pH	...	7.38	7.32	6.98	7.55	7.84	7.43	7.89
6	Cation Exchange Capacity (CEC)	meq/100g	34.6	25.3	36.1	33.8	33.2	38.1	34.2



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7	Electrical Conductivity (EC)	µs/cm	357.1	334.1	352.7	354.2	354.9	334.4	371.3
8	Water Holding Capacity (WHC)	%	38.2	23.3	30.3	31.6	31.1	33.5	33.3
9	Sodium,(Na)	mg/kg	158.3	78	162.5	156.1	156.4	148.4	155.2
10	Calcium,(Ca)	mg/kg	121.1	47	119.6	107.3	115.6	122.8	117.5
11	Magnesium,(Mg)	ml/kg	55.5	44	52.5	51.2	56.2	52.3	57.4
12	Bulk Density	g/cm <sup>3</sup>	1.01	1.23	1.56	1.33	1.45	1.77	1.31
13	Total Nitrogen (N)	mg/kg	81	83	81	76	73	81	69
14	Phosphorus (PO <sub>4</sub> )	mg/kg	35	21	45	38	37	41	39
15	Potassium (K )	mg/kg	42	45	67	50	48	69	53
16	Organic Matter,(OM)	%	1.05	1.06	1.09	1.12	1.67	1.13	1.05
17	Organic Carbon,(OC)	%	1.58	1.91	1.72	1.66	1.54	1.61	1.12
18	Sulphate as (SO <sub>4</sub> )	mg/kg	2.02	1.54	2.01	1.88	1.83	1.84	1.66
19	Porosity	%	1.38	1.47	1.33	1.12	1.48	1.48	1.51
20	Permeability	cm/s	17.6	15.3	17.2	16.3	18.2	16.8	18.6

**3.7.3 Interpretation**

The chemical classification of soil quality and levels of soil fertility is as shown in **Table 3.19** and **Table 3.20**.

**Table 3.19: Chemical Classification of Soil Quality**

SN	Soil Test	Classification
1	pH	4.5 Extremely acidic 4.51- 5.50 Very strongly acidic 5.51-6.00 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (mmhos/cm) (1ppm = 640 mmho/cm)	Upto 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon (%)	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4	Nitrogen (Kg/ha)	Up to 50 very less 51-100 less 101-150 good



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		151-300 Better >300 sufficient
5	Phosphorus (Kg/ha)	Up to 15 very less 16-30 less 31-50 medium 51-65 on an average sufficient 62-60 sufficient >80 more than sufficient
6	Potash (Kg/ha)	0 -120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Source: Hand Book of Agriculture, ICAR, New Delhi

**Table 3.20: Levels of Soil Fertility**

Soil Fertility Level	Organic Carbon (%)	Available N kg/ha	Available P <sub>2</sub> O <sub>5</sub> kg/ha	Available K <sub>2</sub> O kg/ha
Very high	> 1.00	> 700	> 80.0	> 360
High	0.81- 1.00	561 – 700	64 – 80	301 – 360
Medium	0.61-0.80	421 – 560	48 – 64	241 – 300
Medium Low	0.41-0.60	281 – 420	32 – 48	181 – 240
Low	0.21-0.40	141 – 280	16 – 32	121 – 180
Very Low	0.20	140	16.0	120

Source: Tondon H.L.S. (2005 )

The findings of the study reveal that pH of the soil in the study area ranged between 6.98-7.89 which is an indicative of moderately alkaline soils. The values for Nitrogen at all locations varied between 69-83 kg/ha. The concentration of phosphate was estimated to be between 21-45 kg/ha. It is important to note that the concentration of potassium was found to be at all locations ranging between 42-69 kg/ha.

Based on the above findings it can be concluded that the soil samples can be classified as per soil classification given by Tondon H.L.S. (2005). The samples fall under very low fertile soils.

### 3.8 Biotic Environment

#### 3.8.1 Introduction

The biotic studies have been conducted with a view to assess the prevailing baseline ecological data within study area in terms of terrestrial & aquatic biodiversity, to identify & quantify probable impacts associated with project activities on prevailing ecology & to advocate suitable management/mitigation measures for the same.

#### 3.8.2 Objectives



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To assess the implication of proposed project activities on the project site & immediate surrounding area following attributes were considered & executed:

- Documentation of project area specific flora and fauna.
- Assessment of any species of conservation importance & felling/clearing activity within project area.
- To assess the impact of proposed project activities on surrounding ecology.
- To recommend suitable management/mitigation measures to minimize any anticipated adverse impacts due to proposed project activity.

**3.8.3 Study Area**

The entire expanse (length & breadth) of project activity area viz. 3, 750 sq. m. land area viz. Passenger Terminal Building (PTB) area & 4 selected sites/locations based on reconnaissance survey within 10 km radius from the project site for maximum habitat representation as depicted in following table & figures.

**Table 3.21: Sites/Locations for Biotic Environment Field Studies/Surveys**

SN	Site/Location	Latitude	Longitude	Direction, Distance from Project site		Feature Details
				Direction	Distance	
1	Project Site	--	--	--	--	Sea Water
2	Govinda Nagar RV	11°50'19.85"N	93° 3'2.00"E	E	1.25	Tropical evergreen & semi evergreen forest
3	Bejoy Nagar RV	11°49'7.25"N	93° 3'31.59"E	SE	2.96	Terrestrial & Beach vegetation
4	Neil Kendra	11°49'53.99"N	93° 1'40.00"E	W	1.34	Terrestrial vegetation
5	Laxmanpur Area	11°50'37.63"N	93° 0'50.17"E	W	2.82	Terrestrial & Beach vegetation



**Figure 3.11: Google Earth imagery Depicting Sites/Locations for Biotic Environment Studies/Surveys**

### ***3.8.4 Ecological Assessment***

#### ***Settings of project area (Terrestrial)***

The approach to project site was by Bharatpur road leading excess to Bharatpur beach, the project site visited was a terrain characterized by presence of large groves of Karanj trees & undergrowth was represented by climbers, herbs & shrubs. The pictures of project site are given following section.

#### ***Settings of project area (Aquatic)***

The sea plane activity area viz. Floating dock & run way is in offshore. The project aquatic area comprises of marine system of Fussiler Channel.

#### ***Settings of study area (Aquatic & Terrestrial)***

The project surrounding 10 km radial area encompasses marine areas & islands (Havelock southern part, Sir Hugh Rose) which are a part of Ritcheis Archipelago viz.) and marine waters of Fusiller Channel, Arthur Channel & Andaman Sea Bay of Bengal. The natural habitats included coral reefs, beaches, evergreen rain forest, semi-evergreen rain forest and mangrove forests.



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**Table: 3.22 Summary of Ecologically Sensitive features in study area**

Sr. No.	Ecological Feature	Presence		Name/Identity	Details	Direction form project site	Distance form project site
		Yes (√)	No (X)				
<b>Sites of Conservation Importance</b>							
1	Biodiversity Heritage Sites (BHS)	X		--	--	--	--
2	Biosphere Reserves	X		--	--	--	--
3	Elephant Reserves	X		--	--	--	--
4	Important Bird Areas (IBA's)	X		--	--	--	--
5	Important Costal And Marine Biodiversity Areas (ICMBA's)	X		--	--	--	--
6	Key Biodiversity Areas (KBA's)	X		--	--	--	--
7	RAMSAR Wetland Sites	X		--	--	--	--
8	Tiger Reserves	X		--	--	--	--
<b>Protected Areas</b>							
1	Community Reserves	X		--	--	--	--
2	Conservation Reserves	X		--	--	--	--
3	Marine Protected Areas	X		--	--	--	--



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Sr. No.	Ecological Feature	Presence		Name/Identity	Details	Direction form project site	Distance form project site
		Yes (√)	No (X)				
4	National Parks		X	--	--	--	--
5	Wildlife Sanctuaries	√		Sir Hugh Ross Island Wildlife Sanctuary	--	Southeast	7.0 km (Aerial distance)
<b>Ecologically sensitive sites other than above</b>							
1	Coral Reefs	√		Scleractinian (Stony) Corals	94 species of stony corals were reported from northern, northeastern & south eastern sea off Shaheed Dweep	North, Northeast & Southeast	Nearest approximately 0.5 km from sea plane activity area
2	Turtle Nesting Sites	√		Green Turtles	Nesting's Green Turtles is known from Shaheed Dweep	--	--
3	Mangroves	√		8 species of true mangroves	8 species of true mangroves & are abundantly present along coasts of Shaheed Dweep within 10 km radial study area	--	Present along shore
4	Mudflats		X	--	--	--	--
5	Wetlands		X	--	--	--	--
6	Plateaus		X	--	--	--	--
7	Forests	√		--	Dense tropical evergreen, semi evergreen forests present within study area	--	--
8	Maas Feeding grounds		X	--	--	--	--
9	Breeding grounds		X	--	--	--	--
10	Migratory routes		X	--	--	--	--



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**3.8.5 Flora**

**Project plot specific flora assessment**

As the project site is in the sea no floral species observed on project location

**Study area flora assessment**

**Table 3.24: Flora inventory in & around sites/locations for biotic environment studies/surveys within study area**

Sr. No.	Botanical Name	Family	IUCN Status	Common Name	Habit	Type	Origin
<b>Mangroves</b>							
1	<i>Lumnitzera racemosa</i>	Combretaceae	Least Concern ver 3.1	Black Mangrove	Tr	Ev	Na
2	<i>Xylocarpus granatum</i>	Meliaceae	Least Concern ver 3.1	Cannonball Mangrove	Tr	Ev	Na
3	<i>Sonneratia apetala</i>	Lythraceae	Least Concern ver 3.1	Sonneratia Mangrove	Tr	Ev	Na
4	<i>Rhizophora mucronata</i>	Rhizophoraceae	Least Concern ver 3.1	Asiatic Mangrove	Tr	Ev	Na
5	<i>Ceriops tagal</i>	Rhizophoraceae	Least Concern ver 3.1	Tagal Mangrove	Tr	Ev	Na
6	<i>Bruguiera gymnorhiza</i>	Rhizophoraceae	Least Concern ver 3.1	Burma Mangrove	Tr	Ev	Na
7	<i>Aegiceras corniculatum</i>	Myrsinaceae	Least Concern ver 3.1	River Mangrove	Sh	Pr	Na
8	<i>Avicennia marina</i>	Acanthaceae	Least Concern ver 3.1	Grey Mangrove	Tr	Ev	Na
<b>Flora other than Mangroves</b>							
9	<i>Hopea odorata</i>	Dipterocarpaceae	Vulnerable A2cd ver 3.1	--	Tr	--	Na
10	<i>Endospermum chinense</i>	Euphorbiaceae	--	--	Tr	--	--
11	<i>Myristica andamanica</i>	Myristicaceae	Vulnerable B1+2c ver 2.3	--	Tr	--	--
12	<i>Dipterocarpus grandiflorus</i>	Dipterocarpaceae	Endangered A2cd	--	Tr	--	--



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			ver 3.1				
13	<i>Aglaia spectabilis</i>	Meliaceae	Least Concern ver 3.1	--	Tr	--	Na
14	<i>Artocarpus gomeziana</i>	Moraceae	--	--	Tr	--	--
15	<i>Dipterocarpus gracilis</i>	Dipterocarpaceae	Vulnerable A2cd ver 3.	--	Tr	--	Na
16	<i>Calophyllum soulattri</i>	Calophyllaceae	Lower Risk/least concern ver 2.3	--	Tr	--	Na
17	<i>Planchonella longipetiolata</i>	Sapotaceae	--	--	Tr	--	--
18	<i>Pterocymbium tinctorium</i>	Sterculiaceae	Least Concern ver 3.1	Winged Boot Tree	Tr	Dc	Na
19	<i>Mesua ferrea</i>	Clusiaceae	--	Indian rose chestnut	Tr	Ev	Na
20	<i>Dinochloa andamanica</i>	Poaceae	--	--	Cl	--	--
21	<i>Gnetum edule</i>	Gnetaceae	--	Joint Fir	Cl	Ev	Na
22	<i>Bambusa bambos</i>	Poaceae	--	Indian Thorny Bamboo	Hb	Pr	Na
23	<i>Ipomoea pes-caprae</i>	Convolvulaceae	--	Beach Morning Glory	Vn	--	--
24	<i>Thespesia populnea</i>	Malvaceae	Least Concern ver 3.1	Indian Tulip Tree	Tr	Ev	Na
25	<i>Dolichandrone spathacea</i>	Bignoniaceae	Least Concern ver 3.1	Mangrove Trumpet Tree	Tr	Ev	Na
26	<i>Pterospermum aceroides</i>	Sterculiaceae	--	Andaman Kanak Champa	Tr	Dc	Na
27	<i>Manilkara littoralis</i>	Sapotaceae	--	Andaman Bullet	Tr	Ev	Na
28	<i>Pongamia pinnata</i>	Fabaceae	Least Concern ver 3.1	Pongam Tree	Tr	Dc	Na
29	<i>Morinda citrifolia</i>	Rubiaceae	--	Indian Mulberry	Tr	Pr	Nt
30	<i>Calophyllum inophyllum</i>	Clusiaceae	Least Concern ver 3.1	Alexandrian Laurel	Tr	Ev	Na



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31	<i>Terminalia catappa</i>	Combretaceae	Least Concern ver 3.1	Indian Almond	Tr	Dc	Na
32	<i>Barringtonia asiatica</i>	Lecythidaceae	Lower Risk/least concern ver 2.3	Sea Poison Tree	Tr	Ev	Na
33	<i>Cordia subcordata</i>	Boraginaceae	Least Concern ver 3.1	Beach Cordia	Tr	Ev	Na
34	<i>Abrus precatorius</i>	Fabaceae	--	Rosary Pea	Tr	Ev	Na
35	<i>Aristolochia acuminata</i>	Aristolochiaceae	--	Tapering Leaf-Pipevine	Cl	Ev	Na
36	<i>Colubrina asiatica</i>	Rhamnaceae	--	Asian Snakewood	Sh	--	--
37	<i>Cordia obliqua</i>	Boraginaceae	--	Clammy Cherry	Tr	Dc	Na
38	<i>Duabanga grandiflora</i>	Lythraceae	Least Concern ver 3.1	Duabanga	Tr	Ev	Na
39	<i>Flagellaria indica</i>	Flagellariaceae	--	--	Cl	--	--
40	<i>Garuga pinnata</i>	Burseraceae	--	Garuga	Tr	Dc	Na
41	<i>Horsfieldia glabra</i>	Myristicaceae	--	--	Tr	--	--
42	<i>Scaevola sericea</i>	Goodeniaceae	--	--	Sh	Ev	In
43	<i>Ximenia americana</i>	Oleaceae	Least Concern ver 3.1	Hog plum	Sh	Pr	Na
44	<i>Pterocarpus dalbergioides</i>	Fabaceae	Vulnerable A2d ver 3.1	Andaman Redwood	Tr	Dc	Na
45	<i>Lagerstroemia hypoleuca</i>	Lythraceae	--	Andaman Crape Martyl	Tr	Dc	Na
46	<i>Tetrameles nudiflora</i>	Tetramelaceae	Lower Risk/least concern ver 2.3	False Hemp Tree	Tr	Dc	Na
47	<i>Gliricidia sepium</i>	Fabaceae	Least Concern ver 3.1	Mexican liliac	Tr	Dc	In
48	<i>Chromolaena odorata</i>	Asteraceae	--	Siam Weed	Hb	Pr	Nt



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49	<i>Cleome viscosa</i>	Cleomaceae	--	Asian Spider Flower	Hb	An	Na
50	<i>Lantana camara</i>	Verbenaceae	--	Lantana	Sh	Pr	Nt
51	<i>Mimosa pudica</i>	Mimosaceae	Least Concern ver 3.1	Touch-me-not	Hb	Pr	Nt
52	<i>Dioscorea bulbifera</i>	Dioscoreaceae	--	Aerial yam	Cl	Pr	Na
53	<i>Microcos paniculata</i>	Tiliaceae	Least Concern ver 3.1	Elm-Leaf Grewia	Tr	Pr	Na
54	<i>Mangifera indica</i>	Anacardiaceae	Data Deficient ver 2.3	Mango	Tr	Ev	Na
55	<i>Artocarpus heterophyllus</i>	Moraceae	--	Jackfruit	Tr	Ev	Na

Hb – Herb, Sh – Shrub, Cl – Climber, Tr – Tree, Na – Native, Nt – Naturalized, In – Introduced, Ev- Evergreen, Dc – Deciduous, An – Annual, Pr – Perennial

**Assessment of Rare, Endangered species (Conservation aspects)**

To identify whether any plant species of conservation importance exists in the study area, the status evaluation of the flora species has been established as per the IUCN assessment as summarized below.

No. of Species	IUCN Red List Categories								Not Assessed
	Data Deficient (DD)	Least Concern (LC)	Near Threatened (NT)	Vulnerable (VU)	Endangered (EN)	Critically Endangered (CR)	Extinct In The Wild (EW)	Extinct (EX)	
55	1	24	--	4	1	--	--	--	25

**3.8.6 Fauna**

Except for direct sighting of some of the commonest birds viz. Kingfisher around the project site none other faunal activity was not noticed

**Secondary data**

**Table 3.25: Sea grasses reported from Study Area**

Sr. No.	Botanical Name	Common Name	Family	IUCN Status
1	<i>Halodule sp.</i>	--	Cymodoceaceae	--
2	<i>Halophila ovalis</i>	Dugong grass	Hydrocharitaceae	Least Concern ver 3.1
3	<i>Halophila decipiens</i>	Paddle grass	Hydrocharitaceae	Least Concern ver 3.1
4	<i>Thalassia hemprichii</i>	Pacific turtle grass	Hydrocharitaceae	Least Concern



EIA Report for “Development of Water Aerodrome” located at Shaheed Dweep, Village – Bharatpur, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar

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**Fauna**

**Reference: Faunal Resources in the Ritchie’s Archipelago, Andaman & Nicobar Islands**  
**Zoological Survey of India**  
**C. Sivaperumna**



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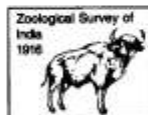
**RECORDS OF THE  
ZOOLOGICAL SURVEY OF INDIA**

**Faunal Resources in Ritchie’s Archipelago,  
Andaman and Nicobar Islands**

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*Edited by the Director, Zoological Survey of India, Kolkata*



**Zoological Survey of India  
Kolkata**



**STUDY PERIOD AND INTENSIVE STUDY AREA**

The study was conducted from April 2008 - December 2011 and it was mainly based on direct observational methods (Altman, 1974). The following islands were surveyed on foot, boat and vehicle namely Havelock, John Lawrence, Henry Lawrence, South Button, North Button, Middle Button, Inglis, Outram and Neil islands.

Following areas of Shaheed Dweep have been considered as study area in the cited reference.

Neil Island		
Neil	11° 59.305’	92°58.865’
Neil	11° 50.571’	93°00.868’
Neil	11° 50.527’	93°00.899’
Sitapur	11° 49.168’	93°03.382’
Sitapur	11° 48.897’	93°03.058’
Sitapur	11° 49.411’	93°03.688’
Sitapur	11° 49.347’	93°02.735’
Rampur	11° 49.229’	93°02.296’
Ramnagar	11° 49.202’	93°02.901’
Lakshmanpur	11° 50.057’	93°01.407’

**Avifauna**

A total of 136 species of birds belonging to 15 order & 40 families were recorded in Ritchie’s Archipelago, of which 85 species were resident, 27 species were resident migrants & 24 species were migrant. Out of the 20 bird species which are endemic to Andaman Islands, 13 species were recorded in Archipelago. Highest number of species richness & abundance was recorded at Havelock Island followed by Shaheed Dweep. The detailed account of avifauna reported from Ritchie’s Archipelago is given under.

Sl.No.	Common Name	Scientific Name	Status
	<b>Ciconiiformes</b>		
	<b>Ardeidae</b>		
1.	Little Egret	<i>Egretta garzetta</i> (Linnaeus)	R
2.	Pacific Reef-Egret	<i>Egretta sacra</i> (Gmelin)	R
3.	Great-billed Heron	<i>Ardea sumatrana</i> Raffles	V
4.	Purple Heron	<i>Ardea purpurea</i> Linnaeus	R
5.	Grey Heron	<i>Ardea cinerea</i> Linnaeus	R



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Sl.No.	Common Name	Scientific Name	Status
6.	Large Egret	<i>Casmerodius albus</i> (Linnaeus)	R
7.	Median Egret	<i>Mesophoyx intermedia</i> (Wagler)	R
8.	Cattle Egret	<i>Bubulcus ibis</i> (Linnaeus)	R
9.	Indian Pond-Heron	<i>Ardeola grayii</i> (Sykes)	R
10.	Yellow Bittern	<i>Ixobrychus sinensis</i> (Gmelin)	R
	<b>Anseriformes</b>		
	<b>Anatidae</b>		
11.	Cotton Teal	<i>Nettapus coromandelianus</i> (Gmelin)	R
12.	Andaman Teal	<i>Anas gibberifrons</i> (Muller)	R
	<b>Falconiformes</b>		
	<b>Accipitridae</b>		
13.	Andaman Blackcrested Baza	<i>Aviceda leuphotes andamanica</i> Abdulali	R
14.	Black Kite	<i>Milvus migrans</i> (Boddaert)	R
15.	Brahminy Kite	<i>Haliastur indus</i> (Boddaert)	R
16.	White-bellied Sea-Eagle	<i>Haliaeetus leucogaster</i> (Gmelin)	R
17.	Greater Grey-headed Fish Eagle	<i>Ichthyophaga ichthyaetus</i> (Horsfield)	R
18.	Crested Serpent-Eagle	<i>Spilornis cheela davisoni</i> Hume	R
19.	Western Marsh-Harrier	<i>Circus aeruginosus</i> (Linnaeus)	M
20.	Shikra	<i>Accipiter badius</i> (Richmond)	R
21.	Eurasian Sparrowhawk	<i>Accipiter nisus</i> (Linnaeus)	M
22.	Changeable Hawk-Eagle	<i>Spizaetus cirrhatus andamensis</i> (Gmelin)	R
	<b>Galliformes</b>		
	<b>Phasianidae</b>		
23.	Grey Francolin	<i>Francolinus pondicerianus</i> (Gmelin)	R
	<b>Gruliformes</b>		
	<b>Rallidae</b>		
24.	Blue-breasted Rail	<i>Gallirallus striatus</i> Linnaeus	R
25.	Andaman White-breasted Waterhen	<i>Amaurornis phoenicurus</i> (Pennant)	R
26.	Water Cock	<i>Gallicrex cinerea</i> (Gmelin)	R
27.	Purple Moorhen	<i>Porphyrio porphyrio</i> (Linnaeus)	R



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Sl.No.	Common Name	Scientific Name	Status
28.	Common Moorhen <b>Charadriiformes</b> <b>Charadriidae</b>	<i>Gallinula chloropus</i> (Linnaeus)	RM
29.	Pacific Golden-Plover	<i>Pluvialis fulva</i> (Gmelin)	M
30.	Little Ringed Plover	<i>Charadrius dubius</i> Scopoli	RM
31.	Lesser Sand Plover	<i>Charadrius mongolus</i> Pallas	RM
32.	Kentish Plover <b>Scolopacidae</b>	<i>Charadrius alexandrinus</i> Linnaeus	M
33.	Pintail Snipe	<i>Gallinago stenura</i> (Bonaparte)	M
34.	Jack Snipe	<i>Lymnocyptes minimus</i> (Brunnich)	M
35.	Bar-tailed Godwit	<i>Limosa lapponica</i> (Linnaeus)	M
36.	Whimbrel	<i>Numenius phaeopus phaeopus</i> (Linnaeus)	M
37.	Eurasian Curlew	<i>Numenius arauata</i> (Linnaeus)	M
38.	Common Redshank	<i>Tringa totanus</i> (Linnaeus)	M
39.	Common Greenshank	<i>Tringa nebularia</i> (Gunner)	M
40.	Green Sandpiper	<i>Tringa ochropus</i> Linnaeus	M
41.	Wood Sandpiper	<i>Tringa glareola</i> Linnaeus	M
42.	Common Sandpiper	<i>Actitis hypoleucos</i> Linnaeus	M
43.	Ruddy Turnstone	<i>Arenaria interpres</i> (Linnaeus)	M
44.	Great Knot	<i>Calidris tenuirostris</i> (Horsfield)	M
45.	Little Stint <b>Burhinidae</b>	<i>Calidris minuta</i> (Leisler)	M
46.	Beach Stone-Plover <b>Laridae</b>	<i>Esacus neglectus</i> (Vieillot)	R
47.	Gull-billed Tern	<i>Gelochelidon nilotica</i> (Gmelin)	M
48.	Black-naped Tern	<i>Sterna sumatrana</i> Raffles	R
49.	Lesser Crested Tern	<i>Sterna bengalensis</i> Lesson	R
50.	White-winged Black Tern <b>Colimbiformes</b> <b>Columbidae</b>	<i>Chlidonias leucopterus</i> (Temminck)	M
51.	Blue Rock Pigeon	<i>Columba livia</i> Gmelin	R
52.	Andaman Wood-Pigeon	<i>Columba palumboides</i> (Hume)	R
53.	Red Collared-Dove	<i>Streptopelia tranquebarica</i> (Hermann)	R



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Name	Scientific Name	Status
54.	Spotted Dove	<i>Streptopelia chinensis</i> (Scopoli)	R
55.	Little Brown Dove	<i>Streptopelia senegalensis</i> (Linnaeus)	R
56.	Andaman Cuckoo-Dove	<i>Macropygia rufipennis andamanica</i> Abdulali	R
57.	Emerald Dove	<i>Chalcophaps indica</i> (Linnaeus)	R
58.	Nicobar Pigeon	<i>Caloenas nicobarica</i> (Linnaeus)	R
59.	Pompadour Green-Pigeon	<i>Treron pompadora chlorptera</i> Blyth	R
60.	Andaman Green Imperial-Pigeon	<i>Ducula aenea andamanica</i> Abdulali	R
	<b>Psittaciformes</b>		
	<b>Psittacidae</b>		
61.	Vernal Hanging-Parrot	<i>Loriculus vernalis</i> (Sparrman)	R
62.	Alexandrina Parakeet	<i>Psittacula eupatria</i> (Linnaeus)	R
63.	Red-breasted Parakeet	<i>Psittacula alexandri</i> (Linnaeus)	R
64.	Red-cheeked Parakeet	<i>Psittacula longicauda</i> (Boddaert)	R
	<b>Cuculiformes</b>		
	<b>Cuculidae</b>		
65.	Brainfever Bird	<i>Hierococcyx varius</i> (Vahl)	R
66.	Common Cuckoo	<i>Cuculus canorus</i> Linnaeus	RM
67.	Oriental Cuckoo	<i>Cuculus saturatus</i> Blyth	RM
68.	Asian Koel	<i>Eudynamys scolopacea</i> (Linnaeus)	R
69.	Andaman Coucal	<i>Centropus andamanensis</i> Beavan	R
70.	Drongo Cuckoo	<i>Surniculus lugubris</i> (Horsfield)	R
	<b>Strigiformes</b>		
	<b>Tytonidae</b>		
71.	Andaman Barn Owl	<i>Tyto alba</i> (Scopoli)	R
	<b>Caprimulgiformes</b>		
	<b>Caprimulgidae</b>		
72.	Indian Jungle Nightjar	<i>Caprimulgus indicus</i> Latham	R
73.	Large-tailed Nightjar	<i>Caprimulgus macrurus</i> Horsfield	R
	<b>Apodiformes</b>		
	<b>Apodidae</b>		
74.	White-bellied Swiftlet	<i>Collocalia esculenta</i> (Linnaeus)	R
75.	Common Edible-nest		



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Name	Scientific Name	Status
	Swiftlet	<i>Collocalia fuciphaga</i> Thunberg	R
76.	Brown-back Needletail-Swift	<i>Hirundapus giganteus</i> (Temminck)	R
77.	Common Swift	<i>Apus apus</i> (Linnaeus)	M
	<b>Coraciiformes</b>		
	<b>Alcedinidae</b>		
78.	Small Blue Kingfisher	<i>Alcedo atthis</i> (Linnaeus)	R
79.	Blue-eared Kingfisher	<i>Alcedo meninting</i> Horsfield	R
80.	Stork-billed Kingfisher	<i>Halcyon capensis</i> (Linnaeus)	R
81.	White-breasted Kingfisher	<i>Halcyon smyrnensis</i> (Linnaeus)	R
82.	Black-capped Kingfisher	<i>Halcyon pileata</i> (Boddaert)	R
83.	Andaman Collared Kingfisher	<i>Halcyon chloris davisoni</i> Sharpe	R
	<b>Meropidae</b>		
84.	Blue-tailed Bee-eater	<i>Merops philippinus</i> Linnaeus	RM
85.	Chestnut-headed Bee-eater	<i>Merops leschenaultia</i> Vieillot	R
86.	Small Bee-eater	<i>Merops orientalis</i> Latham	R
	<b>Coraciidae</b>		
87.	Oriental Broad-billed Roller	<i>Eurystomus orientalis</i> (Linnaeus)	R
	<b>Piciformes</b>		
	<b>Picidae</b>		
88.	Fulvus-breasted Pied Woodpecker	<i>Dendrocopos macei</i> (Vieillot)	R
89.	Andaman Black Woodpecker	<i>Dryocopus hodgei</i> (Blyth)	R
	<b>Passeriformes</b>		
	<b>Hirundinidae</b>		
90.	House Swallow	<i>Hirundo tahitica</i> Gmelin	R
91.	Red-rumped Swallow	<i>Hirundo daurica</i> Linnaeus	R
	<b>Motacillidae</b>		
92.	Forest Wagtail	<i>Dendronanthus indicus</i> (Gmelin)	RM
93.	Large Pied Wagtail	<i>Motacilla maderaspatensis</i> Gmelin	R



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Name	Scientific Name	Status
94.	Yellow Wagtail	<i>Motacilla flava</i> Linnaeus	R
95.	Grey Wagtail	<i>Motacilla cinerea</i> Tunstall	M
<b>Campephagidae</b>			
96.	Large Cuckoo-Shrike	<i>Coracina macei</i> (Lesson)	R
97.	Bar-bellied Cuckoo-Shrike	<i>Coracina striata</i> (Boddaert)	R
98.	Pied Triller	<i>Lalage nigra</i> (Forster)	R
99.	Small Minivet	<i>Pericrocotus cinnamomeus</i> (Linnaeus)	R
100.	Scarlet Minivet	<i>Pericrocotus flammeus</i> (Forster)	R
<b>Pycnonotidae</b>			
101.	Red-whiskered Bulbul	<i>Pycnonotus jocosus</i> (Linnaeus)	R
102.	Andaman Bulbul	<i>Pycnonotus atriceps fuscoflavescens</i> Temminck	R
<b>Irenidae</b>			
103.	Asian Fairy-Bluebird	<i>Irena puella</i> (Latham)	R
<b>Lanidae</b>			
104.	Brown Shrike	<i>Lanius cristatus</i> Linnaeus	M
105.	Philippine Shrike	<i>Lanius cristatus lucionensis</i> Linnaeus	M
<b>Turdinae</b>			
106.	Orange-headed Thrush	<i>Zoothera citrina</i> (Latham)	R
107.	Andaman Ground Thrush	<i>Zoothera citrina andamanensis</i> (Walden)	R
108.	Oriental Magpie-Robin	<i>Copsychus saularis</i> (Linnaeus)	R
109.	Andaman Shama	<i>Copsychus albiventris</i> Blyth	R
<b>Sylviinae</b>			
110.	Streaked Fantail-Warbler	<i>Cisticola juncidis</i> (Rafinesque)	R
111.	Thick-billed Warbler	<i>Acrocephalus aedon</i> (Pallas)	M
112.	Greenish Leaf-Warbler	<i>Phylloscopus trochiloides</i> (Sundevall)	M
<b>Muscicapinae</b>			
113.	Asian Brown Flycatcher	<i>Muscicapa dauurica</i> Pallas	RM
<b>Monarchinae</b>			
114.	Asian Paradise-Flycatcher	<i>Terpsiphone paradisi</i> (Linnaeus)	RM
115.	Blacknaped Monarch-Flycatcher	<i>Hypothymis azurea</i> (Boddaert)	R
<b>Dicaeidae</b>			
116.	Plain Flowerpecker	<i>Dicaeum concolor</i> Jerdon	R



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Name	Scientific Name	Status
117.	Andaman Flowerpecker <b>Nectariniidae</b>	<i>Dicaeum concolor virescens</i> (Jerdon)	R
118.	Olive-backed Sunbird	<i>Nectarinia jugularis andamanica</i> Linnaeus	R
119.	Crimson Sunbird <b>Zosteropidae</b>	<i>Aethopyga siparaja</i> (Raffles)	R
120.	Oriental White-eye <b>Estrildidae</b>	<i>Zosterops palpebrosus</i> (Temminck)	R
121.	White-rumped Munia	<i>Lonchura striata</i> (Linnaeus)	R
122.	Black-headed Munia <b>Passerinae</b>	<i>Lonchura malacca</i> (Linnaeus)	R
123.	House Sparrow <b>Sturnidae</b>	<i>Passer domesticus</i> (Linnaeus)	R
124.	Asian Glossy Starling	<i>Aplonis panayensis</i> (Scopoli)	R
125.	White-headed Starling	<i>Sturnus erythropygius</i> (Blyth)	R
126.	Common Myna	<i>Acridotheres tristis</i> (Linnaeus)	R
127.	Common Hill-Myna <b>Oriolidae</b>	<i>Gracula religiosa</i> Linnaeus	R
128.	Eurasian Golden Oriole	<i>Oriolus oriolus</i> (Linnaeus)	RM
129.	Andaman Black-naped Oriole <b>Dicruridae</b>	<i>Oriolus chinensis andamansis</i> Tytler	R
130.	Crow-billed Drongo	<i>Dicrurus annectans</i> (Hodgson)	R
131.	Ashy Drongo	<i>Dicrurus leucophaeus</i> Vieillot	RM
132.	Large Andaman Drongo	<i>Dicrurus andamanensis dicruriformes</i> (Hume)	R
133.	Greater Racket-tailed Drongo <b>Artamidae</b>	<i>Dicrurus paradiseus</i> (Linnaeus)	R
134.	White-breasted Woodswallow <b>Corvidae</b>	<i>Artamus leucorhynchus</i> (Linnaeus)	R
135.	Andaman Treepie	<i>Dendrocitta bayleyi</i> Tytler	R
136.	Jungle Crow	<i>Corvus macrohynchos</i> Wagler	R



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

<b>Sl.No.</b>	<b>Common Name</b>	<b>Scientific Name</b>
1.	Western Marsh-Harrier	<i>Circus aeruginosus</i> (Linnaeus)
2.	Eurasian Sparrowhawk	<i>Accipiter nisus</i> (Linnaeus)
3.	Pacific Golden-Plover	<i>Pluvialis fulva</i> (Gmelin)
4.	Pintail Snipe	<i>Gallinago stenura</i> (Bonaparte)
5.	Jack Snipe	<i>Lymnocyptes minimus</i> (Brunnich)
6.	Bar-tailed Godwit	<i>Limosa lapponica</i> (Linnaeus)
7.	Whimbrel	<i>Numenius phaeopus phaeopus</i> (Linnaeus)
8.	Eurasian Curlew	<i>Numenius arauata</i> (Linnaeus)
9.	Common Redshank	<i>Tringa totanus</i> (Linnaeus)
10.	Common Greenshank	<i>Tringa nebularia</i> (Gunner)
11.	Green Sandpiper	<i>Tringa ochropus</i> Linnaeus
12.	Wood Sandpiper	<i>Tringa glareola</i> Linnaeus
13.	Common Sandpiper	<i>Actitis hypoleucos</i> Linnaeus
14.	Ruddy Turnstone	<i>Arenaria interpres</i> (Linnaeus)
15.	Great Knot	<i>Calidris tenuirostris</i> (Horsfield)
16.	Little Stint	<i>Calidris minuta</i> (Leisler)
17.	White-winged Black Tern	<i>Chlidonias leucopterus</i> (Temminck)
18.	Common Swift	<i>Apus apus</i> (Linnaeus)
19.	Grey Wagtail	<i>Motacilla cinerea</i> Tunstall
20.	Brown Shrike	<i>Lanius cristatus</i> Linnaeus
21.	Philippine Shrike	<i>Lanius cristatus lucionensis</i> Linnaeus
22.	Orange-headed Thrush	<i>Zoothera citrina</i> (Latham)
23.	Thick-billed Warbler	<i>Acrocephalus aedon</i> (Pallas)
24.	Grenish Leaf-Warbler	<i>Phylloscopus trochiloides</i> (Sundevall)



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Name	Scientific Name
	<b>Charadriiformes</b>	
	<b>Charadriidae</b>	
1.	Pacific Golden-Plover	<i>Pluvialis fulva</i> (Gmelin)
2.	Little Ringed Plover	<i>Charadrius dubius</i> Scopoli
3.	Lesser Sand Plover	<i>Charadrius mongolus</i> Pallas
4.	Kentish Plover	<i>Charadrius alexandrinus</i> Linnaeus
	<b>Scolopacidae</b>	
5.	Pintail Snipe	<i>Gallinago stenura</i> (Bonaparte)
6.	Jack Snipe	<i>Lymnocyptes minimus</i> (Brunnich)
7.	Bar-tailed Godwit	<i>Limosa lapponica</i> (Linnaeus)
8.	Whimbrel	<i>Numenius phaeopus phaeopus</i> (Linnaeus)
9.	Eurasian Curlew	<i>Numenius arauata</i> (Linnaeus)
10.	Common Redshank	<i>Tringa totanus</i> (Linnaeus)
11.	Common Greenshank	<i>Tringa nebularia</i> (Gunner)
12.	Green Sandpiper	<i>Tringa ochropus</i> Linnaeus
13.	Wood Sandpiper	<i>Tringa glareola</i> Linnaeus
14.	Common Sandpiper	<i>Actitis hypoleucos</i> Linnaeus
15.	Ruddy Turnstone	<i>Arenaria interpres</i> (Linnaeus)
16.	Great Knot	<i>Calidris tenuirostris</i> (Horsfield)
17.	Little Stint	<i>Calidris minuta</i> (Leisler)
	<b>Burhinidae</b>	
18.	Beach Stone-Plover	<i>Esacus magnirostris</i> (Vieillot)
	<b>Laridae</b>	
19.	Gull-billed Tern	<i>Gelochelidon nilotica</i> (Gmelin)
20.	Black-naped Tern	<i>Sterna sumatrana</i> Raffles
21.	Lesser Crested Tern	<i>Sterna bengalensis</i> Lesson
22.	White-winged Black Tern	<i>Chlidonias leucopterus</i> (Temminck)



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

**Odonata**

The publication reports 43 species of Odonata under 4 families & 25 genera from Ritchie’s Archipelago, out of 43 species of Odonata, 29 species were reported from Shaheed Dweep listed as under.

Sl. No.	Family	Species name	IUCN status
1.	Aeschnidae	<i>Anax guttatus</i> (Burmeister)	LC
2.		<i>Gynacantha hyalina</i> Selys	-
3.		<i>Gynacantha bayadera</i> Selys	LC
4.		<i>Oligoaeschna andamani</i> Chhotani, Lahiri & Mitra	-
5.	Gomphidae	<i>Gomphidia ganeshi</i> Chotani, Lahiri & Mitra	-
6.	Libellulidae	<i>Acisoma panorpoides panorpoides</i> Rambur	LC
7.		<i>Brachydiplax chalybea chalybea</i> Brauer	LC
8.		<i>Crocothemis servilia servilia</i> (Drury)	LC
9.		<i>Cratilia lineata</i> Forester	-
10.		<i>Cratilia metallica</i> (Brauer)	-
11.		<i>Diplacodes trivialis</i> (Rambur)	LC
12.		<i>Diplacodes nebulosa</i> (Fabricius)	LC
13.		<i>Indothemis carnatica</i> (Fabricius)	NT
14.		<i>Lathrecista asiatica asiatica</i> (Fabricius)	LC
15.		<i>Neurothemis fluctuans</i> (Fabricius)	LC
16.		<i>Neurothemis intermedia intermedia</i> (Rambur)	LC
17.		<i>Neurothemis fulvia</i> (Drury)	LC
18.		<i>Neurothemis ramburii ramburri</i> (Brauers)	LC
19.		<i>Orthetrum chrysis</i> (Selys)	LC
20.		<i>Orthetrum pruinsum neglectum</i> (Rambur)	LC
21.		<i>Orthetrum pruinsum pruinsum</i> (Burmeister)	LC
22.		<i>Orthetrum sabina sabina</i> (Drury)	LC
23.		<i>Pantala flavescens</i> (Fabricius)	LC
24.		<i>Potamarcha congener</i> (Rambur)	LC
25.		<i>Tamea limbata similata</i> (Rambur)	LC
26.	<i>Tamea virginia</i> (Rambur)	LC	



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl. No.	Family	Species name	IUCN status
27.		<i>Trithemis aurora</i> (Brumeister)	LC
28.		<i>Trithemis festiva</i> (Rambur)	LC
29.		<i>Rhyothemis variegata variegata</i> (Linnaeus)	LC
30.		<i>Tholymis tillarga</i> (Fabricius)	LC
31.		<i>Zyxomma petiolatum</i> Rambur	LC
32.	Calopterygidae	<i>Vestalis gracilis gracilis</i> (Rambur)	-
33.	Coenagrionidae	<i>Aciagrion pallidum</i> Selys	LC
34.		<i>Agriocnemis femina oryzae</i> Lieftinck	LC
35.		<i>Agriocnemis rubescens</i> Selys	-
36.		<i>Pseudagrion andamanicum</i> Fraser	-
37.		<i>Pseudagrion microcephalum</i> (Rambur)	LC
38.		<i>Pseudagrion pruinosum</i> (Burmeister)	LC
39.	Lestidae	<i>Lestes praemorsus praemorsus</i> Selys	LC
40.		<i>Lestes malabarica</i> Fraser	DD
41.	Platycnemididae	<i>Copera marginipes</i> (Rambur)	LC
42.	Platystictidae	<i>Drepanosticta annandalei</i> Fraser	
43.	Protoneuridae	<i>Prodasineura verticalis andamanensis</i> (Fraser)	LC



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

**Butterflies**

The publication reports 84 species of Butterflies under 5 families & 58 genera from Ritchie’s Archipelago, out of 84 species of butterflies, 56 species were reported from Shaheed Dweep listed as under.

Sl.No.	Common Nmae	Islands of Ritchie’s Archipelago								
		Havelock Lawrence	John Lawrence	Henry	Inglis Button	South Button	North Button	Middle	Outram	Neil
1.	Pale Palm Dart	√								
2.	Common Snow Flat	√	√	√					√	√
3.	Common Awl									
4.	White Banded Awl		√							√
5.	Plain Banded Awl	√						√		
6.	Brown Awl		√	√	√		√		√	√
7.	Giant Red Eye	√	√	√		√			√	√
8.	Common Spotted Flat	√	√		√					
9.	Paint Brush Swift	√								
10.	Common Banded Demon		√	√	√				√	√
11.	Great Jay	√	√	√	√		√			√
12.	Fivebar Swordtail	√	√	√			√			√
13.	Andaman Swordtail	√	√		√		√	√	√	√
14.	Tailed Jay	√	√	√	√		√	√	√	
15.	Andaman Helen	√			√	√	√	√	√	√
16.	Andaman Mormon	√	√	√					√	√
17.	Great Mormon	√	√	√	√	√	√	√	√	√
18.	Common Mormon	√	√	√	√		√	√	√	√
19.	Lime Butterfly	√	√	√	√				√	√



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Nmae	Islands of Ritchie’s Archipelago								
		Havelock Lawrence	John Lawrence	Henry	Inglis Button	South Button	North Button	Middle	Outram	Neil
20.	Andaman Clubtail	√	√	√	√	√	√	√	√	√
21.	Andaman Birdwing	√								√
22.	Crimson Rose	√							√	√
23.	Common Rose	√	√	√	√	√	√	√	√	√
24.	Three Spot Grass Yellow	√							√	√
25.	Common Grass Yellow	√								√
26.	Tree Yellow	√	√				√		√	√
27.	Common Emigrant	√	√	√	√	√	√	√	√	
28.	Mottled Emigrant	√		√	√	√	√	√	√	
29.	Yellow Orange Tip	√				√		√	√	√
30.	Great Orange Tip	√				√				√
31.	Andaman Wanderer	√	√	√	√	√	√			√
32.	Striped Albatross	√					√	√	√	
33.	Chocolate Albatross	√		√					√	
34.	Orange Albatross	√		√	√	√	√	√	√	√
35.	Common Albatross	√			√	√	√	√		√
36.	Large Cabbage White	√	√							√
37.	Lesser Gull	√	√		√	√	√	√		√
38.	Pysche	√							√	√
39.	Indian Sunbeam	√						√	√	√
40.	Common Cerulean	√								√



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Name	Islands of Ritchie's Archipelago								
		Havelock Lawrence	John Lawrence	Henry	Inglis Button	South Button	North Button	Middle	Outram	Neil
41.	Yamfly	√					√		√	
42.	Leaf Blue	√								
43.	Club Silverline	√								
44.	Forget-Me-Not	√								√
45.	Lesser Grass Blue	√		√			√	√	√	√
46.	Dark Blue Royal	√	√				√			
47.	Plains Cupid	√	√					√	√	√
48.	Purple Leaf Blue	√								
49.	Apefly	√			√			√	√	√
50.	Dark Grass Blue	√			√					√
51.	Dingy Blue									
52.	Common Tit	√		√		√				√
53.	Silverstreak Blue	√			√	√				√
54.	Common Onyx	√	√							√
55.	Quaker	√								√
56.	Andaman Map		√						√	
57.	Striped Tiger	√	√	√	√				√	√
58.	Dark Glassy Tiger	√	√	√						
59.	Plain Tiger	√	√		√					
60.	Blue Tiger	√	√	√			√	√	√	√
61.	Glassy Tiger	√		√	√	√				√
62.	Spotted Black Crow	√	√	√	√	√	√	√	√	



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

Sl.No.	Common Nmae	Islands of Ritchie’s Archipelago								
		Havelock Lawrence	John Lawrence	Henry	Inglis Button	South Button	North Button	Middle	Outram	Neil
63.	Andaman Crow	√								√
64.	Tree Nymph	√								√
65.	Palmking	√		√					√	
66.	Common Evening Brown	√	√	√					√	√
67.	Long-Brand Bush Brown	√							√	√
68.	Banded Bush Brown	√							√	
69.	Andaman Chestnut Palmfly	√	√	√						
70.	Nigger	√							√	√
71.	Leopard Lacewing	√	√	√						
72.	Cruiser	√	√	√						
73.	Common Sergeant	√								
74.	Common Sailer	√			√			√	√	√
75.	Clear Sailer	√								
76.	Clipper	√			√		√		√	√
77.	Hewitson Andaman Viscount	√	√	√	√					√
78.	Peacock Pansy	√	√	√	√					√
79.	Blue Pansy	√	√	√	√					√
80.	Peacock Pansy	√	√	√	√	√	√	√	√	√
81.	Yellow Pansy	√			√	√		√		
82.	Grey Pansy	√			√	√	√	√	√	√
83.	Great Egg fly	√								√
84.	Danaid Eggfly	√		√				√		√

**Reptiles & Amphibians**

**Table 3.26: Reptiles & Amphibians reported from Study Area**

Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Assessment
<b>Reptiles</b>					
1	Saltwater crocodile	<i>Crocodylus porosus</i>	Crocodylidae	Lower Risk/least concern ver 2.3	Schedule – I (Part II)
2	--	<i>Cnemaspis kandianus</i>	Gekkonidae	--	--
3	Tokay gecko	<i>Gekko gekko</i>	Gekkonidae	Least Concern ver 3.1	--
4	Andaman giant gecko	<i>Gekko verreauxi</i>	Gekkonidae	--	--
5	Common house gecko	<i>Hemidactylus frenatus</i>	Gekkonidae	Least Concern ver 3.1	--



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

6	Andaman Islands day gecko	<i>Phelsuma andamanensis</i> ( <i>Phelsuma andamanense</i> )	Gekkonidae	Least Concern ver 3.1	--
7	Andaman green calotes	<i>Calotes andamanensis</i>	Agamidae	--	--
8	--	<i>Coryphophylax subcristatus</i>	Agamidae	--	--
9	Oriental garden lizard	<i>Calotes versicolor</i>	Agamidae	--	--
10	Andaman Islands grass skink	<i>Eutropis andamanensis</i>	Scincidae	--	--
11	Tytler's mabuya	<i>Eutropis tytleri</i>	Scincidae	--	--
12	King cobra	<i>Ophiophagus Hannah</i>	Elapidae	Vulnerable A2acd ver 3.1	Schedule – II (Part II)
13	Andaman cobra	<i>Naja sagittifera</i>	Elapidae	--	Schedule – II (Part II)
14	Andaman pit viper	<i>Trimeresurus andersonii</i> ( <i>Trimeresurus purpureomaculatus andersoni</i> )	Viperidae	--	--
<b>Amphibians</b>					
15	Andaman Wart Frog	<i>Minervarya andamanensis</i> ( <i>Fejervarya andamanensis</i> )	Dicroglossidae	Least Concern ver 3.1	--
16	Asian common toad	<i>Duttaphrynus melanostictus</i>	Bufoidea	Least Concern ver 3.1	--
<b>Reptiles Reference: Sea turtles &amp; their conservation</b>					
1	Hawks bill sea turtle	<i>Eretmochelys imbricate</i> ( <i>Eretmochelys imbricata imbricate</i> )	Cheloniidae	Critically Endangered A2bd ver 3.1	Schedule – I (Part II)
2	Green sea turtle	<i>Chelonia mydas</i>	Cheloniidae	Endangered A2bd ver 3.1	Schedule – I (Part II)



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

The publication reports 26 species of reptiles & amphibians belonging to 21 genera & 12 families from Ritchie’s Archipelago, out of 26 species of reptiles & amphibian, 16 species were reported from Neil listed as above.

**Mammals**

**Table 3.27: Mammals reported from Study Area**

Sr. No.	Common Name	Scientific Name	Family	IUCN Status	WPA Assessment
1	Indian flying fox	<i>Pteropus medius</i> ( <i>Pteropus giganteus</i> )	Pteropodidae	Least Concern ver 3.1	Schedule – IV
2	Short-beaked common dolphin	<i>Delphinus delphis</i>	Delphinidae	Least Concern ver 3.1	Schedule – I (Part I)
3	Sea cow	<i>Dugong dugon</i>	Dugongidae	Vulnerable A2bcd+4bcd ver 3.1	Schedule – I (Part I)
4	Andaman wild pig	<i>Sus scrofa andamanensis</i>	Suidae	--	Schedule – I (Part I)
5	Spotted deer	<i>Axis axis</i>	Cervidae	Least Concern ver 3.1	Schedule – III
6	Five-striped palm squirrel	<i>Funambulus pennantii</i>	Sciuridae	Least Concern ver 3.1	Schedule – IV

**Table 3.28: Echinodermata (Other than Holothuroidea) reported from Study Area**

*Rec. zool. Surv. India : 99 (Part 1–4) : 157-170, 2001*

**ECHINODERMATA (OTHER THAN HOLOTHUROIDEA) FROM THE RITCHIE’S ARCHIPELAGO, ANDAMAN ISLANDS**

D. R. K. SASTRY

*Zoological Survey of India, Port Blair –744 102, INDIA*

Sr. No.	Scientific Name	Common Name	IUCN Status	WPA Assessment
1	<i>Actinopyga mauritiana</i>	Surf redfish	Vulnerable A2bd ver 3.1	--
2	<i>Holothuria arenicola</i>	--	Data Deficient ver 3.1	--
3	<i>Stichopus chloronotus</i>	Green fish sea cucumber	Least Concern ver 3.1	--
4	<i>Macrophiothrix demessa</i>	--	--	--



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

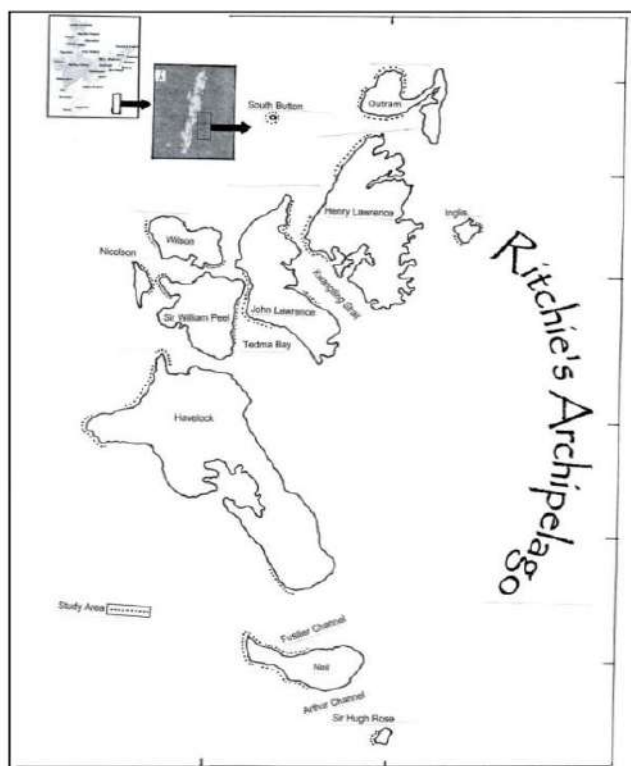
5	<i>Macrophiothrix propinqua</i>	--	--	--
6	<i>Ophiothrix trilineata</i>	--	--	--
7	<i>Ophiocoma erinaceus</i>	--	--	--
8	<i>Ophlocoma pusilia</i>	--	--	--
9	<i>Ophiocoma scolopendria</i>	--	--	--
10	<i>Ophiomastix annulosa</i>	--	--	--
11	<i>Ophioelegans cincta</i>	--	--	--
12	<i>Sterina sarasini</i>	--	--	--
13	<i>Ophiactis savignyi</i>	Little brittle star	--	--
14	<i>Macrophiothrix demessa</i>	--	--	--

The study conducted during 2001 revealed presence of 14 echinoderm (other than holothuroidea) species in sea off Neil Island in Ritchies Archipelago the IUCN assessment of the recorded species is as under.

No. of Species	IUCN Red List Categories								Not Assessed
	Data Deficient (DD)	Least Concern (LC)	Near Threatened (NT)	Vulnerable (VU)	Endangered (EN)	Critically Endangered (CR)	Extinct In The Wild (EW)	Extinct (EX)	
14	1	1	--	1	--	--	--	--	11

**Table 3.29: Scleractinian (Stony Coral) reported from Study Area**

**Reference: Scleractinian Diversity of Ritchie’s Archipelago, Andaman & Nicobar Islands By Tamal Mondal, C. Raghunathan & K. Venkataraman (Zoological Survey of India)**



Sr. No.	Scientific Name	Common Name	IUCN Status	WPA Assessment
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**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

1	<i>Acropora aspera</i>	--	Vulnerable A4ce ver 3.1	Schedule – I (Part IVA)
2	<i>Acropora microphthlma</i>	--	--	Schedule – I (Part IVA)
3	<i>Acropora robusta</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
4	<i>Acropora humilis</i>	Finger Coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
5	<i>Acropora ocellata</i>	--	Data Deficient ver 3.1	Schedule – I (Part IVA)
6	<i>Acropora nasuta</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
7	<i>Acropora clathrata</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
8	<i>Acropora monticulosa</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
9	<i>Acropora rudis</i>	--	Endangered A4ce ver 3.1	Schedule – I (Part IVA)
10	<i>Acropora nobilis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
11	<i>Acropora forskali</i>	--	Data Deficient ver 3.1	Schedule – I (Part IVA)
12	<i>Acropora abrotanoides</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
13	<i>Acropora cythera</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
14	<i>Acropora valida</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
15	<i>Acropora hyacinthus</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
16	<i>Acropora gemmifera</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
17	<i>Acropora spicifera</i>	--	Vulnerable A4ce ver 3.1	Schedule – I (Part IVA)
18	<i>Acropora bifurcata</i>	--	Data Deficient ver 3.1	Schedule – I (Part IVA)
19	<i>Acropora vaughani</i>	--	Vulnerable A4ce	Schedule – I (Part IVA)



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

			ver 3.1	
20	<i>Acropora grandis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
21	<i>Acropora austera</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
22	<i>Acropora tanegasshimensis</i>	--	--	Schedule – I (Part IVA)
23	<i>Acropora palmerae</i>	--	Vulnerable A4ce ver 3.1	Schedule – I (Part IVA)
24	<i>Acropora florida</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
25	<i>Acropora polystoma</i>	--	Vulnerable A4ce ver 3.1	Schedule – I (Part IVA)
26	<i>Acropora subulata</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
27	<i>Acropora sekiseiensis</i>	--	Data Deficient ver 3.1	Schedule – I (Part IVA)
28	<i>Acropora kimbeensis</i>	--	Vulnerable A4ce ver 3.1	Schedule – I (Part IVA)
29	<i>Acropora wallaceae</i>	--	Data Deficient ver 3.1	Schedule – I (Part IVA)
30	<i>Acropora samoensis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
31	<i>Acropora digitifera</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
32	<i>Isopora palifera (Acropora palifera)</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
33	<i>Montipora hispida</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
34	<i>Montipora digitata (Montipora digita)</i>	Finger coral	Least Concern ver 3.1	Schedule – I (Part IVA)
35	<i>Montipora peltiformis</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
36	<i>Montipora grisea</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
37	<i>Montipora informis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
38	<i>Montipora monasteriata</i>	--	Least Concern	Schedule – I



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

			ver 3.1	(Part IVA)
39	<i>Montipora aequituberculata</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
40	<i>Montipora danae</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
41	<i>Astreopora myriophthalma</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
42	<i>Pocillopora damicornis</i>	Cauli flower coral	Least Concern ver 3.1	Schedule – I (Part IVA)
43	<i>Pocillopora varrucosa</i>	Knob horned coral	Least Concern ver 3.1	Schedule – I (Part IVA)
44	<i>Pocillopora meandrina</i>	Cauli flower coral	Least Concern ver 3.1	Schedule – I (Part IVA)
45	<i>Pocillopora ligulata</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
46	<i>Seriatopora hystrix</i>	Thin birdsnest coral	Least Concern ver 3.1	Schedule – I (Part IVA)
47	<i>Seriatopora stellata</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
48	<i>Stylophora pistillata</i>	Hood coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
49	<i>Galaxea astreata</i>	--	Vulnerable A4cd ver 3.1	Schedule – I (Part IVA)
50	<i>Galaxea cryptoramosa</i>	--	Vulnerable A4c ver 3.1	Schedule – I (Part IVA)
51	<i>Galaxea fascicularis</i>	Octopus coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
52	<i>Pseudosiderastrea tayami</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
53	<i>Psammocora contigua</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
54	<i>Pachyseris gemmae</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
55	<i>Pachyseris speciosa</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
56	<i>Pachyseris rugosa</i>	--	Vulnerable A4cd ver 3.1	Schedule – I (Part IVA)
57	<i>Pavona minuta</i>	--	Near	Schedule – I



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

			Threatened ver 3.1	(Part IVA)
58	<i>Ctenactis echinata</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
59	<i>Fungia danai</i>	--	--	Schedule – I (Part IVA)
60	<i>Fungia fungites</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
61	<i>Fungia paumotensis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
62	<i>Fungia horrida</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
63	<i>Herpolitha limax (Herpolitha weberi)</i>	Tongue slipper	Least Concern ver 3.1	Schedule – I (Part IVA)
64	<i>Lithophyllon undulatum (Lithophyllon lobata)</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
65	<i>Hydnophora microconos</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
66	<i>Hydnophora grandis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
67	<i>Hydnophora rigida</i>	Horn coral	Least Concern ver 3.1	Schedule – I (Part IVA)
68	<i>Merulina scabricula</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
69	<i>Merulina ampliata</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
70	<i>Symphyllia radians</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
71	<i>Symphyllia agaricia</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
72	<i>Symphyllia recta</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
73	<i>Lobophyllia hemprichii</i>	Lobed brain coral	Least Concern ver 3.1	Schedule – I (Part IVA)
74	<i>Dipsastraea pallida (Favia pallida)</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
75	<i>Favia fava</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
76	<i>Favia lizardensis</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
77	<i>Favia matthaii</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
78	<i>Leptastrea transversa</i>	--	Least Concern	Schedule – I



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

			ver 3.1	(Part IVA)
79	<i>Favites abdita</i>	Larger star coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
80	<i>Favites pentagona</i>	Larger star coral	Least Concern ver 3.1	Schedule – I (Part IVA)
81	<i>Favites complanata</i>	Larger star coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
82	<i>Favites halicora</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
83	<i>Barabattoi amicorum</i>	--	--	Schedule – I (Part IVA)
84	<i>Leptoria phrygia</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
85	<i>Leptoria irregularis</i>	--	Vulnerable A4c ver 3.1	Schedule – I (Part IVA)
86	<i>Platygyra pini</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
87	<i>Platygyra daedalea (Platygyra daedaea)</i>	Lesser valley coral	Least Concern ver 3.1	Schedule – I (Part IVA)
88	<i>Platygyra sinensis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
89	<i>Platygyra lamellina</i>	Hard brain coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
90	<i>Echinophora gemmacea</i>	--	--	Schedule – I (Part IVA)
91	<i>Echinophora lamellosa</i>	--	--	Schedule – I (Part IVA)
92	<i>Paragoniastrea australensis (Goniastrea australensis)</i>	Lesser star coral	Least Concern ver 3.1	Schedule – I (Part IVA)
93	<i>Goniastrea retiformis</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
94	<i>Goniastrea minuta</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
95	<i>Goniastrea edwardsi</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
96	<i>Pectinia laetuca</i>	--	--	Schedule – I (Part IVA)
97	<i>Pectinia paeonia</i>	--	Near Threatened ver 3.1	Schedule – I (Part IVA)
98	<i>Echinophyllia aspera</i>	Chalice coral	Least Concern	Schedule – I



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			ver 3.1	(Part IVA)
99	<i>Oxypora crassispinosa</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
100	<i>Porites solida</i>	--	--	Schedule – I (Part IVA)
101	<i>Porites lobata</i>	Lobe coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
102	<i>Porites lutea</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
103	<i>Porites cylindrica</i>	Hump coral	Near Threatened ver 3.1	Schedule – I (Part IVA)
104	<i>Porites rus</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
105	<i>Goniopora tenuidens</i>	--	Least Concern ver 3.1	Schedule – I (Part IVA)
106	<i>Euphyllia glabrescens</i>	Torch coral	Near Threatened ver 3.1	Schedule – I (Part IVA)

The study conducted during August 2009 to November 2011 revealed presence of 106 stony coral species around sea off Neil Island in Ritchie’s Archipelago the IUCN assessment of the recorded species is as under.

No. of Species	IUCN Red List Categories								Not Assessed
	Data Deficient (DD)	Least Concern (LC)	Near Threatened (NT)	Vulnerable (VU)	Endangered (EN)	Critically Endangered (CR)	Extinct In The Wild (EW)	Extinct (EX)	
106	5	51	31	10	1	--	--	--	8

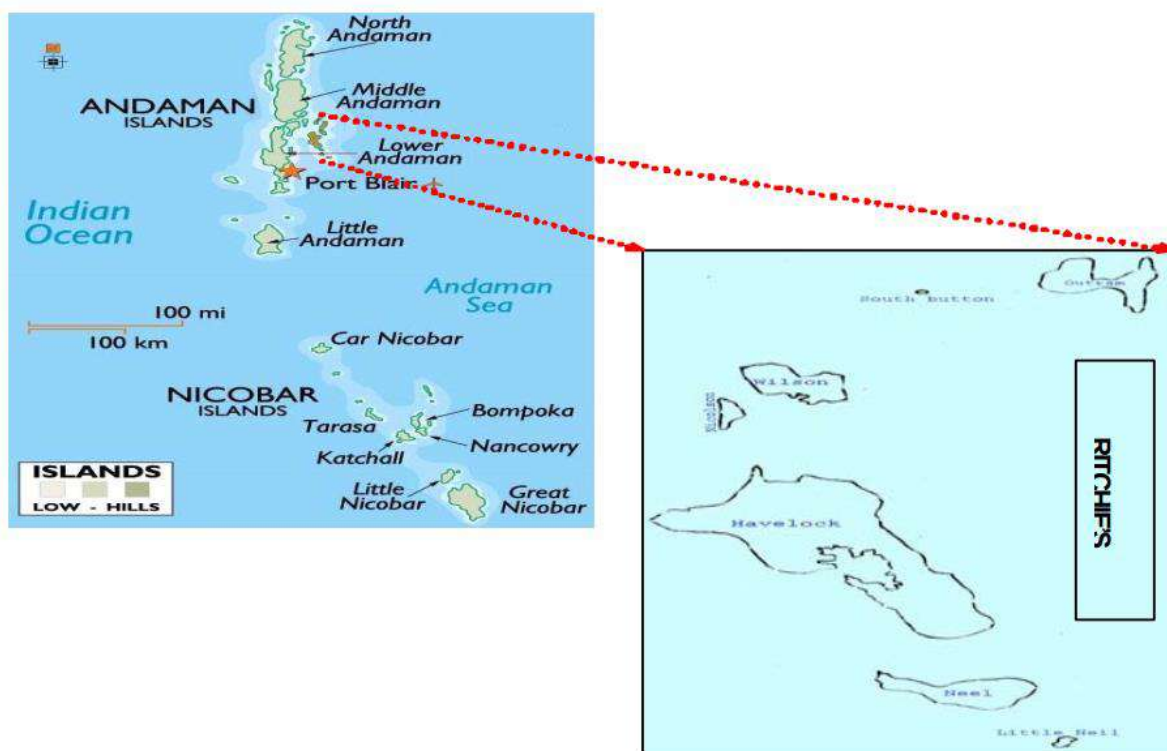
All of the recorded Sclerectinian Corals are listed in Schedule I of WPA 1972.

**Table 3.30: Brachyuran Crabs reported from Study Area**

**Reference: Diversity & Distribution of Brachyuran crabs from Ritchie’s Archipelago**  
**By S. Kumaralingam, C. Sivaperuman and C. Raghunathan**  
**(Zoological Survey of India Andaman and Nicobar Regional Center, National Coral Reef Research Institute)**  
**Study Period: May to December 2009**



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Sr. No.	Scientific Name	Common Name	IUCN Status	WPA Assessment
1	<i>Charybdis feriata</i>	Crucifix crab	--	--
2	<i>Charybdis lucifera</i>	--	--	--
3	<i>Portunus longispinosus</i>	--	--	--
4	<i>Portunus armatus (Portunus pelagicus)</i>	Blue swimmer crab	--	--
5	<i>Scylla serrata</i>	Mangrove crab	--	--
6	<i>Thalamita integra</i>	--	--	--
7	<i>Thalamita crenata</i>	Mangrove swimming crab	--	--
8	<i>Thalamita quadrilobata</i>	--	--	--
9	<i>Macrophthalmus japonicus</i>	--	--	--
10	<i>Austruca annulipes (Uca annulipes)</i>	--	--	--
11	<i>Uca hesperia</i>	--	--	--
12	<i>Metopograpsus messor</i>	--	--	--
13	<i>Grapsus grapsus</i>	Red rock crab	--	--
14	<i>Pachygrapsus minutus</i>	--	--	--
15	<i>Pachygrapsus planifrons</i>	--	--	--
16	<i>Actaea cavipes</i>	--	--	--
17	<i>Epixanthus frontalis</i>	--	--	--
18	<i>Zosimus aeneus</i>	Devil crab	--	--
19	<i>Trapezia formosa</i>	--	--	--
20	<i>Trapezia digitalis</i>	--	--	--
21	<i>Trapezia ferruginea</i>	--	--	--

**3.8.7 Interpretation**

**Flora**



### CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT

The project site devoid of any floral species

Study area had 55 flora species which comprised of 8 true mangrove species, of which the IUCN assessment of 24 species was Least Concern, 1 species as Data Deficient, 4 species viz. *Pterocarpus dalbergioides*, *Dipterocarpus gracilis*, *Myristica andamanica* & *Hopea odorata* as Vulnerable and 1 species viz. *Dipterocarpus grandiflorus* as Endangered, whereas assessment of 25 species was not available.

Though study area had presence of Vulnerable, & Endangered species, any of the project related activities during construction or operational phases does not associate with & alter/affect the project area surrounding vegetation.

#### Flora (Sea grasses)

4 species of sea grasses are reported from sea off Shaheed Dweep of which IUCN assessment of 3 species is Least Concerned & assessment of 1 species is not available.

#### Avifauna

A total of 136 species of birds belonging to 15 order & 40 families were recorded in Ritchie’s Archipelago, of which 85 species were resident, 27 species were resident migrants & 24 species were migrant. Out of the 20 bird species which are endemic to Andaman Islands, 13 species were recorded in Archipelago. Highest number of species richness & abundance was recorded at Havelock Island followed by Shaheed Dweep.

#### Odonata

43 species of Odonata under 4 families & 25 genera from Ritchie’s Archipelago, out of 43 species of Odonata, 29 species were reported from Shaheed Dweep.

#### Butterflies

84 species of Butterflies under 5 families & 58 genera from Ritchie’s Archipelago, out of 84 species of butterflies, 56 species were reported from Shaheed Dweep.

#### Reptiles & Amphibians

16 reptile species are reported from Shaheed Dweep of which the IUCN assessment of 4 species was Least Concern, 1 species viz. *Ophiophagus hannah* was assessed as Vulnerable, 1 species *Eretmochelys imbricate* was assessed as Critically endangered and 1 species *Chelonia mydas* was assessed as Endangered. 2 species of reported amphibians from Neil Island were assessed as Least Concern.

Off the reported reptiles & amphibians 3 species of reptiles viz. Salt water crocodile (*Crocodylus porosus*), Hawks bills sea turtle (*Eretmochelys imbricate*) & Green sea turtle (*Chelonia mydas*) are listed in Schedule I of WPA 1972.

#### Mammals



## CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT

6 species of mammals were reported Shaheed Dweep 4 species were assessed as Least Concern 1 species viz. Sea cow (*Dugong dugong*) were assessed as Vulnerable also Sea cow (*Dugong dugong*) is listed as Schedule I species.

### **Echinodermata (Other than Holothuroidea)**

14 species of echinoderms are reported from Shaheed Dweep of which 1 species is assessed as Least concern, 1 species is assessed as Data Deficient, 1 species viz. Surf redfish (*Actinopyga mauritiana*) is assessed as Vulnerable & assessment of 11 species is not available.

### **Corals (Sclerectinians – Stony Corals)**

94 species of stony corals are reported from Shaheed Dweep, of which the IUCN assessment of 5 species is as Data Deficient, 48 species as Least concern, 24 species as Near Threatened, 8 species as Vulnerable & 1 species as Endangered, whereas as assessment of 8 species was not available.

All of the reported coral species are listed in Schedule I of WPA 1972.

### **Brachyuran crabs**

19 species are reported from Shaheed Dweep Island of which IUCN assessment is not available.

## **3.9 Socio Economic Environment**

The initiation, growth and development of infrastructure development associated with it are intended to create impact on the socio-economic profile of the communities nearby to project area.

The impact could be positive or negative depends on the development activities adopted and carried out by the company/industry. An assessment of socio - economic environment forms an integral part of the EIA/EMP study. In order to improve the quality of life of the people affected by the industrial activities it is necessary to understand the socio- economic aspects and its trends in the study area.

Socio-demographic features / survey are very useful for understanding social and economic problems and identifying potential solutions. To understand the socio demographic status and the trends of the communities in the 10 km radius map census 2011 & District census handbook 2011 has been contemplated and necessary data collected and compiled from it.

### **3.9.1 Baseline Status**

Baseline information is collected after delineation of the baseline study area in order to study the socio-economic profile of the project affected area. The process related to baseline database analysis includes:

- Demographic Structure
- Infrastructure Base
- Economic Structure



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

- Health Status
- Cultural Attributes
- Salient Observations
- Public Awareness and their concerns regarding the proposed project
- Socio-economic status in relation with ‘Quality of Life’

**3.9.2 Demographic Structure**

The demographic structure of the study area was derived primarily from data of Census record of South Andaman District covering one Tehsil and 01 Village. The demographic structures of each village in the study area as per Census 2011 are presented in Table 3.29. Summary of demographic structure is presented in **Table 3.31**.

**Table 3.31: Summary of Demographic Structure in Study Area**

Demographic Parameters Details	
No. of States/Union Territory	1
No. of District	1
No. of Tehsils	1
No. of Villages	05
Total Area of surveyed village (ha)	660.94
Total No. of Households	680
Total Population	2766
Density of Population (km <sup>2</sup> )	419
Sex ratio (No. of female\ 1000 males)	866
Scheduled Castes	0 (0%)
Scheduled Tribes	3 (0.11%)
Literate	2101 (75.96%)
Total Worker	1336 (48.30%)
Main Worker	915 (33.08%)
Marginal Worker	421 (15.22%)
Non Worker	1430 (51.70%)

**Source:** Primary Census Abstract & DCHB 2011, North & Middle Andaman District, Andaman & Nicobar

**3.9.3 Infrastructure Resources**

The infrastructure resources base of the eleven study areas with reference to education, medical facility, water supply, post and telegraph, transportation, communication facility, power supply and existence of nearest town etc. according to the Village Directory Census CD 2011. The basic infrastructure of the study area is as follows,

**Table 3.32: Infrastructure Resource Base of the Study Area**

S N	Villages	Education	Medical	Water	Sanitati	Communication	Transportat	Road	Ba	Power	SH
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**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

					on		ion		n k		G
1.	Bharatpur	GPPS(2),G PS(2)	NA	TWU, UW, T/P/L	OK D	TP,PCO, MPC	GB,A/ MA,V, TR	BTPR, GKR, AWR,F	N A	PSDU,PS AU,PSCU ,PSAU	S H G
2.	Shaheed Kendra	GPPS,GPS , GMS,GSS( 2), GSSS(2)	PHC,M &CWC ,VH	TWU, UW, T/P/L	OK D	PO,P& TO, TP,PCO, MPC	GB,A/ MA,V, TR	BTPR, GKR, AWR,F	C O B	PSDU,PS AU,PSCU ,PSAU	S H G
3.	Lakshman pur	GPPS(2),G PS(2),PPS, GMS,GSS( 2),GSSS	NA	TWT, UW, T/B	OK D	TP,PCO, MPC	GB,A/ MA,V,	BTPR, GKR, AWR,F	N A	PSDU,PS AU,PSCU ,PSAU	S H G
4.	Ram Nagar	GPPS(2)	PHSC	UW	OK D	TP,PCO, MPC	GB,T, V,	BTPR, GKR, AWR,F	N A	PSDU,PS AU,PSCU ,PSAU	S H G
5.	Sitanagar	DNA	DNA	DNA	DN A	DNA	DNA	DNA	D N A	DNA	D N A

Source: DCHB 2011, South Andamaan District, Andaman & Nicobar

**Abbreviations:**

EDUCATIO N	MEDICA L	WATER	TRANSPORTATIO N		SANITATIO N	COMMUNICATIO N
GPPS: Govt. Pre - Primary School	AH: Allopathic Hospital	TWT: Tap Water Treated	GBS: Govt. Bus Service		OD: Open Drainage	PO: Post Office
GPS: Govt. Primary School	PHC: Primary Health Centre	TWU; Tap Water Untreated	PBS: Private Bus Service		OPDC: Open Pucca Drainage Covered	SPO; Sub Post Office
PPS: Private Primary School	PHSC: Primary Health Sub Centre	CW; Covered Well	A/MA: Auto/Modified Autos		OPDU: Open Pucca Drainage Uncovered	P&TO: Post &Telegraph office
GMS: Govt. Middle School	M&CWC: Maternity And Child Welfare Centre	UW: Uncovered Well	RS: Railway Station		ND: No Drainage	TP: Telephone
PMS: Private Middle School	FWC: Family Welfare Centre	HP; Hand Pump	T:Taxi	V:Van	OKD: Open Kuccha Drainage	PCO: Public Call Office
GSS: Govt. Secondary School	D: Dispensary	R/C: River/Canal	NH: National Highway		<b>BANK</b>	MPC: Mobile Phone Coverage
PSS: Private Secondary School	VH: Veterinary Hospital	T/P/L: Tank/Pond/Lak e	SH: State Highway		CB: Commercial Bank	<b>POWER</b>



**CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT**

GSSS: Govt. Senior Secondary School	TBC: T.B. Clinic	TW: Tube Wells/Borehole	<b>ROAD</b>	COB: Co Operative Bank	PSDU: Power Supply for Domestic use
PSSS: Private Senior Secondary School	MHC: Mobile Health Clinic	NA: Not Applicable	BTPR: Black Topped Road	ACS: Agriculture Credit Society	PSAU: Power Supply Agriculture use
			GKR: Gravel (kuchha) Road		
GA&SDC: Govt Arts and Science Degree College	<b>SHG: SELF HELP GROUP</b>		AWR: All Weather Road	F:Foothpath	PSCU: Power Supply For Commercial Use
PA&SDC: Private Arts and Science Degree College			WBM: Water Bounded Macadam		PSAU: Power Supply For All Users

The significant features of these important parameters for each study area are discussed as follows:

- (a) **Education Facilities:** In the study area, education is available from primary school to senior secondary school. Colleges and other diploma courses are available at Port Blair and are 41 km away from the project site
- (b) **Medical Facilities:** There are Two (2) government healthcare facilities available within the study area at Villages Shaheed Kendra, and Ramnagar. However; two (2) villages namely Bharatpur and Lakshmanpur in the study areas were lacking in medical facilities and the Sitnagar village census is not available. Hospitals and other good medical facilities were available at Port Blair.
- (c) **Drinking Water:** Dug wells are the only water resource for Shaheed Dweep with a yield of 0.18 MLD of water.  
(Source: Master Plan for Havelock and Neil Islands, Town and Country Planning Unit, APWD)
- (d) **Power Supply:** All villages are availing electricity facility for all purpose. Load shedding was a common problem being faced by the villagers. The solar system was also available in some surveyed villages.
- (e) **Transportation:** For transportation purpose Taxi, Auto and Public Bus services are available in the study area. However; frequency of Public Bus is not adequate in the region to cater the large number of tourists on the island. Bicycles and Motor Cycles were mostly used by local population for transportation purpose.
- (f) **Communication Facilities:** For communication purpose mainly Sub Post Office, Telephone, Mobile phones and newspaper are available in most of the villages.
- (g) **Grampanchayat:** Most of the villages have Grampanchayat look after the activities of villages in the study area.



### CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT

- (h) **Agriculture:** Most of the respondents are engaged in labor work, agriculture, fishing and livestock activities. Farming is the main occupation; a few respondents service in government sectors. Most of the respondents are labors and others are trying to migrate towards other city places.
- (i) **Houses:** : Most of the houses are pakka and semi pakka with good construction within the study area.
- (j) **Employment:** Main occupations of the people in the study area are agriculture and labor work. As directed by the A&N Administration, Office of the Labour Commissioner, the revised minimum rates of wages in the six schedules of Employment covered under Minimum Wages Act, 1948 in the UT of A&N Islands are as follows: Unskilled – Rs 461/day; Semi-Skilled/ Unskilled Supervisory – Rs 518/day; Skilled/Clerical – Rs 603/day; Highly Skilled – Rs 661/day.
- (k) **Fuel:** The primary source of cooking fuel is LPG and firewood. Kerosene is also being used in some of the households.
- (l) **Main Crops:** The principal crops grown in agricultural farm are Coconut, Paddy, Maize, Green gram Black gram, Others (specify) Tapioca, Sweet potato, Areca nut, Copra. Average crop productivity of paddy is 2-6quintal per acre.
- (m) **Language:** The most widely spoken language within the study area is Bengali followed by Hindi, Tamil, Telugu and Malayalam. Andaman Creole Hindi is also widely used as a trade language in the Andaman Islands.
- (n) **Migration:** During survey it was found that local population were migrating maximum towards the district level as a purpose of employment and some to other states.
- (o) **Sanitation:** Systems of individual and combined septic tanks are in use at some places of these Islands. The natural terrain and the size and form of Swaraj and Shaheed Dweep help in draining of rainwater quickly.
- (p) **Road Connectivity:** Most of the roads are tar and connects to the villages. Both tar and gravel roads were commonly seen in the villages.
- (q) **Market Facility:** Study area is predominantly rural type. In villages, small shops are available for daily needs. Port Blair is major hub for all type of facilities in the area.
- (r) **Recreation:** Temples, Samaj bhawan, Television and Radio are the main recreation facilities in the study area. Newspaper/Magazine is also used by the villagers.
- (s) **Tourism:** At a distance of 40 kilometers from Port Blair and close to the study area Neil Island is one of the most beautiful islands in the Andaman and Nicobar Islands. There is a jetty at Shaheed Kendra, which serves as the only access point of the island. There are regular Government ferry from Port Blair to Shaheed Island. There are private cruise ships such as Makruzz and Coastal Cruise. People from all over the world visit the destination to spend some great time at this captivating destination. Nile Island, it is increasing the maximum number of tourism and thus generates better income.

#### 3.9.4 Economic Attributes

The classification of workers is based on their occupation. Economic resource based on any region mainly depends upon its economically active group i.e. the working population involved



### CHAPTER 3: DESCRIPTION OF THE ENVIRONMENT

in productive work. Work may be defined as participation in any economically productive activity. Such participation may be physical or mental in nature. Work involves not actual work but also effective supervision and direction of work. It also includes unpaid work on farm or in family enterprise. There are different types of workers that may be classified as under with main workers employment pattern given below in **Table 3.33**.

**Table 3.33: Worker Pattern in the Study Area**

Demographic Parameters	Details
Total Worker	1336 (48.30%)
Main Worker	915 (33.08%)
Marginal Worker	421 (15.22%)
Non Worker	1430 (51.70%)
Cultivator worker	322 (35.19%)
Agriculture Worker	251 (27.43)
Household Worker	4 (0.44%)
Others Worker	338 (36.94%)

*Source: Primary Census Abstract 2011, South Andaman District*

#### **3.9.4 Health Status**

Diarrhea / Cholera, Malaria, eye disease, skin disease and Unhygienic are the general health problems which are attributed due to improper sanitation, mosquito nuisance and water logging. Malaria is one of the most frequently occurring diseases and also respiratory infection in the region.

#### **3.9.5 Quality of Life**

QoL is terms which indicate overall status of socio-economic environment in a given area. The average QoL index value for the study area is leaning towards satisfactory level due to good economic status like income, employment, educational facilities, medical facility and also availability of basic needs, viz. food, clothing, and housing.

#### **3.9.6 Cultural and Aesthetic Environment**

There are no cultural and heritage sites that could be affected due to the proposed construction along or in close proximity to the Study area.

#### **3.9.7 Rehabilitation and Resettlement Plan (R & R Plan)**

As there is no existing settlement on the proposed project area, there are no issues of resettlement or rehabilitation involved.



## **CHAPTER 4. ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**

Environmental Impact Assessment (EIA) is an activity or an attempt to identify, predict, evaluate and communicate the likely environmental impacts of the proposed project on the surrounding environment.

This section of the report provides an assessment of the potential impacts on different identified environmental components, which are likely to occur during the construction phase of the proposed building. However, by adopting appropriate management measures, the majority of the assessed impacts can be mitigated.

The major potential impacts associated with the proposed project are impact on soil, impact on water resources and area drainage, air quality degradation, noise impacts, impact on ecological environment, land use changes, impact on health and safety, impact on socio-economic features, impact on community activities.

The identified impacts due to the proposed project can be mitigated through the incorporation of appropriate measures at different stages of the project. This will ensure the best design with minimal damage to or loss of significant or sensitive features such as roadside vegetation, local water resources, etc.

### **4.1 Air Environment**

#### ***4.1.1 Construction Phase***

##### **Identification of Sources**

Vehicular movement (Vessel) is only the identified source of air pollutant

##### **Impact Prediction**

For the quantitative impact analysis on the air quality due to the proposed activity, air dispersion modeling is performed. The criteria pollutants like PM<sub>10</sub>, PM<sub>2.5</sub>, SO<sub>2</sub>, NO<sub>x</sub> & CO generated from activities mentioned in above sections were considered for air modeling.

AERMODCloud5 developed by Envitrans and authorized by CPCB is used for air modeling simulation which is based on the steady state Gaussian plume equation.

##### **Model Option used for Computation**

- Area Source & Line source modeling is considered using different modelling software;
- Calms processing routine is used by default;
- Wind profile exponents is used by default;
- Flat and elevated terrain is used for computations;



- It is assumed that the pollutants do not undergo any physico-chemical transformation and that there is no pollutant removal by dry deposition;
- Washout by rain is not considered; and
- Cartesian co-ordinate system has been used for computations.
- Uniform polar receptor grid is used. The grid consists of 612 receptors each assumed to be at ground level.

### **Modeling Procedure**

The prediction of the Ground Level Concentrations (GLC's) due to activity has been computed by AERMODCloud5 as per CPCB guidelines. While performing the AERMODCloud5 model the urban dispersion and regulatory defaults options were selected as per guidelines on air quality models (PROBES/70/1997-1998).

### **Meteorological Data Processing**

The meteorological observation station of IMD for Port Blair is located at A&N Island. The quality assurance process was undertaken as required by the EPA (EPA-454/R-99-005) to identify and fill the missing data for preparation of hourly surface meteorological data. The surface and profile met data were prepared for use in AERMOD using the AERMET meteorological data preprocessor of Envitran. Processing the surface file indicated more than 90 % data availability. Meteorological inputs required are hourly wind speed and direction, ambient temperature, pressure, precipitation, cloud cover, stability class and mixing height. The atmospheric inversion level at Pune during pre monsoon period for 12 hours from 6:00 hour to 20:00 hour is represented in the below **Table No 4.1**. The data has been compiled from IMD manual.

**Table 4.1: Atmospheric Inversion Level at A&N Islands.**

SN	Time	Mixing Height, Meter
1	7.00	240
2	8.00	320
3	9.00	500
4	10.00	550
5	11.00	600
6	12.00	600
7	13.00	700
8	14.00	700
9	15.00	700
10	16.00	600
11	17.00	550
12	18.00	475
13	19.00	450

*Source: (Hourly Mixing Height & Assimilative capacity of Atmosphere in India) by IMD*



### **Modeling Data Input & Interpretation**

Following conditions/activities are considered to perform ambient air quality modeling studies.

- Emissions from Unpaved Road within construction premises Heavy Construction Activities
- Heavy Construction Activities
- Aggregate Handling & Stockpiling
- DG Set Operation

The emission factor used in the air dispersion modeling for estimating the pollutants from different sources are calculated using document of EPA AP-42, the source wise details of the same are tabulated below

**Table 4.2 : List of Reference Documents for Emission Rate Calculation**

<b>SN</b>	<b>Emission Source</b>	<b>Reference document to calculate emission factors</b>
<b>Construction Phase</b>		
1	Emissions from Unpaved Road within construction premises	EPA AP-42, chapter no. 13 Miscellaneous Sources, Unpaved Road, Section 13.2.2
2	Heavy Construction Activities	EPA AP-42, chapter no. 13 Miscellaneous Sources, Heavy Construction operation, Section 13.2.3
3	Aggregate Handling & Stockpiling	EPA AP-42, chapter no. 13 Miscellaneous Sources, Aggregate Handling And Storage Piles, Section 13.2.4
4	DG Set Operation	EPA AP-42, chapter no. 3 Stationary Internal Combustion Sources, Gasoline and Diesel Industrial Engines, Section 3.3

### **Mitigation Measures**

- The vehicles hired for transportation of material and labor shall have PUC certificate in order to reduce air emissions;
- Traffic Management - vehicular movement to be regulated with proper parking facility and internal road system;

#### ***4.1.2 Operational Phase***

### **Identification of Sources**

The following probable sources are identified in phase of after construction:

Emissions from fossil fuel burning for sea plane operations at different speeds & altitudes.



### Impacts Prediction

The CO released due to fuel combustion in engines will reduce the haemoglobin concentration in blood of the people get exposed to higher concentration of CO.

The emission factor used in the air dispersion modelling for estimating the pollutants from different sources are calculated using document of EPA AP-42, the source wise details of the same are tabulated below:

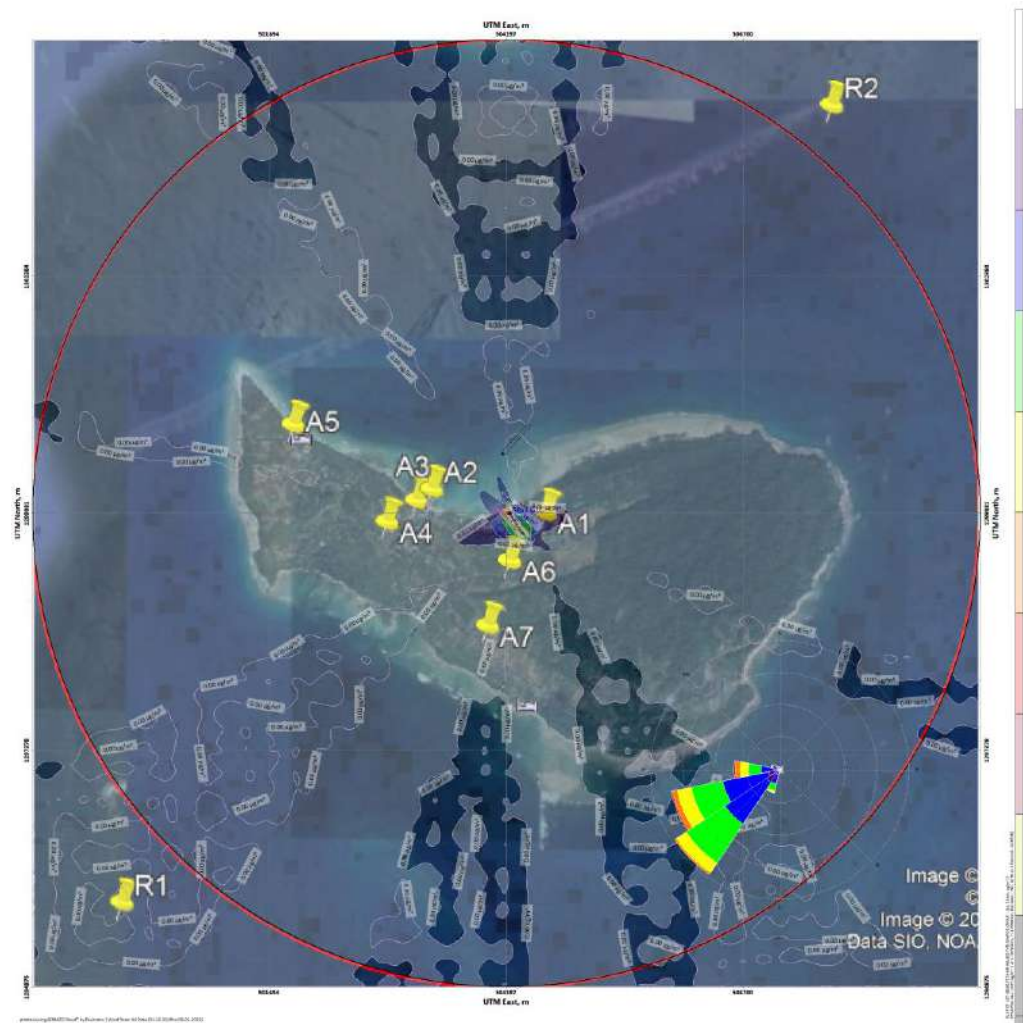
**Table 4.3 : List of Reference Documents for Emission Rate Calculation**

Operation Phase		
1	Emission from Aircraft	Airport Air Quality Manual 2011 of International Civil Aviation Organization (ICAO)
2	DG Set operation	EPA AP-42, chapter no. 3 Stationary Internal Combustion Sources, Gasoline and Diesel Industrial Engines, Section 3.3
3	Vehicular Movement	Emission Factors Calculated by (ARAI), 2007

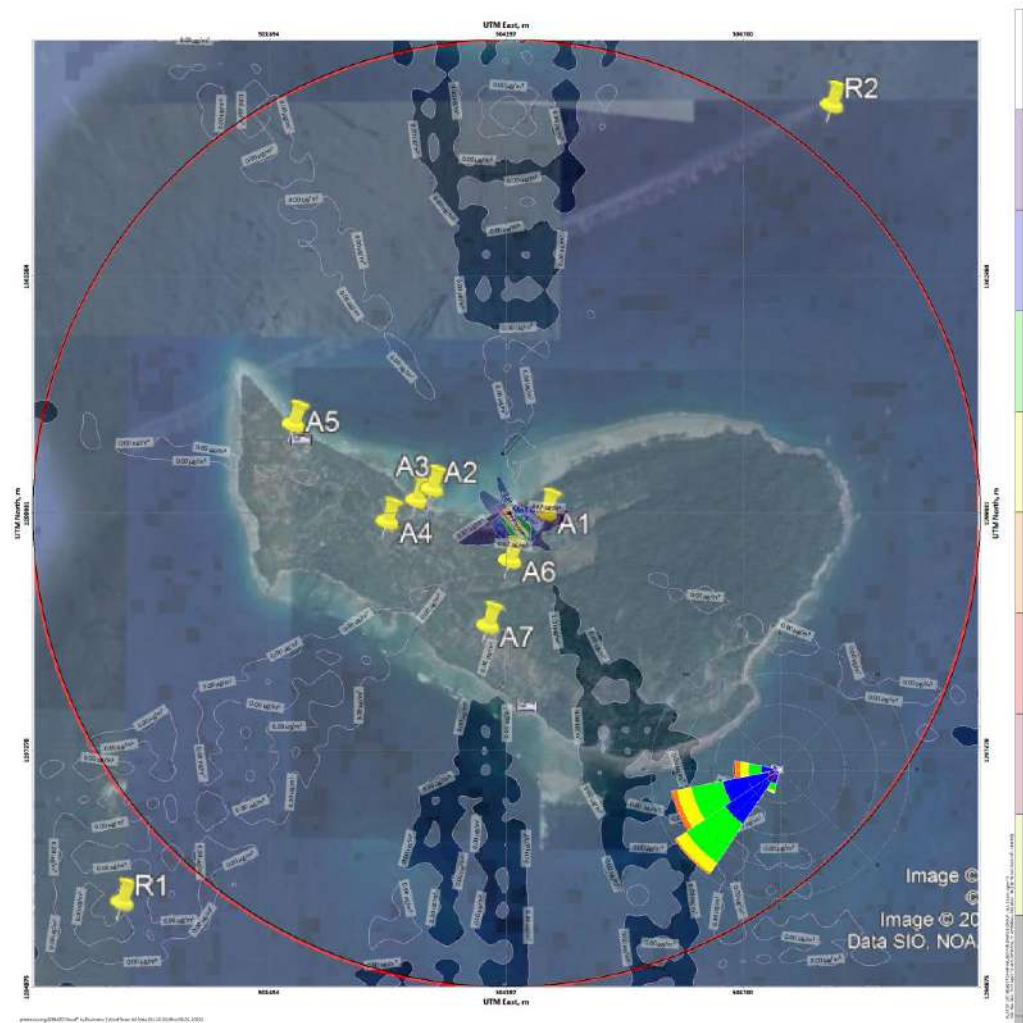
Daily 150 vehicles are considered to visit at Facilitation centre for travelling purpose, Considering worst case scenario and dimensions of road area, all 20 vehicles are considered for performing air quality modelling studies.

**Table 4.4 : Inputs for Air Modeling (Operation Phase)**

S.N	Parameters	Values	
1	Source : Aircraft emission	Short haul plain	
2	Capacity	-	
3	Fuel Used	Aviation Turbine Fuel (ATF)	
4	Air strip distance	0.8 km	
5	Emission Factors (g/s)	PM <sub>10</sub>	0.009259 g/sec
		PM <sub>2.5</sub>	-
		SO <sub>2</sub>	-
		NO <sub>x</sub>	0.259 g/sec
		CO	0.11 g/sec
SN	Parameters	Values	
1.	Source : Transport of Vehicles	20 vehicles per Hour	
2	Length of approach road	377 meters	
3	Width of road	6 meter	
4	Average Car dimension	4.39m (L) X 1.73 m (W)	
5	Fuel used	Diesel (Considering Worst-case)	
6	Emission Factors (g/s)	PM <sub>10</sub>	0.000320 g/s
		NO <sub>x</sub>	0.00042 g/s
		CO	0.0001296 g/s
		SO <sub>2</sub>	0.0350 g/s



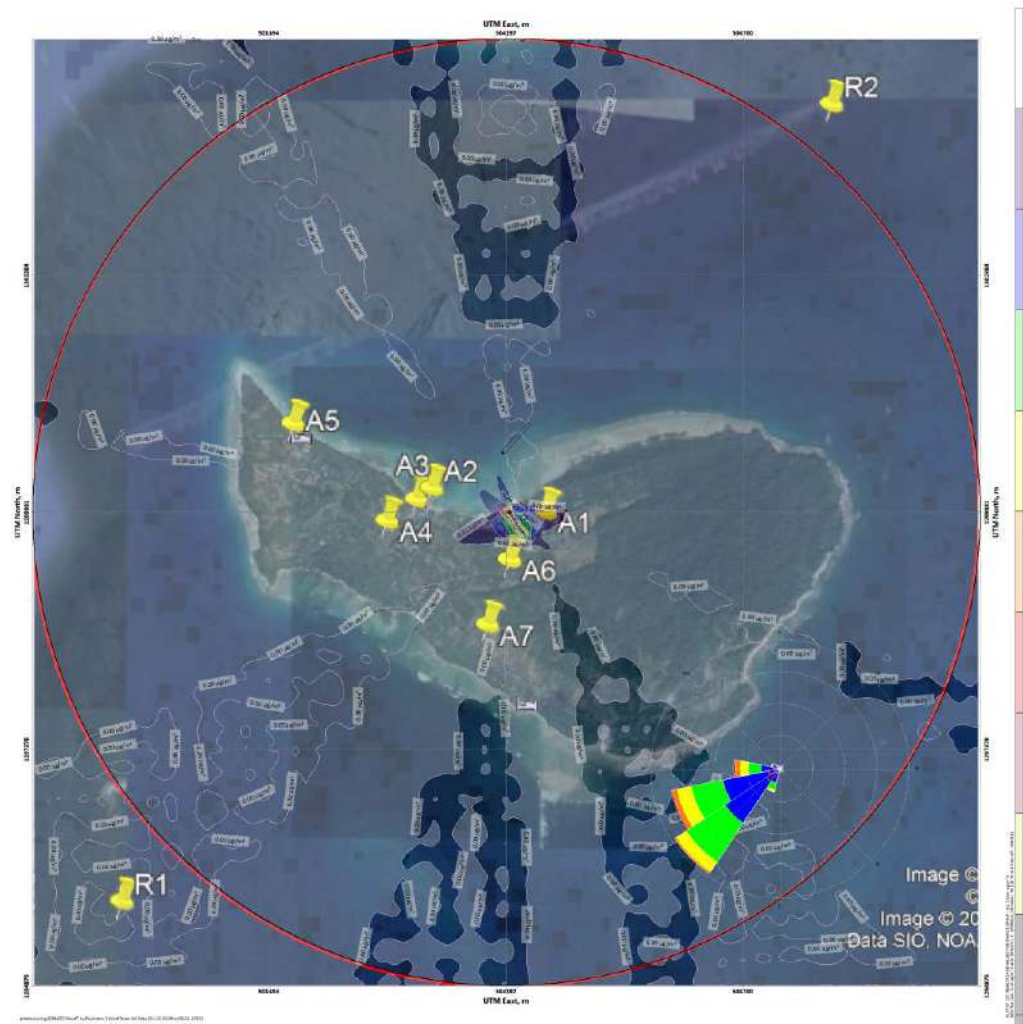
**Figure 4.1: Dispersion Model for PM<sub>10</sub> Parameter (Operational Phase)**



**Figure 4.2: Dispersion Model for SO<sub>2</sub> Parameter (Operational Phase)**



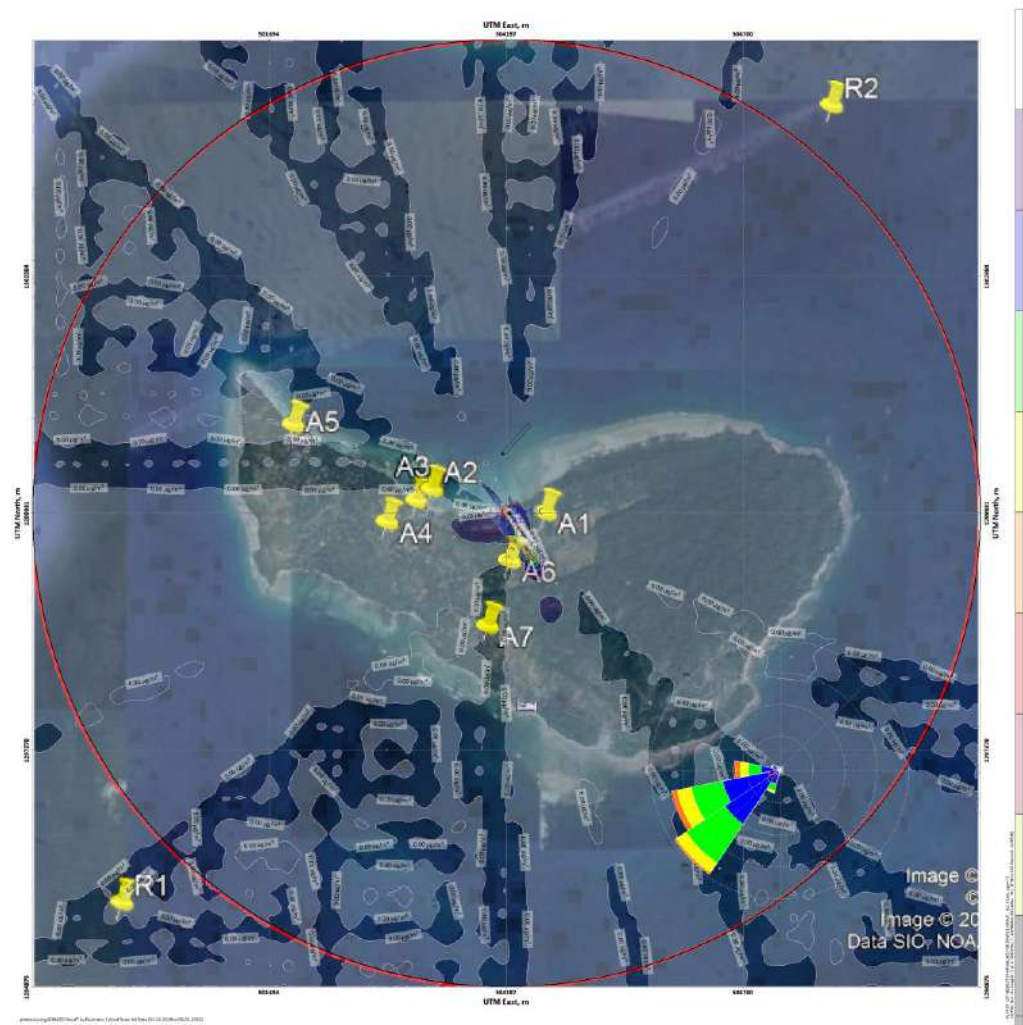
**CHAPTER 4: ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**



**Figure 4.3: Dispersion Model for NO<sub>x</sub> Parameter (Operational Phase)**



## CHAPTER 4: ENVIRONMENTAL IMPACTS & MITIGATION MEASURES



**Figure 4.4: Dispersion Model for CO Parameter (Operational Phase)**



**CHAPTER 4: ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**

**Table 4.5: Interpretation of Incremental Values (Operational Phase)**

S.N	Sampling Location Code & Name	PM <sub>10</sub> (ug/m <sup>3</sup> )			SO <sub>2</sub> (ug/m <sup>3</sup> )			NO <sub>x</sub> (ug/m <sup>3</sup> )			CO (mg/m <sup>3</sup> )		
		BV	IV	RV	BV	IV	RV	BV	IV	RV	BV	IV	RV
1	*A1	62.61	0.02	62.630	11.29	0.97	12.26	21.34	0.02	21.36	0.88	0	0.88
2	A2	55.81	0	55.81	10.19	0	10.19	19.27	0	19.27	0.91	0	0.91
3	A3	53.02	0	53.02	9.68	0	9.68	18.31	0	18.31	0.84	0	0.84
4	A4	58.32	0	58.32	9.62	0	9.62	20.14	0	20.14	0.91	0	0.91
5	A5	53.66	0	53.66	9.8	0	9.8	18.53	0	18.53	0.75	0	0.75
6	A6	51.51	0	51.51	9.41	0	9.41	17.78	0	17.78	0.81	0	0.81
7	A7	58.75	0	58.75	9.00	0	9.00	20.28	0	20.28	0.63	0	0.63
<b>NAAQS Standards</b>		<b>100 (24 hourly)</b>			<b>80 (24 hourly )</b>			<b>80 (24 hourly )</b>			<b>4 (1 hourly)</b>		

**Table 4.6: Predicted 24-Hourly Short Term Incremental GLCs**

Pollutants	Maximum Incremental Levels	Distance, m	Direction
PM	0.09 µg/m <sup>3</sup>	40	E
NO <sub>x</sub>	0.12 µg/m <sup>3</sup>	40	E
SO <sub>2</sub>	9.73 µg/m <sup>3</sup>	40	E
CO	0.0013 mg/m <sup>3</sup>	40	ESE



## **Mitigation Measures**

Following mitigation measures are proposed to reduce emissions from overall activity:

- Sea Plane engine shall be maintained in good condition.
- Traffic Management - vehicular movement to be regulated with proper parking facility and internal road system.

### **4.2 Noise Environment**

#### **4.2.1 Construction Phase**

#### **Probable Sources**

Sources of noise emissions are expected from various construction equipments. General noise levels generated from the operation of equipment and machinery is provided in the following table.

**Table 4.7: Noise Level generation from Construction Equipment's**

SN	Name of Source	Limit (*)	Noise Levels From Source (dBA)		
			At a Distance of 500m	At a Distance of 16 m	At a Distance of 1 m
1	Cranes – Mobile	75	51	81	105
2	Concrete Vibrators	75	47	77	101

In this particular case, the volume of construction is small because the existing infrastructure is optimized. Instead of full RCC construction, more of fabrication is used.

#### **4.2.2 Operational Phase**

#### **Probable Sources**

1. Seaplane noise during takeoff and landing
2. Noise producing from seaplane passenger boarding and arrival

**Seaplane noise during takeoff and landing:** Most aircraft make their greatest noise on take-off, since it is at that point that a large amount of thrust is required to become airborne. In a seaplane, take-off is generally accomplished at full power in order to rapidly get up onto the step and then off the water to clear waves, swells, debris, or other water-related complications. After lift-off, normal procedure is to level off until reaching best angle of climb. The majority of the noise coming from a propeller aircraft is created at the tips of the propeller; there is not much coming from the exhaust pipe. During takeoff noise level arise maximum 95 to 100 dB(A) Landings are generally made at greatly reduced power settings, and, consequently, the noise comparison between takeoffs and landings favours landings. According to a Seaplane Pilots



Association study, "In fact, seaplane noise levels at low throttle settings may be generally below background noise levels and thus are not measurable.

**Noise producing from seaplane during passenger boarding and arrival:** Before boarding and arrival seaplane is standing in aerodrome in that time engine is running and producing around 60 to 65 dB(A).

During the operation phase of the project, major sources of noise pollution are expected to be from machine, vehicular traffic, air conditioning systems and by use of any other machinery.

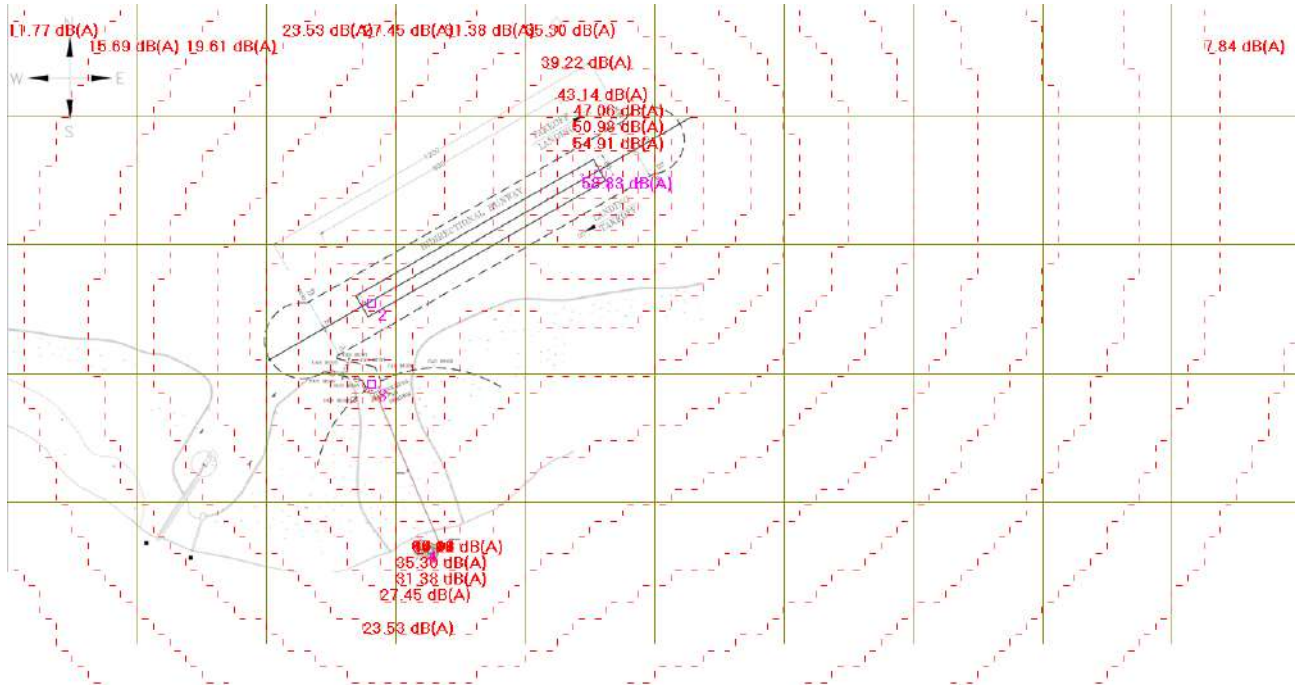
### **Impact Prediction & Mitigation Measures**

<b>SN</b>	<b>Expected Impact</b>	<b>Mitigation</b>
1.	During takeoff and landing of Seaplane local community may feel disturbance	Due to attenuation phenomena takeoff noise will less in near community. No major local community within 500 m vicinity
2.	It affects the sleeping there by inducing the people to become restless and loose concentration and presence of mind during their activities	Duding night time takeoff and landing activity will not allowed

Operation of sea plane will generate some noise during takeoff and landing. According to the data presented by the European Commission, only 1% of noise over 65 dB is created by air traffic, while the share of road traffic amounts to 90% The major problem is the noise produced by seaplanes during taking off and landing operations. The noise is estimated at 75 dB (A), i.e. well over ambient noise. Taking into consideration that during these relatively short periods a seaplane creates more noise than a vessel under way, the take-off/landing zone should be designed in such a way that flying over inhabited areas at low height is avoided.

Frequency of seaplane operation will be 4 to 5 per day so as per frequency; exposure of noise also will be low.

During takeoff and landing of seaplane noise at terminal building and boarding point will be 38.96 dB(A) & 48.91 dB(A) respectively, due to the inverse square law, the sound level from a seaplane decreases in intensity as the aircraft increases in distance from the source. As the ambient noise levels are higher than the predicted noise level, due to masking effect, there is no increase in the ambient noise levels during operation phase is envisaged. Hence, there will not be any significant impact on nearby area due to masking effect.



**Figure 4.5: Noise Contours during Operation Phase**

#### **4.3 Water Environment**

As the proposed project involves only Floating jetty water requirement is not envisaged.

#### **4.4 Biotic Environment (Terrestrial & Aquatic)**

The project activity/component wise probable anticipated impacts during construction & operational phases of project on terrestrial & aquatic ecology in & around the project site along with mitigative /precautionary measures are detailed in the matrix below.

**Table 4.8: Project activity/component wise anticipated impacts & mitigations measures during project Construction & operational phase on Aquatic Environment**

<b>Project Activity/ Component: Speed boat path &amp; Operations</b>			
<b>Components</b>	<b>Speed boat path</b>	<b>Anticipated Impact</b>	<b>Precautionary/Mitigation Measures</b>
<b>Releases</b>	<ul style="list-style-type: none"> <li>Speed boats will not have urinals/lavatories; the cruise time of speed boat from gangway to floating is walkway will be only few minutes.</li> </ul>	<ul style="list-style-type: none"> <li>Releases from speed boat in whatsoever manner will not occur in creek/sea.</li> </ul>	--
<b>Emissions</b>	<ul style="list-style-type: none"> <li>Emissions from speed boat operations will not occur since electrical speed boats will be operated.</li> </ul>	<ul style="list-style-type: none"> <li>None emissions are anticipated from operation of speed boats</li> </ul>	--
<b>Disturbances to Surrounding Habitat</b>	<ul style="list-style-type: none"> <li>Unlike the fuel driven boats, electric speed boats are likely to generate negligible noise &amp; vibrations.</li> </ul>	<ul style="list-style-type: none"> <li>The magnitude of noise &amp; vibrations to be generated will be negligible.</li> </ul>	<ul style="list-style-type: none"> <li>Electric driven speed boats are already provisioned with a view to keep disturbances to a minimum.</li> </ul>
<b>Project Activity/ Component: Floating Walkway &amp; Operations</b>			
<b>Components</b>	<b>Floating Walkway</b>	<b>Anticipated Impact</b>	<b>Precautionary/Mitigation Measures</b>
<b>Habitat loss &amp; Alteration/Disturbance of sea bed</b>	<ul style="list-style-type: none"> <li>Floating dock will be installed near sea plane taxi way.</li> <li>The only point of contact of</li> </ul>	<ul style="list-style-type: none"> <li>Habitat loss will not occur, however at the point of contact of rocks &amp; seabed</li> </ul>	In order to ensure minimum disturbances to sea bed activities viz. dredging/digging are being



**CHAPTER 4: ENVIRONMENTAL IMPACTS & MITIGATION MEASURES**

	<p>floating dock with seabed will be through mooring activity.</p> <ul style="list-style-type: none"> <li>Floating dock will be moored to sea bed by tying to natural rocks with ropes.</li> <li>The floating dock mooring area is mainly sand dominated &amp; free from underwater growth.</li> </ul>	<p>benthic faunal communities may be temporally disturbed.</p>	<p>avoided.</p>
<b>Project Activity/ Component: Provision of sea surface as taxi way &amp; run way</b>			
Components	Provision of sea surface as taxi way & run way	Anticipated Impact	Precautionary/Mitigation Measures
<b>Habitat loss &amp; Alteration/Disturbance of sea bed</b>	<ul style="list-style-type: none"> <li>The sea surface will be operated as superficial taxi way of and run way.</li> <li>Since the design of planes to be operated is as such only 2 m water depth is required for taxing/takeoff/landing activities, these activities are not anticipated to in contact with sea bed at any given point of operation.</li> <li>The sea surface area to be used for taxing/takeoff/landing is devoid of bottom/underwater growth.</li> </ul>	<ul style="list-style-type: none"> <li>Habitat loss &amp; disturbances to/alteration of sea bed will not occur in whatsoever manner.</li> </ul>	<ul style="list-style-type: none"> <li>To avoid contact of sea planes with sea bed, the design of sea planes to be operated is already considered to be operable on surface water.</li> </ul>



#### **4.5 Socio-Economic**

The setting up of any kind project would undoubtedly include significant impact on socio-economic and cultural life of the people in the project area. Here, an attempt is made to visualize and discuss such tentative impacts likely to be induced by the project. The likely impacts due to project activity are described below:

##### **Anticipated Impact**

The setting up of any kind project would undoubtedly include significant impact on socio-economic and cultural life of the people in the project area. Here, an attempt is made to visualize and discuss such tentative impacts likely to be induced by the project. The likely impacts due to project activity are described below:

##### **Positive Impacts**

- The proposed project plot being uninhabited so issues like resettlement and rehabilitation are not envisaged.
- Establishment of proposed project will help to improve tourism on Shaheed Dweep.
- There will job opportunity for working in terminal building, apart from this there will be growth in indirect jobs and business opportunities to the local and surrounding people such as contractors, transporters and raw material suppliers etc. due to the proposed development in the area.
- Demands of community services and commercial development also create additional employment for the poor strata of society by way of security guard, driver, servant, sweeper, gardener etc.
- There could be increase in hotels and restaurants.

##### **Negative Impacts**

- Due to the proposed project activity, influx of contractors/skilled workers as needed during the construction phase. This may lead to strain on infrastructure facilities in the area as well as increase in population at local level. However, this impact is only for the short duration and temporary in nature.
- During construction phase, increase level of dust and other air pollutants may lead to health problems.
- Vehicular traffic and construction activities may create noise pollution.

##### **Mitigation Measures**



In order to mitigate the adverse impacts likely to arise in the surrounding area due to proposed project activity, it is necessary to formulate an effective mitigation plan. The suggestions are as follows:

**Before Commencing and During Initial Phase:**

- Communication with the local community should be initiated prior to construction activities to apprise them of the upcoming construction phase of the proposed development of water aerodrome activities.

**Construction Phase:**

- Project proponent should take appropriate steps to keep environment clean and healthy during construction phase.
- Provision of adequate drinking water, toilet and bathing facilities should be made available on project site.
- Water shall be sprinkle/spread to suppress dust during construction phase to control air pollution and thereby avoid adverse health impact.
- 
- Proper Training and awareness programme should be carried out so that the workers understand the importance of wearing the personal protective equipment's.

**Operation Phase:**

- The project management collectively will need a pool of watchmen, gardeners, sweepers, plumbers, fitters, etc. Preference should be given to local people for any possible employment opportunities.

The authority should help in promoting local people for livelihood commensurate with their will, skill and abilities by utilizing the minimum amount.



## **CHAPTER 5 – ANALYSIS OF ALTERNATIVES**

### **5.1 Introduction**

The consideration of alternatives of the proposed aerodrome is one of the more proactive sides of environmental assessment - enhancing the project design through examining options instead of only focusing on the more defensive task of reducing adverse impacts of a single design. This calls for the systematic comparison of feasible alternatives for the proposed airport site, technology and operational alternatives. Feasible alternatives are compared in terms of their potential environmental impacts, capital and recurrent costs, suitability under local conditions and institutional, training and monitoring requirements.

### **5.2 Alternative of Project Site**

A multi-disciplinary team from AAI, conducted a prefeasibility survey for each proposed location of water aerodrome. Following one site were considered (**Figure 5.1**) for aerodrome as follows,

- 1) Lalaji Bay on Shaheed Dweep



**Figure 5.1: Google Earth Image of Alternate Site considered for Proposed Project**

Apart from selected site, alternate site located adjacent to current one was considered for proposed terminal building Initially but due to issue of accessibility, considering HTL and presence of estuarine water body it was decided to construct terminal building in west side of estuarine body , considering availability of necessary approach way and less forest density.



**Table 5.1: Alternatives Site Analysis for Proposed Project**

Sr. No	Parameters for site selection	Site 1 (Selected Site)	Site 2 (Alternate site considered earlier)
1	Road Availability for ease of transport	Road is already available	Road construction was not possible.
2	Tree density	PFC will be established on the existing jetty, no trees will be disturbed	Tree density was higher
3	Water Supply	Present, supplied by local body, since the existing jetty is in operations	Present, supplied by local body, since habitation is present nearby
4	Proximity of CRZ area	ICRZ notification will be applicable	ICRZ notification will be applicable
5	HTL	It is being provided on the existing jetty	It was close to HTL
6	Eco- Sensitive Zone	Not present in 10 km radius	Not present in 10 km radius
7	Creek to be affected	Not applicable as we are providing PFC on the existing jetty	Yes estuarine water was close to site
8	Mangrove	Not Present	Present
9	Presence of suitable water regime for takeoff and landing	Water depth is sufficient for takeoff during low tide period	Water depth is sufficient for takeoff during low tide period
10	Site to be Selected	Selected	Not Selected

### 5.3 Alternative for Energy & Water Conservation

Not Applicable as the Passenger Facilitation Centre is being provided in the existing shed on the existing jetty.



## **CHAPTER 6. ENVIRONMENTAL MONITORING PROGRAMME**

### **6.1 Environmental Monitoring Plan**

A monitoring program has been detailed out in which the frequencies of measurement, the planned location of measurement and detailed budgets are listed.

The environmental monitoring program includes following:

- Ambient Air Quality
- Monitoring of exhausts from DG Sets
- Noise Level Monitoring
- Water and Wastewater Quality
- Marine and Sediment Quality

To monitor effectiveness of Control Measures:

- Monitor daily, Assess effectiveness of the Control Measures being implemented, Explore the need to modify or add new Control Measures particularly if a violation is observed & Report weekly.
- Regular monitoring of environmental parameters will be made to find out any deterioration in environmental quality.

The attributes, which merit regular monitoring, are specified in the following sections as well as **Table 6.1** and **Table 6.2**.

### **6.2 During Construction Phase**

#### **6.2.1 Air and Noise Monitoring**

Not Applicable as the Passenger Facilitation Centre is being provided in the existing shed on the existing jetty.

#### **6.2.2 Water Management**

The water supply lines are being maintained by Andaman Public Water Works are generally of good quality but still to ascertain its quality as a precaution it shall be checked quarterly for physicochemical and bacteriological parameters.

#### **6.2.3 Biotic Environment**

Biotic monitoring studies to be undertaken, to assess any changes from the existing baseline conditions during constructional & operational phases.



#### **6.2.4 Soil monitoring**

Not Applicable as the Passenger Facilitation Centre is being provided in the existing shed on the existing jetty.

### **6.3 During Operation Phase**

#### **6.3.1 Air and Noise Monitoring**

The ambient air quality for the parameters PM<sub>10</sub>, SO<sub>2</sub>, PM<sub>2.5</sub>, NO<sub>x</sub> and CO and Noise levels shall be monitored quarterly as per guidelines at five different locations at the project site and vicinity to ascertain that they are within the prescribed limits.

During operational period the major noise pollution source will be Seaplane and surrounding traffic activity. In order to prevent adverse noise exposure to the occupants, optimal mix of mitigation measures such as low noise generation units, acoustic enclosures, and plantation of trees as noise barriers all around the project boundary has been planned.

#### **6.3.2 Water and Wastewater Management and Analysis**

The proposed project consists of pre-casting of floating jetty only, hence water is not required for the project

#### **6.3.3 Biotic Environment**

Biotic monitoring studies to be undertaken, to assess any changes from the existing baseline conditions during constructional & operational phases.

#### **6.3.4 Soil monitoring**

Daily vehicular movement (accidental fuel spillage), discharge of untreated water on soil, if any may affect soil quality present near to proposed terminal building. Therefore, to ensure implementation of measures suggested, soil monitoring is planned.

### **6.4 Environmental Monitoring Plan with Budgetary Allocation**

The budgetary allocation for environmental monitoring plan for construction and operation phase of the project is as explained in the **Table 6.1** and **Table 6.2**.



**CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME**

**Table 6.1: Environmental Monitoring Plan during Construction Phase**

SN	Item	Parameters	Frequency	Location	Total (Rs. lakhs/year)
1	Ambient Air Quality	Not Applicable	--	--	--
2	Noise Level	Not Applicable	--	--	
3	Biotic Environment	Marine & Terrestrial environment	Quarterly	Around Project Area	0.10
4	Marine Water and Marine Sediment	pH, colour, odour, DO, BOD, TDS, hardness, Cl, F, SO <sub>4</sub> , Alkalinity, NO <sub>3</sub> , Ca, Mg, Na, K, Cu, Cr, Cd, CN, Phenols, Pb, Zn, O&G, Total Coliforms	Pre & Post Monsoon Period	Near Floating dock	0.70
<b>Total</b>					<b>0.80</b>



**CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME**

**Table 6.2: Environmental Monitoring Plan during Operation Phase**

SN	Item	Parameters	Frequency	Location	Total (Rs. lakhs/year)
1	Ambient Air Quality	PM <sub>2.5</sub> , PM <sub>10</sub> , CO, SO <sub>2</sub> & NO <sub>x</sub> SPM, SO <sub>2</sub> , NO <sub>x</sub>	Monthly	One location at upwind and two at downwind from floating jetty	7.46
2	Noise Level	Equivalent Noise Level dB(A)	Monthly	Near passenger facilitation center	
3	Biotic Environment	Marine & Terrestrial environment	Quarterly	Around project area	1.5
4	Marine Water and Marine Sediment	pH, colour, odour, DO, BOD, TDS, hardness, Cl, F, SO <sub>4</sub> , Alkalinity, NO <sub>3</sub> , Ca, Mg, Na, K, Cu, Cr, Cd, CN, Phenols, Pb, Zn, O&G, Total Coliforms	Half Yearly (pre and post monsoon)	Near Floating dock	0.70
<b>Total</b>					<b>9.66</b>



## **CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME**

### **6.5 Environmental Monitoring Agency**

NABL accredited 3<sup>rd</sup> party laboratory also having ANPCC / MoEF&CC approval shall be hired to carry out the environmental monitoring as per the above mentioned plan. There will be one record section for recording all the sampling frequencies and analysis reports.

Details of the in-house EMS for the management of environmental aspects during construction and operation phases of the proposed jetty are provided in Section 10.4, Chapter 10.

## CHAPTER 7. ADDITIONAL STUDIES

### 7.1 Public Consultation

As per recommended ToR by EAC, Ministry of Environment, Forest & Climate Change vide Letter No. F.No. 10-53/2019-IA-III dated 16<sup>th</sup> December, 2019; Public Hearing had been conducted for the proposed Water Aerodrome Project at Shaheed Island dated 25<sup>th</sup> September, 2020 at around 10.30 AM. The Public Hearing was carried out at the Neil Kendra Panchayat, Shaheed Dweep, South Andaman District & was preceded by Assistant Commissioner (SETT) – Equivalent to the designation Assistant District Magistrate, South Andaman.

The issues raised/comments by public, commitments made by Project Proponent on the same along with budgetary allocation are given in tabular chart below.

Table 7.1: Issues raised/comments by public, Commitments made by Project Proponent on the same along with budgetary allocation

Sr. No.	Attendee Name	Detail	Issue/Comment/Query	Commitment by Project Proponent	Financial budget for complying the Commitment
1	K Andiswamy	Local Resident & PRI, UP-Pradhan	--	--	--
2	Joykrishna Das	Local Resident & PRI	Appreciated the initiative of the Administration for development of Water Aerodrome in the Island, which will help in the development of the Shaheed Dweep especially in tourism sector. He suggested that a proper separate road may be developed to connect to the proposed Water Aerodrome and requested that the job created due to the proposed developmental project the local people of Shaheed Dweep may be given preference.	--	Rs. 1.46 Crore have been allocated for road development.



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**CHAPTER 7: ADDITIONAL STUDIES**

Sr. No.	Attendee Name	Detail	Issue/Comment/Query	Commitment by Project Proponent	Financial budget for complying the Commitment
3	Namita Das	Local Resident & PRI	--	--	--
4	Subash Das	Local Resident & PRI	--	--	--
5	Rudra Das	Local Resident & PRI	--	--	--
6	Sandeep Kumar Das	Local Resident & PRI	--	--	--
7	Ram Krishna Biswas	Local Resident & Pradhan, Neil Kendra Panchayat, Shaheed Dweep	<p>Welcome the project of Water Aerodrome at Shaheed Dweep and express his happiness aware that the operation of Sea Plane will increase the connectivity from Port Blair to Shaheed Dweep and boost the tourism activities in the Island. He suggested that while undertaking the developmental work of construction of Water Aerodrome due care may be taken to protect the corals and mangrove if present in the project area. He also suggested that no big trees should be cut until unless it is very much essential. Further he suggested that some of the youth of the Island are operating boat for their livelihood so their activities should not be disturbed. Preference to the local people may be given for employments which are likely to be generated during the construction of the</p>	<p>Project proponent informed that all necessary precautions will be taken during the development of the project for the protection of environment including marine ecosystem of the area through the Environment Management System based on ISO 14000, Quality Management and Occupational Health and Safety Management System.</p> <p>Project Proponent also informed that the project</p>	<p>Rs. 70.3 Lakh &amp; Rs. 26.2 Lakh have been allocated as Captial &amp; Recurring cost for Environmet Management Plan.</p>



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**CHAPTER 7: ADDITIONAL STUDIES**

Sr. No.	Attendee Name	Detail	Issue/Comment/Query	Commitment by Project Proponent	Financial budget for complying the Commitment
			project and operation of the same.	will serve job opportunities to local people in terms of direct and indirect employment.	
8	Shankar Das	Local Resident	--	--	--
9	Gyanmoy Mondal	Local Resident	--	--	--
10	Rupel Adhikari	Local Resident	--	--	--
11	Kajal Das	Local Resident	--	--	--
12	Dilip Fisheries	SI Fisheries	--	--	--
13	Kartick Mistry	Local Resident	--	--	--
14	Priyanka	Local Resident	--	--	--
15	Madhumangal Biswas	Local Resident	--	--	--
16	Shyamal Bairagi	Local Resident	--	--	--
17	A Muthaiah	Local Resident	--	--	--
18	A Manoharan	Local Resident & ALHW	--	--	--
19	Kartick Roy	Local Resident	--	--	--
20	S P Gunashekharan	Local Resident	--	--	--
21	Ranjan Bhakta	Agri. Dept.	--	--	--
22	Sudharsan Haldar	Forest Dept.	--	--	--
23	Prasanjeet (Prasanjit) Das	Local Resident	Informed that the present location of the proposed Water Aerodrome is very near to	Project Proponent explained about the	--



**CHAPTER 7: ADDITIONAL STUDIES**

Sr. No.	Attendee Name	Detail	Issue/Comment/Query	Commitment by Project Proponent	Financial budget for complying the Commitment
			the place where the local entrepreneurs (boat operators) anchor their boats. He wants to know whether any adverse effect on the boat operating activities will be there due to the operation of the Sea Plane.	proposed location of the Water Aerodrome and informed that there will not be any disturbance to boat operators due to the operation of the Sea Plane.	
24	Ashim Debnath	Local Resident	--	--	--
25	Bidhan Mondal	Local Resident	Suggested that during the development of the project a proper road connectivity may be developed for Bharatpur Village.	--	Rs. 1.46 Crore have been allocated for road development.
26	Sandhya Malakar	Local Resident	--	--	--
27	Meera Mondal	Local Resident	--	--	--
28	Sheuli Das	Local Resident	--	--	--
29	Dhiman Bala	EOC	--	--	--
30	Manjuri Paul	AWW	--	--	--
31	Narayan Das	Local Resident	--	--	--
32	Ajay Singh	STS In charge	--	--	--
33	Dipik Sarkar	Local Resident	--	--	--
34	Chameli Das	PSM	--	--	--
35	Bharati Baidya	AWW	--	--	--
36	Urmila Mistry	AWW	--	--	--
37	Kadam Sarkar	AWW	--	--	--
38	L Krishnaveni	AWW	--	--	--
39	Ravi Das	Local Resident	--	--	--



**CHAPTER 7: ADDITIONAL STUDIES**

Sr. No.	Attendee Name	Detail	Issue/Comment/Query	Commitment by Project Proponent	Financial budget for complying the Commitment
40	Uttam Kumar Das	Local Resident	--	--	--
41	Manas Biswas	Local Resident	--	--	--
42	Sanjay Mondal	Local Resident	--	--	--
43	Dasrath Verma	ZPM	--	--	--
44	Primal Das	PRI	--	--	--
45	Ashok Mondal	EOC	--	--	--
46	Asit Baran Roy	Local Resident	--	--	--
47	Sumala Das	AWW	--	--	--
48	Sreemanta Roy	Local Resident	Suggested that during the development of the project a proper road connectivity may be developed for Bharatpur Village.	--	Rs. 1.46 Crore have been allocated for road development activities.
49	Parimal Tarafder	Local Resident	--	--	--
50	Gopal Chatarjee	Local Resident	--	--	--
51	Albunus	Local Resident	--	--	--
52	Mohammed Mansoor	Patwari	--	--	--
53	Santosh Kumar	Police Radio	--	--	--
54	R Basker	Police	--	--	--
55	Divya Kumari	AWW	--	--	--
56	Shantilata Biswas	AWW	--	--	--
57	Sudeep Kumar Das	Choudhary Rev Dept	--	--	--



**CHAPTER 7: ADDITIONAL STUDIES**

Sr. No.	Attendee Name	Detail	Issue/Comment/Query	Commitment by Project Proponent	Financial budget for complying the Commitment
58	Robin Biswas	Local Resident	--		
59	Dr. (Mrs.) Baljit Kumar	SVO/VD/SNDP	--	--	--
60	Ashutosh Chaterjee	Local Resident	--	--	--
61	Chinmay Biswas	DTRM-EPNK	--	--	
62	Satyaranjan Roy	Local Resident	--	--	--
63	Sushanta Gharami	Local Resident	--	--	--
64	V Narasimha	Local Resident	--	--	--
65	Ratan Sarkar	Local Resident & A/A	--	--	--
66	K Dunnamma	Local Resident	--	--	--
67	Jagrani	AWW	--	--	--
68	Somra Dhanwar	Local Resident	--	--	--
69	Sriti Mazumder	Local Resident	--	--	--
70	Manojit Mondal	Local Resident	--	--	--
71	Dulal Bain	Local Resident	--	--	--
72	Sukumar Paik	Local Resident	--	--	--
73	Kmr. Saibaba	ASI, PS Shaheed Dweep on duty	--	--	--
74	R. Sujit	J.E Electricity	--	--	--



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### CHAPTER 7: ADDITIONAL STUDIES

<b>Sr. No.</b>	<b>Attendee Name</b>	<b>Detail</b>	<b>Issue/Comment/Query</b>	<b>Commitment by Project Proponent</b>	<b>Financial budget for complying the Commitment</b>
75	Timir Shah	Environmental Consultant - Enviro Resources	--	--	--
76	Sandeep Dhamne	Principal Consultant - Feedback Infra Pvt. Lt.	--	--	--

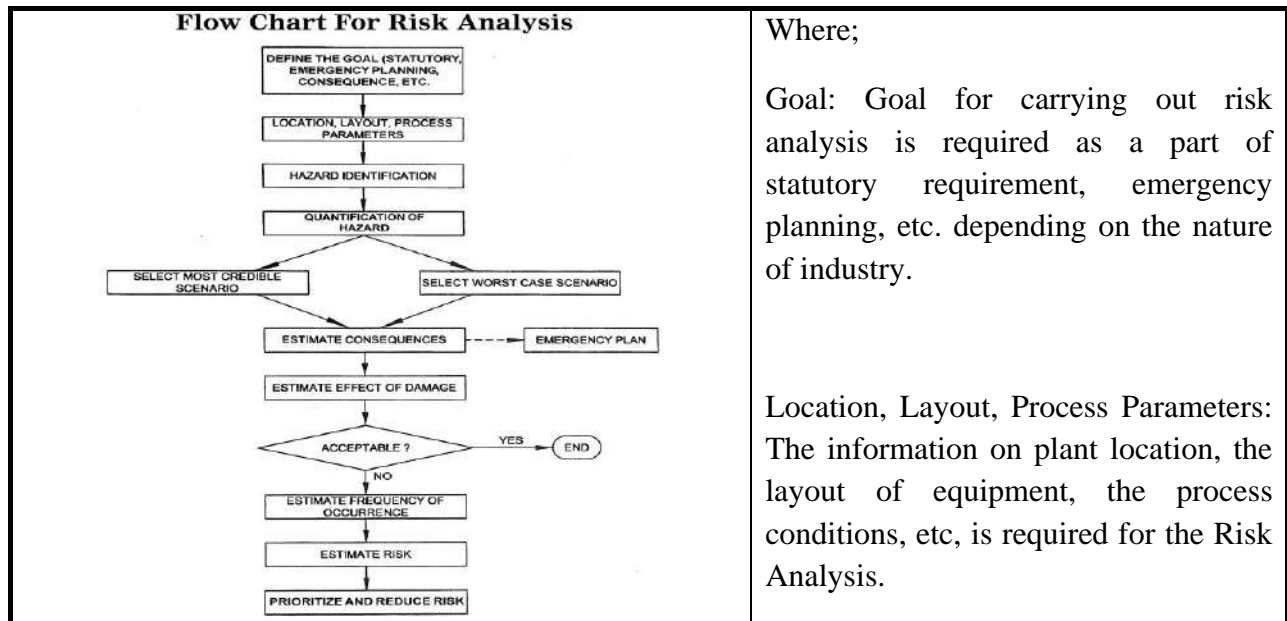


The proceedings and minutes of the Public Hearing are as provided as *Annexure 5*.

## 7.2 Risk Assessment

### 7.2.1 Risk Assessment Methodology

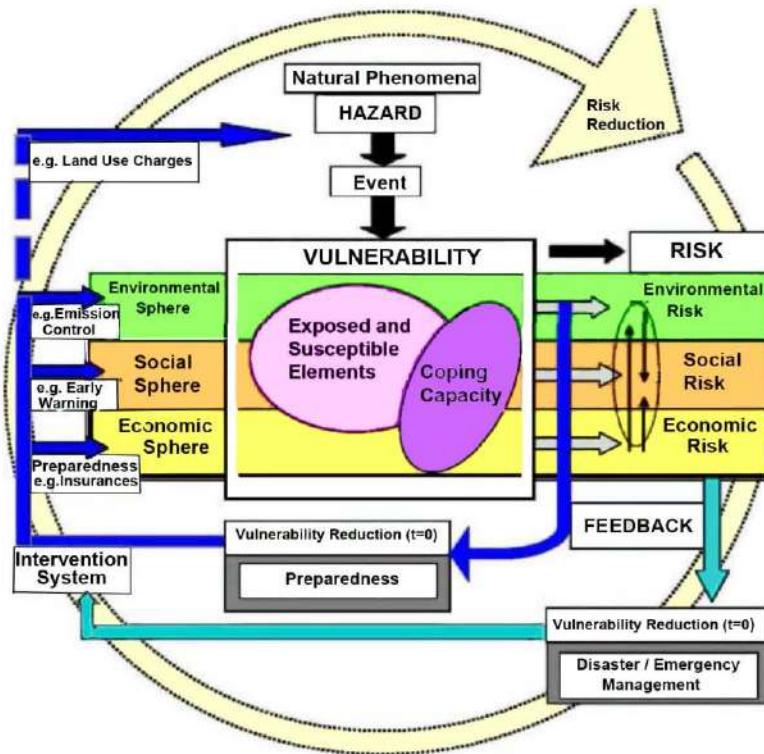
Risk assessment Methodology is as per the “Hazard Identification and Hazard Analysis Techniques of Hazard Identification and Risk Analysis – Code Of Practice IS 15656: 2006.”



- Hazard Identification: Hazard identification is done by comparative and/or fundamental methods leading to qualitative or quantitative results.
- Quantification of Hazards: The indices method for hazard identification can assess the hazard potential for the identified scenarios and can be used as a tool for screening.
- Select Most Credible Scenario: The credible scenarios which can culminate into an accident out of several major and minor scenarios, possible for the release of material and energy.
- Select Worst-Case Scenario: The incident, which has the highest potential to cause an accident of maximum damage, is selected for further analysis.
- Estimate Consequences: The consequences of scenarios in the plant in the form of fire, explosion and toxic effects have to be estimated and presented.
- Estimate Frequency of Occurrence: The probability or frequency of its occurrence of any incident is to be found out by reliability analysis, which includes fault tree/ event tree, etc.

While identifying the hazard(s) a filtering process is carried and only portions with potential risk are involved for risk analysis. Hazard is not considered for further analysis, if it is;

- Unrealizable, and
- Not very significant.



Source : Author, based on Bogardi/ Birkmann (2004) and Cardona (1999/ 2001)

**Figure 7.1: Vulnerability the BBC - Conceptual Framework**

In the present study the reliable data in this regard is not available. Also the study doesn't take in to account category of human factor because of the absence of the human failure data. However, the risk is as low as broadly acceptable region likelihood of such an incident is considered as being extremely low. It should be noted it depends heavily upon the maintenance of the hardware and of the management procedures; neglect of either will lead to loss of protection and the rating will rise to the higher level.

### 7.2.2 Classification of Emergency/ Disaster

**Table 7.1: Disaster Category**



**CHAPTER 7: ADDITIONAL STUDIES**

SN.	INCIDENCE	VULNERABILITY						CATEGORY/ LEVEL OF EMERGENCY
		Personnel			Property			
		Before Emergency	During Emergency	After Emergency	Before Emergency	During Emergency	After Emergency	
1.	Fall of structure.	Low.	High.	Moderate.	Low.	High.	Low.	1
2.	Trapped in lift.	Low.	Moderate.	Moderate.	Low.	Low.	Low.	1
3.	Fire/ Explosion.	Low.	High.	Moderate.	Low.	High.	Low.	3
4.	Bomb threat.	Low.	High.	Moderate.	Low.	High.	Low.	3
5.	Flooding.	Low.	Low.	Low.	Low.	Low.	Low.	1
6.	Cyclone.	Low.	High.	Low.	Low.	High.	Low.	3
7.	Earthquake.*	Low.	High.	Moderate.	Low.	High.	Moderate.	3

Where;

Category 1:	Events can be controlled by Fire/ Security department with local resources.
Category 2:	Events action plan requires additional help from local fire brigade and evacuation.
Category 3:	Events action plan requires mobilization of external agencies, resources and evacuation.

**Table 7.2: Preliminary Hazard Analysis**

IDENTIFICATION OF HAZARD CHECK LIST		PHASE OF THE PROJECT		
Hazard		Construction	Operation	Post Operation/ Decommissioning
Natural Causes	Cyclone.			
	Earth quake.	√	√	√
	Land slide.	√	√	√
	Flooding - heavy rain, Nalla flooding.	√	√	√
	Tsunami.	√	√	√
Physical Hazards	Noise.	√	√	√
	Radiation (UV, radioactive materials).	√	√	√
	Extreme temperatures.	√		
	Vibration.	√	√	√
Bio Hazards	Epidemics/ communicable diseases by pests, insects, rodents etc.	√	√	√
	Toxic marine organism near coastal region.	√	√	√
	Honey bees/ animal/ snake bites.	√	√	√



**CHAPTER 7: ADDITIONAL STUDIES**

	Occupational health hazards at STP, Diesel tank.	√	√	√
<b>Electrical Hazard</b>	Transformer fire/ explosion.		√	√
	Power transmission tower line wire snap/ up routing tower in escape route.		√	√
	Lightening strike.		√	√
	Fires due to Short circuit.	√	√	√
	Power outage.	√	√	√
<b>Hazardous Substances &amp; Wastes</b>	AC, Refrigerators, Air conditioners units - fire/ explosion.	√	√	
	Diesel fire at DG set.	√	√	√
	Foul odor at STP.		√	√
	Hazardous waste uncontrolled disposal - batteries, Asbestos containing - Dust, Glass, Plastics, Steel.	√	√	√
	Hazardous waste uncontrolled disposal- e-waste batteries.	√	√	√
	Industrial accidents, toxic gas release, fire/ explosion.	√	√	√
	Smoke in fire, acid gases in fire, dumping yard.	√	√	√
	Transport accident at express way.	√	√	
	Vehicles accidents, fire.	√	√	√
Toxic gas release (Carbon Monoxide) at parking lot.	√	√	√	
<b>Mechanical</b>	Failure of machinery and equipment.	√	√	√
	Lack of safety guards in machines.	√	√	√
	Poor maintenance of machinery and equipment.	√	√	√
	Power driven tools, saws, grinders and abrasive cutting wheels.	√	√	√
	Scaffolding – fixed and portable failure.	√	√	√
	Structural failure.	√	√	√
	Truck and transport vehicles.	√	√	√
<b>Frequent Causes Of Accidents During Maintenance Activity</b>	Being struck by falling object.	√	√	√
	Caught in or compressed.	√	√	√
	Cranes, winches, hoisting and hauling equipments malfunction.	√	√	√
	Dusting.	√	√	√
	Electricity (electrocution).	√	√	√
	Fall from height.	√	√	√
	Fire and explosion - Explosives, Blasting chemicals uncontrolled explosion during demolition/ land development.			√
	Hit by sharp objects.			√
	Injuries during handling heavy objects.			√
	Lack of PPE, housekeeping practices, safety signs.	√	√	√
	Oxygen deficiency in confined spaces	√	√	√
	Paint/ thinner cleaners, pesticides, waste oil, flammable combustible materials fire at store.	√	√	√
	Poor illumination.	√	√	√
	Slipping on wet surfaces.			√
Snapping cables, ropes, chains, slings, hooks, chains.	√	√	√	
Struck by moving objects.	√	√	√	



**CHAPTER 7: ADDITIONAL STUDIES**

	Welding fumes and Radiations.			√
<b>Ergonomics &amp; Psychosocial Hazards</b>	Repetitive and monotonous work, excessive workload, strain injuries.	√	√	
	Mental stress, human relations; (aggressive behavior, alcohol and drug abuse, violence).	√	√	√
	Poverty, low wages, lack of education.	√	√	√
	Shaheed working hours, shift work, night work, temporary employment.	√	√	√
<b>Others</b>	Drowning.	√	√	√
	Flight safety hazard sources such bird hits.	√	√	√
	The vegetation, coral reef exposure to human activity.	√	√	√
	Escalating the designed event during Mock Drill.	√	√	√
	Power outage to emergency equipments/ cable failure.	√	√	√
	automatic sliding doors at exit and entry points of Terminal Building system failure.		√	
	Stampede during evacuation/ at assembly point.	√	√	√
	Spreading rumors.	√	√	√
	Organic contaminated water generated during fire fighting operations, sprinkler operation, spill/ floor washing may enter storm drain. Damage to costal environment.	√	√	√
<b>Environmental Conditions</b>	Heavy rain.		√	
	Wind shear.		√	
	Tailwind.		√	
	Crosswind.		√	
	Bird strike.		√	
	Fog.		√	
	Ice.		√	
	Vortex shedding.		√	
<b>Runway Conditions</b>	Inadequate markers.		√	
	Loss of runway lights.		√	
	Failure of ILS.		√	
	Absence of VASI.		√	
	FOD.		√	
	Loss of friction.		√	
	Aquaplaning.		√	
	Presence of snow on the runway.		√	
	Presence of ice on the runway.		√	
<b>Aircraft Performance Characteristics</b>	Outbreak of pneumatic.		√	
	Engine failure.		√	
	Thrust reverse failure.		√	
	Flap failure.		√	
	Spoiler failure.		√	
	Brake failure.		√	
	Landing gear failure.		√	



**CHAPTER 7: ADDITIONAL STUDIES**

	Loss hydraulic power.		√	
	Loss electrical power.		√	
	Anti-skid system failure.		√	
	High speed.		√	
<b>Human Factor</b>	Inadequate crew competence.		√	
	Inadequate ATC service.		√	
	Inadequate maintenance.		√	
	Incorrect loading of the aircraft.		√	
<b>Unknown</b>	Unknown causes.		√	

**Table 7.3: Top Ten Hazardous Locations**

1	Fire/ explosion hazard due to gas cylinders during construction phase.
2	Security threat.
3	Toxic gases release at Confined Space (STP).
4	Stampede during evacuation.
5	Fire/ explosion hazards due to, combustible material used for interior decoration.
7	Fire/ explosion hazard at fuel at DG set, transformer/ electric substation.
8	Natural disaster like tsunami.
9	Natural hazards like cyclone, land slide & earthquakes.



Table 7.4: Safety Information Sheet

SAFETY INFORMATION SHEET		
	<b>NAME (S)</b> : KEROSENE, JET FUEL	PK-1 UN No: 1223
	<b>CHEMICAL FORMULA</b> : A Complex mixture of Hydrocarbons.	
PHYSICAL PROPERTIES	OTHER CHARACTERISTICS	
D.R. : 145°C to 300°C S.G. : 0.80 (approx) V.D. : 4.5 (Air=1) F.P. : 35°C to 50°C E.L. : 0.7-5.0% by vol in air I.T. : 210°C	Combustible liquid. Low volatility, water white to straw tint in colour. The odour ranges from aromatic to odourless. Actual composition varies widely depending on the crude oil from which it is produced and method of preparation, but generally aliphatic hydrocarbons in the C <sub>9</sub> to C <sub>16</sub> range predominate. Aromatic hydrocarbon content ranges from 5% to 20% approximately. Solubility (water) : 0.0002 to 0.0004g/100ml (20°C).	
<b>TLV/MAC VALUE :</b> No threshold limit values has been established. However, the TLV of 500 ppm for petroleum naphtha might be used as a base for assessing kerosine exposures.		
HAZARDS	PRECAUTIONS	EXTINGUISHING AGENTS
<b>*FLAMMABLE*</b> Fire :- Moderate, when exposed to heat or flame; can react with oxidising materials. Explosion :- Moderate, when exposed to heat or flame.	No open flame. Adequate ventilation; keep away from oxidising agents.	Foam, carbon dioxide, dry chemical, BCF, BTM, CBM, DBC. water may be ineffective but may be used to cool fire exposed containers.
SYMPTOMS	PRECAUTIONS	FIRST AID
<b>Inhalation</b> :- Dizziness, headache and nausea; depresses the central nervous system and has an anesthetic effect. Continued inhalation can produce visual and auditory hallucinations, delirium and mania. Symptoms may also be fatigue, somnolence, staggering gait, sleepiness, loss of consciousness and loss of memory. Gastro intestinal disturbances, conjunctivitis, bronchitis and pneumonia may also result. <b>Ingestion</b> :- Spontaneous vomiting, low to moderate oral toxicity. Irritation of the mouth, throat and gastro intestinal tract, nausea, weakness, dizziness, slow and shallow respiration, convulsions, unconsciousness. <b>Skin and Eye Contact</b> :- Skin irritant, prolonged contact can result in drying of skin, dermatitis and eye irritation.	Kerosine should not be used as solvents to remove oil or grease from skin. Excessive exposure to kerosine mist should be avoided. Adequate ventilation should be provided to maintain vapor concentration below the safe level. Proper personal respiratory protective device such as fresh air mask or a canister mask approved for organic vapors should be worn, when kerosine is used as a spray or at elevated temperatures. It should never be siphoned by mouth. It should be stored in clearly marked containers well out of the reach of children. Goggles, faceshield, coveralls, rubber gloves and rubber boots should be worn to avoid prolonged contact.	Remove victim from contaminated atmosphere. Artificial respiration should be applied immediately if breathing is interrupted. If ingested, do not induce vomiting. Paraffin, olive oil or somether vegetable oil may be given orally to retard absorption of kerosine. Gastric lavage and induction of vomiting are not advisable because of the possibility of the development of chemical pneumonia from aspiration of kerosine. Use of oxygen and antibiotics prophylactically may be indicated for prevention of secondary bacterial pneumonia.
<b>ADDITIONAL INFORMATION :</b>		

FIRE & EXPLOSION

TOXICOLOGY



**CHAPTER 7: ADDITIONAL STUDIES**

## DIESEL

INGREDIENTS	CAS No	%	TWA
diesel	68334-30-5	>99	

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS

### PROPERTIES

Liquid.  
Does not mix with water.  
Floats on water.  
Combustible.

### HEALTH HAZARD INFORMATION

**Acute Health Effects:**  
Irritating to skin.  
HARMFUL - May cause lung damage if swallowed.  
Vapors may cause dizziness or suffocation.  
Vapors may cause dizziness or suffocation.  
Inhalation and/or ingestion may produce health damage\*.  
May produce discomfort of the eyes and respiratory tract\*.  
\* (limited evidence).

**Chronic Health Effects:**  
Limited evidence of a carcinogenic effect.  
Cumulative effects may result following exposure\*.  
Repeated exposure potentially causes skin dryness and cracking\*.  
\* (limited evidence).

### EMERGENCY

**Swallowed:**  
Give water (if conscious). Seek medical advice.  
Do NOT give milk or oil.  
Do NOT give alcohol.

**Eye:**  
Wash with running water.

**Skin:**  
Remove contaminated clothing. Wash with water and soap.

**Inhaled:**  
Fresh air. Rest, keep warm. If breathing shallow, give oxygen. Medical attention.

**Advice to Doctor:**  
Evaluate for respiratory distress. Consider lavage with cuffed tube. NO adrenalin.

**Fire Fighting:**  
Foam.

**Spills & Disposal:**  
Eliminate ignition sources.  
Absorb with dry agent.  
Stop leak if safe to do so.  
To clean the floor and all objects contaminated by this material, use water and detergent.

### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS

+	X	+	X	X	+

X: Must not be stored together  
 O: May be stored together with specific precautions  
 +: May be stored together

### PRECAUTIONS FOR USE

**Engineering Controls:**  
Local Exhaust Ventilation recommended.

**Glasses:**  
Chemical goggles.

**Gloves:**  
1.NITRILE

**Respirator:**  
Type A Filter of sufficient capacity

**Storage & Transport:**  
Keep container tightly closed.  
Keep container in a well ventilated place.  
Keep away from food, drink and animal feeding stuffs.  
Store in cool, dry, protected area.

**Fire/Explosion Hazard:**  
Vapors/ gas heavier than air.  
Toxic smoke/fumes in a fire.

### EMERGENCY

**FIRST AID**

**Figure 7.2: Hazmat & Hazard Potential Locations Map**



LEVEL	MEASURE	DESCRIPTION	TIMEFRAME
<b>A</b>	Will Occur	Issue will occur, is currently a problem or is expected to occur in most circumstances.	Weekly.
<b>B</b>	Likely to occur	Issue has been a common problem in the past and there is a high probability it will occur in most circumstances.	Once per month.
<b>C</b>	Should Occur	Issue may have arisen in the past and there is a high probability that it should occur at some time.	Once in 6 months.
<b>D</b>	Could Occur	Issue may have occurred in the past and there is a moderate probability that it could occur at some time.	Once per 10 years.
<b>E</b>	Rare	Issue has not occurred in the past and there is a low probability that it may occur in exceptional circumstances.	Once per life of facility.

The combination of the likelihood and consequence ratings was then compared to the qualitative risk analysis matrix, providing an indication of the magnitude or significance of the impact (ranging from low high to priority). The adopted risk assessment matrix is presented in the following table.

**Table 7.5: Risk Assessment Matrix**

LIKELIHOOD	CONSEQUENCE				
	1 Insignificant	2 Minor	3 Moderate	4 Major	5 Catastrophe
A – Will Occur	S	S	H	H	H
B – Likely to Occur	M	S	S	H	H
C – Should Occur	L	M	S	H	H
D – Could Occur	L	L	M	S	H
E – Rare	L	L	M	S	S

H = High = Detailed research and management planning required at senior levels. Immediate action required.

S = Significant = Senior management attention needed.

M = Moderate = Management responsibility and integration into management plans required.

L = Low = Manage by routine procedures.

### MCA/ Worst Possible Scenario

The major concern of the assessment is to identify the activities falling in a matrix of high & low frequencies at which the failures occur and the degree of its impact. The high frequency, low impact activities can be managed by regular maintenance *i.e* LDAR (Leak detection and repair) programs. Whereas, the low frequency, high impact activities (accidents) are of major concern in terms of risk assessment. As the frequency is low, often the required precautions are not realized or maintained. However, the risk assessment identifies the areas of major concerns, which



require additional preventive measures; likely consequence distances considering domino effects, which will give the possible casualties and ecological loss in case of accidents.

This risk assessment exercise for the site under consideration establishes the significance of impacts first and proceeds to delineate the associated mitigation measures. So the significance here reflects the “worst-case scenario” before mitigation is applied, and therefore provides an understanding of what may happen if mitigation fails or is not as effective as predicted.

Based on this exercise the following table gives identified events having potential of fire/ explosion/ toxic gas release at site operations. Following accident scenarios are considered for further analysis.

SN	EVENTS HAVING SIGNIFICANT CONSEQUENCES
<b>Event 1</b>	High Speed Diesel stock accidental spill followed by pool fire.
<b>Event 2</b>	Vehicle at parking fuel release followed by fire.
<b>Event 3</b>	Sea plane mishap followed by fuel fire/ explosion.

### 7.2.3 Consequence Analysis

#### 7.2.3.1 Likely Accident Scenarios

1	Flammable Fuel spill followed by fire.
2	Flammable gas cylinder fire during construction.
3	Toxic gas release.

These accident scenarios are divided in two categories considering the consequence seriousness and occurrence frequency.

- **Maximum Credible Loss Scenario (MCLS)**
- **Worst Possible Scenario**

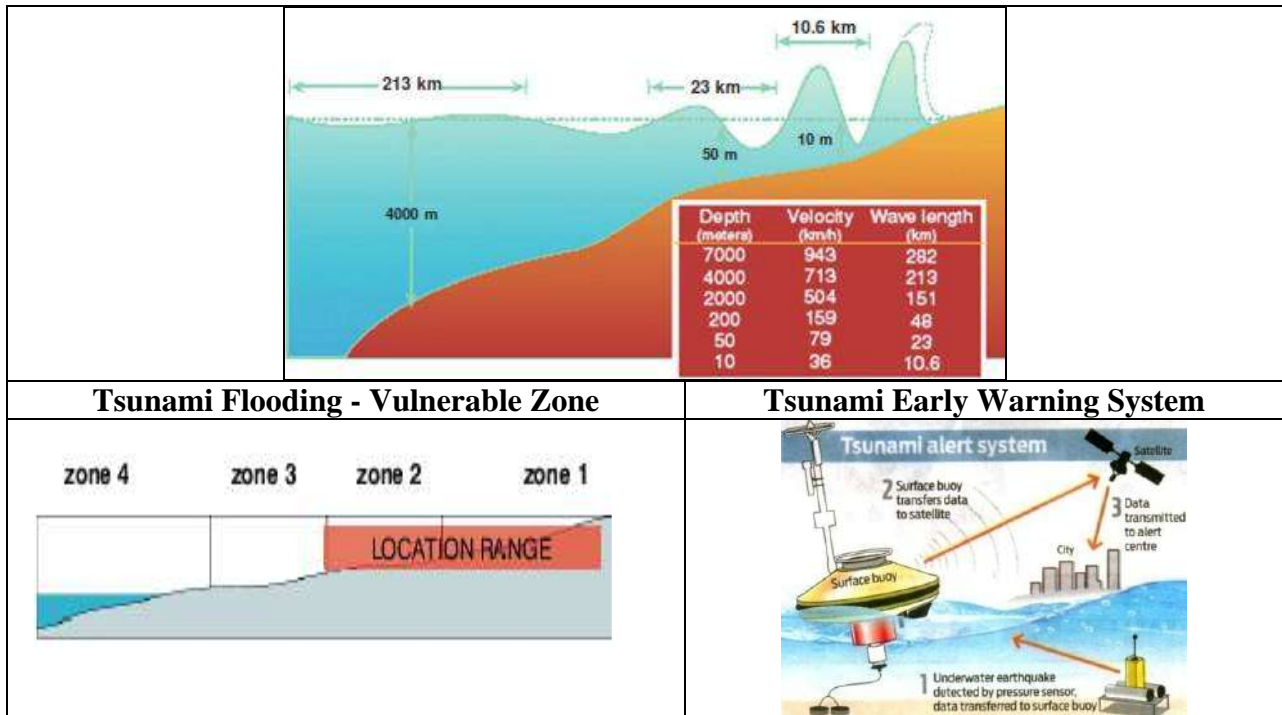
#### Maximum Credible Loss Scenario (MCLS)

Maximum Credible Loss Scenario (MCLS) is one of the methodologies evolved to assess the events in realistic and practical way. An MCLS can be described as the worst “credible” accident or as an accident with a maximum damage distance, which is still believed to be probable. The analysis, however, does not include a quantification of the probability of occurrence of an accident.

### 7.2.4 Vulnerability & Impact Assessment

#### 7.2.4.1 Tsunami

Tsunami velocity is dependent on the depth of water through which it travels, and is equal to the square root of depth times the gravitational acceleration. Tsunami Waves travel at a speed of approximately 700 Km/ hr in 4000 m of water. In 10 m of water the velocity drops to about 36 Km/hr.



**Figure 7.4: Tsunami Flooding**

Hazard Zone	1	2	3	4
Maximum Water Depth	0 to 3 m	3 to 6 m	6 to 9 m	>9 m

**Multi Hazard Data for East Coast of India - Andaman & Nicobar**

Seismic Zone	Design Cyclonic Wind UT [IS:875 (III)] m/sec	Probable Maximum Storm Surge Heights (m)	Astronomical High Tide above Mean Sea Level (m)	Flood Proneness
V	44	**	1.0	-

Tsunami in 26 December 2004.

\*\* Storm surge occurrence in Andaman & Nicobar Islands has not been documented however storms originating over these areas are not intense enough to cause significant surge.

The project site is situated at above mean sea level of 6 to 7 meter.

**7.2.4.2 Flooding**

**Vulnerability:** Heavy rain coinciding with high tide timing. The annual total rainfall is 2968.1 mm.

**Table 7.6: Long Term Meteorological Data Of Port Blair**  
(30 Years Average 1981-2010)



**CHAPTER 7: ADDITIONAL STUDIES**

Month	Temperature (°C) daily		Relative Humidity (%)		Rainfall (mm)	Predominant Wind Direction (From)	Calm Period		Cloud Amounts Oktas all clouds		Wind Speed Km/hr
	Max	Min	08:30	17:30			08:30	17:30	08:30	17:30	
January	29.5	22.4	72	74	32.1	NE, E	9	11	4.3	4.9	5.8
February	30.2	22.1	71	72	16.8	NE, E	16	26	3.5	4.1	4.7
March	31.3	22.7	69	72	32.5	NE, E	22	37	3.7	4.4	4.5
April	32.3	24.1	69	74	75.8	NE, E	19	42	4.6	5.2	4.9
May	31.2	24.2	78	81	368.8	SW, W	16	24	6.2	6.4	8.6
June	29.8	23.9	82	84	448.2	SW, W	3	6	6.9	7.0	13.8
July	29.4	23.8	83	84	442.5	SW, W	6	8	6.9	6.9	12.9
August	29.2	23.6	84	85	446.4	SW, W	5	8	6.9	7.0	14.1
September	29.2	23.0	84	87	458.3	SW, W	14	24	6.6	6.7	9.6
October	29.7	23.0	80	85	301.4	SW, W	28	44	5.9	6.1	6.2
November	29.8	23.3	77	82	242.4	NE, E	15	24	5.6	5.9	6.2
December	29.5	23.0	72	75	103.2	NE, E	7	10	4.8	5.3	6.7
Annual Total or Mean	30.1	23.3	77	80	2968.3	NE, E & SW, W	14	23	5.5	5.8	8.2

Source: IMD, Port Blair.

Being a tropical humid climate high humidity is observed in all the months. The relative humidity in the region ranges between 69-87%. The maximum humidity during rainy season is 87%.

Most of the year clouds were observed in the sky. Maximum of the rain is received in the region from April to December. The Relevant details about the number of days with zero oktas of cloud cover (all clouds) for all months are presented in the following table.

**Table 7.7: No. of days with zero oktas of cloud cover (Port Blair)**

Cloud	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Time 08:30	0	1	1	0	0	0	0	0	0	0	0	0
Time 17:30	0	0	0	0	0	0	0	0	0	0	0	0

**Impact**

- Flooding spots may affect emergency movements and rescue operations on the approach road for external help.
- Direct impact in terms of injury, fatality, loss of property and long term local and wide spread impacts on the residents.

**7.2.4.3 Sea Plane**

A seaplane is a fixed winged aeroplane which is designed for taking off and landing on water and includes amphibians operating as sea planes. A seaplane is in the unique position of being able to provide air service which is practically impossible with any other kind of craft. It offers the public the speed of the airplane with the utility of the boat.



There are two main types of seaplane: flying boats (often called hull seaplanes) and floatplanes. The bottom of a flying boat’s fuselage is its main landing gear. This is usually supplemented with smaller floats near the wingtips, called wing or tip floats. The hull of a flying boat holds the crew, passengers, and cargo; it has many features in common with the hull of a ship or boat.



**SEA PLANE (TYPICAL)**

### **Vulnerability -**

Contact, collision, grounding, cross wind, hits rocks/ objects etc. leading to mishap on water. The onset of hypothermia, and its associated effects, during and following prolonged immersion in cold water; and the immediate toxicity and respiratory effects on survivors in the water following the ingestion of floating fuel and oils and their associated vapors, and fire suppressant foams, powders and gases.

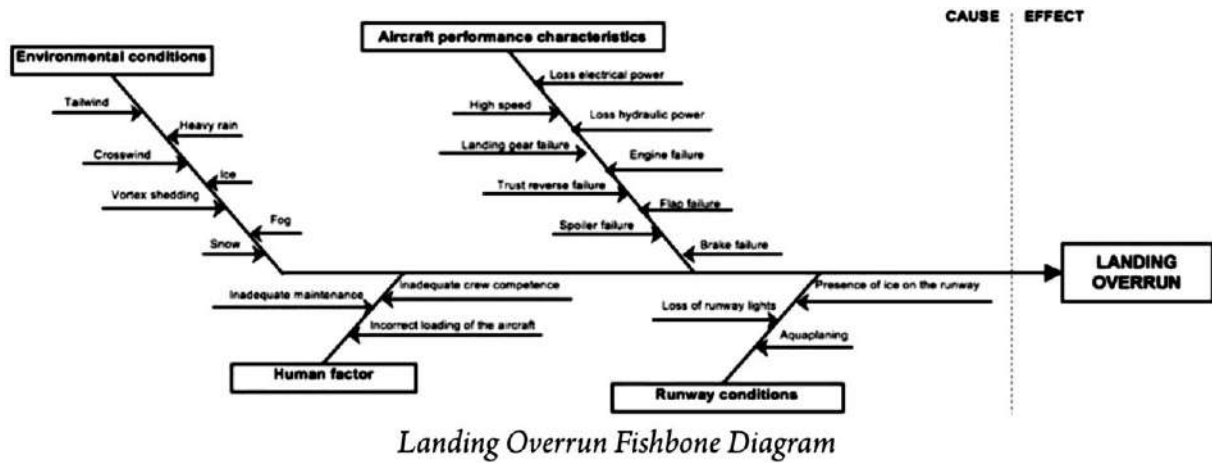
#### **7.2.4.4 Aircraft Crash Incidents**

- Aircraft incidents due to bird strike;
- Hazards posed to infrastructure and surrounding areas

The primary consequences of aircraft crash incidents on the ground include Property damage, injuries or perhaps fatalities. An aircraft crash could also cause an emergency incident at the island or a bush fire in the adjacent wetlands.

Methods for estimating individual risk require three basic quantities:

- i The annual probability that a crash occurs near a given airport (crash frequency). Crash Frequency is estimated from the annual aircraft movements multiplied by the applicable crash rate for each aircraft type;
  - ii The distribution of these crashes with respect to the airport location (crash location); and
  - iii The size of the crash area and the lethality within this area (crash consequence).
- Landing overshoot;
  - Landing veer-off;
  - Take-off veer-off;
  - Landing overrun;
  - Take-off overrun;
  - Ground collision with other aircraft in landing; and
  - Ground collision with other aircraft in take-off.



**Figure 7.5: Landing Overrun Fishbone Diagram**

- The overrun accident is an accident during a landing or an aborted take-off, when the pilot is unable to prevent the aircraft from leaving the paved surface of the runway from its ends. It is a “Longitudinal deviation”, that is the Longitudinal distance travelled beyond the accelerate/stop distance available (for takeoff events), and beyond the landing distance available (for landing events).
- The under shoot accident is a “Longitudinal deviation”, that is the Longitudinal distance the aircraft undershoots the intended threshold.
- The veer-off accident, both take-off and landing, is a overruns in which the aircraft leaves the side (as opposed to the end). It is a “lateral deviation” that is the lateral distance to the extended runway centreline.
- The ground collision with other aircraft is an event where aircraft collide on the runway or while one is on the ground and the other in the air close to the ground, both take-off and landing.

Civil aviation is a complex mosaic of many varied, yet interrelated human, technical, environmental, and organizational factors that affects safety and system performance. Aviation accidents result from multiple contributing factors. Logan (1999) mentioned that operational safety data such as aircraft reliability, flight data records, employee safety reports, enforcement information, inspector investigations or oversight information were also essential to aviation risk analysis.

In the present study the reliable data in this regard is not available. Also the study doesn't take in to account category of human factor because of the absence of the human failure data. However, the risk is as low as broadly acceptable region likelihood of such an incident is considered as being extremely low.

#### **7.2.4.5 Cyclone Strike**

#### **Vulnerability**



The predominant wind direction at Port Blair and neighbouring Islands is from North East and East in November to April months. During monsoon period the predominant wind direction is from South-West and West.

Visibility	Number Of Days In The Year
less than 1 km.	0.5 days
1 to 4 km. range	10.4 days
4 to 10 km. range	95.4 days
between 10 to 20 km.	219.4 days
above 20 km.	39.3 days

### **Special Weather Phenomena**

- The occurrence of thunderstorm is 64.8 days per year, mostly spread across the months of April to July.
- Annual Dust Storm is only 0.2 days during September month.

### **Impact**

- Cyclones bring in their wake considerable loss of life and property.
- Long term wide spread impacts on the residents.
- Destructive potential to damage lifeline infrastructure such as power and communication towers, hospitals, roads etc. due to high velocity winds.
- Direct impact in terms of injury, fatality, loss of property and long term local and wide spread impacts on the residents.
- Structures falling outside protection provided by lightning arrestor are vulnerable exceptionally heavy rainfall associated with cyclone causes flooding. Storm surge inundates low-lying areas.

### **7.2.4.6 Earthquake**

#### **Seismic Vulnerability**

Andaman & Nicobar falls in seismic Zone V which is very high Damage Risk Zone (MSK IX or more).

Year	Remarks
19 <sup>th</sup> August 1868	Earthquake $M_w$ 7.5 in the Bay of Bengal. Tsunami wave run-up level at Port Blair, Andaman Island 4.0 m.
31 <sup>st</sup> December 1881	Earthquake of magnitude $M_w$ 7.9 in the Bay of Bengal, reported tsunami run-up level of 0.76 m at Car Nicobar, 0.3 m at Dublat, 0.3 m at Nagapattinam and 1.22 m at Port Blair in Andaman & Nicobar Islands.
26 <sup>th</sup> June 1941	Earthquake of magnitude $M_w$ 8.1 in the Andaman Sea at 12.9°N, 92.5°E. No reliable data on the resultant tsunamis on the east coast of India. Although there is some unverifiable reports, no press reports of any tsunami related damage from East Coast.

#### **Impact (Unmitigated Risk)**



- Direct impact in terms of injury, fatality, stampede during evacuation, loss of property and Long term local and wide spread impacts on the residents.
- In Zone III, (moderate risk zone) earthquakes of higher intensity may be felt. Earthquakes that frightens everyone, making it difficult for people to stand. Even people in moving vehicles may feel such quakes. Structures/buildings of good design and construction suffer slight damage, while poorly designed/ built ones suffer considerable damages. (\*Intensity: VII).\* Intensity is here considered a classification of the severity of the ground shaking on the basis of observed effects in a limited area and is measured in the MSK Scale ranging from I to XII.

*\* Adopted From National Disaster Management Guidelines, Management of Earthquakes, Seismic Zone Map of India (IS: 1893, 2002)}*

#### 7.2.4.7 Land Slide

Mild rolling topography, dense mass of canopy trees abruptly raising in the coast to a height of 30 – 40 meters, humid climate and high intensity of rainfall are the characteristics generally associated with Swaraj & Shaheed Dweep.

#### Potential Land Slide Causes

- Interference with, or changes to, natural drainage.
- Vibrations caused by earthquake.

#### 7.2.4.8 Fire and Explosion

Fuels handled at site are HSD for **DG Set** also flammable gas cylinder during construction phase.

**Table 7.8: Applicability of "The MSIHC Rules, 1989"**

Group		Max. Storage Capacity (MT.)
5.1	Flammable Gases.	< threshold*
5.3	Very Highly Flammable Liquids: Chemicals having flash point $\leq 23^{\circ}\text{C}$ & boiling point $< 35^{\circ}\text{C}$ .	< threshold*
5.5	Highly Flammable Liquids: Chemicals having $23^{\circ}\text{C} < \text{flash point} \leq 60^{\circ}\text{C}$ .	< threshold*
5.6	Flammable Liquids: Chemicals having $60^{\circ}\text{C} < \text{flash point} < 90^{\circ}\text{C}$ .	< threshold*

\*Criteria used: “The Manufacture Storage and Import of Hazardous Chemicals Rules, 1989”.

At site hazard occurrence may result in,

- Fire and/or explosion.
- Leakage of flammable material.

Damage due to Hazards at ATF stock and HRD stock or at Airport: Model simulations reveal that leakage at HRD store causing fire will be 100% lethal within <10 meters and 50% lethal within <10 meters. Vulnerable zone within abnormal heat is within 15 meters.



As there is no proposal for storage for ATF; BLEVE - fireball due to failure of ATF storage is not credible event. Safe distance for pool fire (leakage) at ATF or HSD spill is < 10 meters.

Vapour Cloud Explosion is due to confined (in a vessel & pipeline) or unconfined explosion (in open air). The peak pressures in confined explosion reach hundreds of KPa while in unconfined it is few KPa. However in the present case the energy of vapor cloud of fuel being less vapor cloud explosion is not credible scenario.

### **DESIGN CONSIDERATION FOR HAZARDOUS MATERIAL STORAGE**

The implication of the above observations is that the location of ATF tank shall be not on the project site but at Port Blair Airport. The design consideration should consider that any spill of HSD at DG set not to enter the storm drain.

### **SMOKE**

In the early stages, smoke from the fire will quickly rise into the roof space. The smoke can spread laterally at a velocity of up to 5 m/s. An average person will walk at 1 to 2 m/s and run at 7.5 m/s. Once the building roof space is full, the smoke will start to build down. The rate at which this occurs varies significantly with the nature of the combustibles and building geometry. Although the smoke is made up mainly of entrained air, it can contain sufficient toxic substances and asphyxiates to disorientate and disable within seconds and kill within minutes.

Most fire-related deaths are due to inhalation of toxic gases in smoke, not to fire or heat it. Carbon monoxide (CO) is thought to be the most common cause of fire-related death. Because of its high affinity for haemoglobin, relatively small concentrations of CO can saturate the blood, form carboxy haemoglobin (COHb), and deprive tissues of oxygenation. In general, COHb smoke can also impede escape from fire, and thereby increase risk of death, by obscuring vision as a result of eye irritation and lacrimation, by impairing mobility, or by impairing mental acuity. The simplest burning scenario is one in which a moderate fire begins on the furniture and does not spread preciously. If the fire size is 100 KW. i.e., about 0.6 m in diameter, it can be shown that the hot smoke will have filled the room to a depth of 1 m from the floor in about 6 min; the temperature of the hot layer will have reached 100°C after 11 min. Hence, by the temperature criterion mentioned above, the environment will have become lethal in 11 min.

#### **7.2.4.9 Security Threat**

**Table 7.9: Vulnerable Zone for Bomb Blast**



**CHAPTER 7: ADDITIONAL STUDIES**

**Bomb Threat Evacuation Guide**

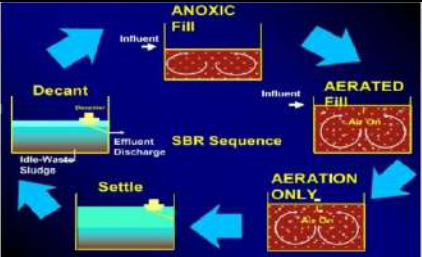
THREAT	DESCRIPTION	EXPLOSIVE QTY	MIN <sup>1</sup> (m)	MAX <sup>2</sup> (m)
	Pipe Bomb Small	100g	80	575
	Pipe Bomb Medium	500g	100	860
	Pipe Bomb Large	2.5kg	130	1,135
	Briefcase/Suitcase	23kg	185	1,520
	Compact Sedan	230kg	270	1,915

Note: The distance estimates are indicative and for initial evacuation.

**Impact**

- Direct impact on occupants in terms of injuries, trauma and fatality likely during evacuation. Long term trauma on the residents.
- Stampede during evacuation.

**7.2.4.10 Toxic Gas Release**

<p>A typical sewage treatment plant consists of the following;</p> <ul style="list-style-type: none"> <li>➤ Biological treatment</li> <li>➤ Filtration</li> <li>➤ Chlorine Contact Tank</li> <li>➤ Sludge Treatment</li> </ul>	
--	--

Identification of Hazards								
Hazards	Confined Space			Chlorine gas poisoning	Fall	Slip	Electric Shock	Fire
	Oxygen Deficiency	Hydrogen Sulphide poisoning	Combustible Gas					
<b>Location: On - Site;</b>								
Septic tanks	✓	✓						
Anaerobic filters	✓	✓						
Closed drains	✓	✓						
Sewers	✓	✓	✓			✓		
Manholes	✓	✓	✓		✓			
Closed drains	✓	✓	✓					
Electrical equipment							✓	✓
Electric room							✓	✓

**Confined Space Hazards**

Possible hazards in confined space include Oxygen deficiency, Hydrogen Sulphide poisoning, and danger of combustible gases.



**Risk of Oxygen Deficiency**

- When oxygen concentration drops below 17%, shortness of breath may occur.
- If the concentration reduces further, consciousness may be lost.
- When the oxygen concentration drops below 10%, death may result.

Oxygen Concentration (%)	Symptoms of Anoxia
19.5	Human begin to suffer adverse health effects when the oxygen level of their breathing air drops below 19.5%.
16 to 19.5	Workers engaged in any form of exertion can rapidly become symptomatic as their tissues fail to obtain the oxygen necessary to function properly. Increased breathing rates, accelerated heartbeat, and impaired thinking or coordination occur more quickly in an oxygen-deficient environment. Even a momentary loss of coordination may be devastating to a worker if it occurs while the worker is performing a potentially dangerous activity, such as climbing a ladder.
12 to 16	Concentration of 12 to 16% oxygen causes increased breathing rate, accelerated heartbeat, and impaired attention, thinking and coordination, even in people who are resting.
10 to 14	At oxygen levels of 10 to 14 %, faulty judgment, intermittent respiration, and exhaustion can be expected even with minimal exertion.
6 to 10	Breathing air containing 6 to 10% oxygen results in nausea, vomiting, lethargic movements, and perhaps unconsciousness.
Below 6	Breathing air containing less than 6% oxygen produces convulsions, then cessation of breathing, followed by cardiac arrest. These symptoms occur immediately. Even if a worker survives the oxygen deficiency, organs may show evidence of oxygen-deficiency damage, which may be irreversible.

**Risk of Hydrogen Sulphide Poisoning In Confined Space**

- Hydrogen sulphide is extremely toxic. Sometimes it may be generated in high concentration in a sewage treatment facility, which causes immediate death.
- Hydrogen sulphide enters the body through eyes or mucous membrane of breathing organs.
- Blood seeps out from the capillaries in cavities of the lungs, causes pulmonary oedema, leading to breathing difficulties and death by suffocation.
- In sewer facilities, it is generated in rising mains with no oxygen supply and in inverted siphons, etc., where sludge is likely to accumulate easily.
- It is generated in grit chamber, pumping well, sedimentation basin, and sludge thickening tank in sewage treatment plants.
- Hydrogen sulphide generated in sewage and deposited sludge is sealed within and in the static condition, so it does not disperse to the atmosphere easily. However, when agitated, it disperses all at once to the atmosphere.

**Fall**

- Accidents frequently occur while climbing/ descending ladders.
- Accident often occurs while working at high places.

**Slip**



**Electric shocks occur because of the following;**

- Exposure of live parts and defects such as damage to insulating sheath.
- Inappropriate work such as forgetting to use insulated protective gear, touching live parts by mistake, etc.

The electric shock level when a person suffers an electric shock may be quantified by the equation below.

**Electric shock level = Shock current (mA) × duration (s)**

**Effects on the human body when subjected to electric shock;**

A	Mild sensation, but not painful.
B	Painful shock but muscle still in control.
C	Muscle control affected.
D	Muscle contraction, breathing affected.
E	Rapid, uncoordinated series of contractions of heart muscle causing irregular heartbeat (fibrillation) and possible death.
F	Severe burns, muscle contractions, stoppage of heart, death certain.

**7.2.4.11 Wildlife Strike Hazard**

Insect bites. The presence of wildlife (birds) on and in the water aerodrome vicinity poses a serious threat to seaplane operational safety. Wild life is attracted to air field because of Food, Water, Habitat cover and security.

**7.2.4.12 Oil Spill Affective Environment**

Assessment, relevance and reliability of analytical methods and framework used in risk assessment are given in Annexure 3.

**7.2.4.13 X-Ray Radiation Hazards**

X - Ray machines are used for bag scanning operation at terminal building; however there are no known adverse effects from eating food, drinking beverages, using medicine or applying cosmetics that have been irradiated by cabinet X - ray system used for security screening. The radiation dose typically received by objects scanned by a cabinet X - ray system is 1 millirad or less.

**7.2.4.14 Biological Disasters**

Biological disasters are scenarios involving disease, disability or death on a large scale among humans, animals and plants due to toxins or disease caused by live organisms or their products. Such disasters may be natural in the form of epidemics or pandemics of existing, emerging or remerging diseases and pestilences or man-made by the intentional use of disease causing agents in Biological Warfare (BW) operations or incidents of Bioterrorism (BT).

**Epidemics**

The outbreak of a disease affecting or tending to affect a disproportionately large number of individuals within a population, community, or region at the same time.



## **Pandemics**

A pandemic is an epidemic (an outbreak of an infectious disease) that spreads across a large region (for example, a continent), or even worldwide.

### **Corona virus disease (COVID-19)**

Symptoms: People may experience:

- Cough
- Fever
- Difficulty breathing (severe cases)

In more severe cases infection can cause pneumonia, severe acute respiratory syndrome, and even death. The period within which the symptoms would appear is 2-14 days.

Using available preliminary data, the median time from onset to clinical recovery for mild cases is approximately 2 weeks and is 3-6 weeks for patients with severe or critical disease

### **7.2.5 Failure Frequency Assessment**

The frequency assessment stage of the analysis involved defining the potential release sources and subsequently determining the likelihood (frequency) of the various releases. The failure frequencies were determined using failure item counts for each of the failure items identified and publicly available historical failure rate data. Ignition probability data was used to estimate the probability of a release subsequently being ignited.

**Table 7.10: Event Failure Frequency**

<b>SN</b>	<b>Event</b>	<b>Event Frequency/ Yr</b>
Event 1	High Speed Diesel stock accidental spill followed by pool fire.	$1 \times 10^{-4}$
Event 2	Vehicle at parking fuel release followed by fire.	$1 \times 10^{-4}$
Event 3	Sea plane mishap followed by fuel fire/ explosion.	$1 \times 10^{-5}$

It is reasonable to assume this change however it should be noted it depends heavily upon the maintenance of the hardware and of the management procedures; neglect of either will lead to loss of protection and the rating will rise to the original estimate (a) indicated above.

### **7.2.6 Risk Assessment**

#### **7.2.6.1 Event**

**Comprehensive risk analysis for sea plane crashing/catching fire at the sea-aerodrome with estimated ATH consumption:**

#### **SYSTEM DESCRIPTION**

**Table 7.11: System Description**

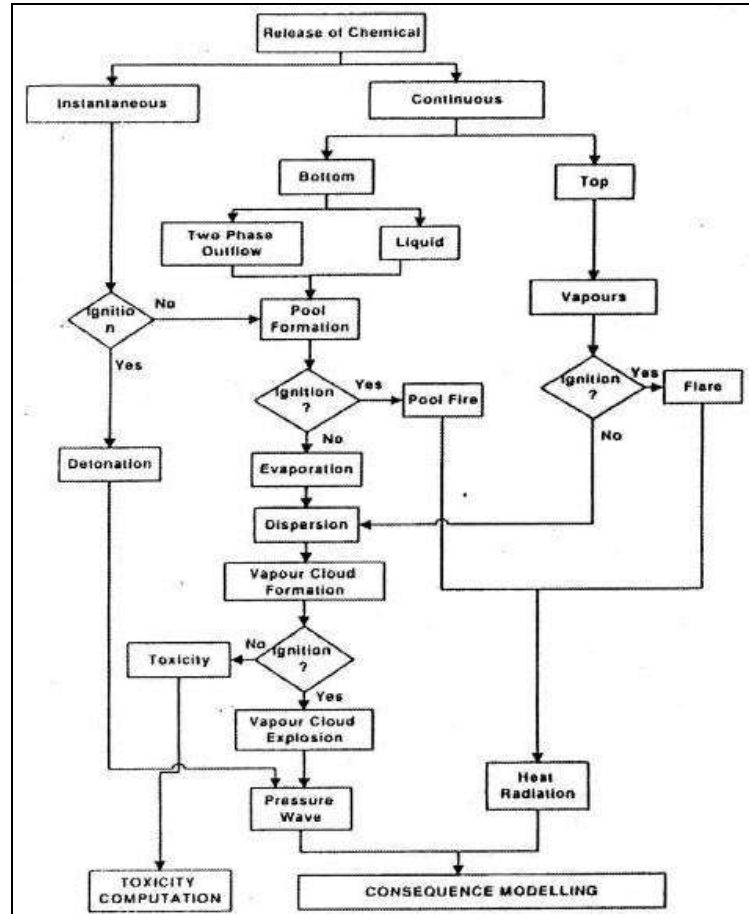


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Sr. No.	Technical Parameters	Details
1	Exterior	<ul style="list-style-type: none"> <li>▪ Exterior Height: 14 ft 2 in</li> <li>▪ Wing Span: 52 ft 1 in</li> <li>▪ Length: 37 ft 7 in</li> </ul>
2	Interior	<ul style="list-style-type: none"> <li>▪ Cabin Height: 4 ft 3 In</li> <li>▪ Cabin Width: 5 ft 2 In</li> <li>▪ Cabin Length: 14 ft 10 In</li> <li>▪ Cabin Volume: 271 cu ft</li> <li>▪ Door Height: 4 ft 1 In</li> <li>▪ Door Width: 4 ft 2 In</li> <li>▪ Internal Baggage: 32 cu ft</li> </ul>
3	Occupancy	<ul style="list-style-type: none"> <li>▪ Crew: 1</li> <li>▪ Passengers: 9</li> </ul>
4	Operating Weights	<ul style="list-style-type: none"> <li>▪ Max T/O Weight: 8000 Lb</li> <li>▪ Max Landing Weight: 7800 Lb</li> <li>▪ Operating Weight: 4940 Lb</li> <li>▪ Empty Weight: 3860 Lb</li> <li>▪ Fuel Capacity: 2224 lbs Lb</li> <li>▪ Payload W/Full Fuel: 871 Lb</li> <li>▪ Max Payload: 2860 Lb</li> </ul>
5	Range	<ul style="list-style-type: none"> <li>▪ Normal Range: 325 nm</li> <li>▪ Max Range: 835 nm</li> <li>▪ Service Ceiling: 25000 ft</li> </ul>
6	Distances	<ul style="list-style-type: none"> <li>▪ Balanced Field Length: 2055 ft</li> <li>▪ Landing Distance: 2508 ft</li> </ul>
7	Performance	<ul style="list-style-type: none"> <li>▪ Rate of Climb: 1234 fpm</li> <li>▪ Max Speed: 186 kts</li> <li>▪ Normal Cruise: 175 kts</li> <li>▪ Economy Cruise: 147 kts</li> <li>▪ Cost per Hour: \$ 659.12</li> </ul>
8	Power Plant	<ul style="list-style-type: none"> <li>▪ Engines: 1</li> <li>▪ Engine Mfg: Pratt &amp; Whitney Canada</li> <li>▪ Engine Model: PT6A-114A</li> </ul>

**ACCIDENT SCENARIO**

Sea plane crash for various reasons as detailed in the text of the report resulting in large spill of Aviation fuel followed by fire/ explosion. In addition and natural and synthetic oils used as lubricants, and hydraulic oils etc. spill leading to pollution issues.



**Figure 7.6: Consequence Analysis**

**MAXIMUM CREDIBLE ACCIDENT (MCA)**

The maximum quantity of Aviation fuel viz. 1419 lit which can be stored in a plane is taken into account for assessment of worst scenario. Instantaneous release of considered at the time of sea plane crash is selected as MCA (Maximum Credible Accident) and considered for consequence analysis.

**Table 7.12: Down Wind Affect Distance (Dispersion)**

DOWNWIND AFFECT DISTANCE DISPERSION							
Sr. No.	ACCIDENT SCENARIO RELEASE OF	Wind speed, Atmospheric Stability	DOWNWIND AFFECT DISTANCE (m)				
			Toxic Vapor Cloud			Flammable Vapor Cloud	
			PAC 3	PAC 2	PAC 1	60 % LEL	10 % LEL
1	Aviation fuel on land.	4 D	146	417	1500	82	227
2	Aviation fuel on open water	4D	389	888	2200	226	565



**Table 7.13: Down Wind Affect Distance (VCE and Pool Fire)**

DOWN WIND AFFECT DISTANCE (VCE and POOL FIRE)								
Sr. No.	ACCIDENT SCENARIO  RELEASE OF	Wind speed, Atmospheric stability	DOWNWIND AFFECT DISTANCE (m)					
			Blast Over Pressure (psi)			Thermal Radiation (KW/m <sup>2</sup> )		
	8		3.5	1.0	10	5	2	
1	Aviation fuel on land.	4 D	LOC not reached.			20	30	48
2	Aviation fuel on open water.	4D	LOC not reached			NA	NA	NA

**IMPACT ASSESSMENT**

**Table 7.14: Sea Plane Crash on Land - Anticipated Impacts & Mitigation Measures**

SEA PLANE CRASH ON LAND		
SN	IMPACT IDENTIFIED	RISK MITIGATION MEASURES
1	<p><b>FIRE/EXPLOSION:</b></p> <ul style="list-style-type: none"> <li>Thermal radiations radiation Exposure and Lethality impact at various levels of thermal radiations is given in the following table. <ul style="list-style-type: none"> <li>✓ Flash fire likely up to 82 m in case of uncontrolled spreading of the liquid pool formed affecting flora fauna in the vulnerable zone.</li> <li>✓ Fire if the vapors find source of ignition 50 % fatality is estimated up to &lt; 10 m from the crash site.</li> <li>✓ No explosion is likely as the LOC is not reached.</li> <li>✓ Inhalation of toxic gases -The immediate toxicity and respiratory effects on survivors on inhalation of the smoke.</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>Crash and rescue facilities.</li> <li>Trained rescue team.</li> <li>Foam stock for fire fighting.</li> <li>Mock Drills.</li> <li>Fire Drills.</li> </ul>
2	<p><b>FUEL SPILL:</b></p> <ul style="list-style-type: none"> <li>Exposure pathways include thermal contact, consumption through bioaccumulation in marine life, consumption through contaminated soil, inhalation of fumes or particles (particularly in confined spaces), and consumption of contaminated water.</li> <li>Air pollution: Most of the products like fuel oil, hydraulic oil, lubricating oil used do not have toxic hazards above certain threshold limits, and therefore do not impose serious health threats to exposed persons. However, immediate rescue is important. Further, most seaplanes operate with turbo-prop engines, which use aviation fuel which does not contain some of the more volatile compounds found</li> </ul>	<ul style="list-style-type: none"> <li>Measures to control oil spills.</li> <li>Cleanup and notification procedures.</li> <li>Oil spill containment, collection and disposal procedure.</li> <li>For spill prevention or control, booms, oil sorbents and barriers, can be used to reduce impacts to the environment in the event of a spill.</li> <li>Spill cleanup equipment.</li> </ul>



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	<p>in many marine engine fuels.</p> <ul style="list-style-type: none"> <li>• Soil pollution: Light refined petroleum products, such as gasoline and kerosene, spread on water surfaces and penetrate porous soils quickly. Fire and toxic hazards are high, but the products evaporate quickly and leave a little residue.</li> <li>• Ground and Surface Water: Contamination hazard of the water sources likely.</li> </ul>	
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**Table 7.15: Radiation Exposure & Lethality**

Radiation Intensity (KW/m <sup>2</sup> )	Exposure Time (Seconds)	Lethality (%)	Degree of Burns
1/6	-	0	No Discomfort even after Long exposure
4.5	20	0	1st
4.5	50	0	1st
8	20	0	1st
8	50	<1	3rd
8	60	<1	3rd
12	20	<1	2nd
12	50	8	3rd
12.5	-	1	-
25	-	50	-
37.5	-	100	-

Source: [http://europe.osha.eu.int/good\\_practice/risks/ds/oel](http://europe.osha.eu.int/good_practice/risks/ds/oel) accessed December 2008

**Table 7.16: Sea Plane Crash on Water- Anticipated Impacts & Mitigation Measures**

SEA PLANE CRASH ON WATER		
SN	IMPACT IDENTIFIED	RISK MITIGATION MEASURES
1	<p><b>FIRE/EXPLOSION:</b></p> <ul style="list-style-type: none"> <li>• Flash fire likely up to 226 m, however the estimate heavily depends on the sea condition like wind, waves etc.</li> <li>• No explosion is likely as the LOC is not reached.</li> </ul>	<ul style="list-style-type: none"> <li>• Crash and rescue facilities.</li> <li>• Trained rescue team.</li> <li>• Foam stock for fire fighting.</li> <li>• Mock Drills.</li> <li>• Fire Drills.</li> <li>• Life guard and floats for passengers.</li> </ul>



2	<p><b>FUEL SPILL:</b></p> <ul style="list-style-type: none"> <li>• It may pose hazard to marine life (and human life), and the likelihood that it will pose a threat to natural and manmade resources.</li> <li>• Spilled oil immediately begins to move, wither, changing its physical and chemical properties. As these processes occur, the oil threatens natural resources, birds, and mammals, as well as a wide range of subsurface marine organisms linked in a complex food chain. Some organisms may be seriously injured (acute effects) or killed (lethal effects) very soon after contact with the oil in a spill.</li> <li>• Marine life on reefs and shorelines is at risk of being smothered by oil that washes ashore or of being slowly poisoned by long-term exposure to oil trapped in shallow water or on beaches.</li> <li>• Inhalation of toxic gases: the immediate toxicity and respiratory effects on survivors in the water following the ingestion of floating fuel and oils and their associated vapours, and fire suppressant foams, powders and gases.</li> <li>• Spilled oil can harm bird. When fur or feathers come into contact with oil, they get matted. This matting causes fur and feathers to lose their insulating properties, placing animals at risk of freezing to death. As the complex structure of the feathers that allows birds to float becomes damaged, and the risk of drowning increases for birds.</li> </ul>	<ul style="list-style-type: none"> <li>• Follow Guidelines given in MARPOL and Shipping Act for oil spill management.</li> <li>• The spill response equipment and materials are greatly affected by such factors as conditions at sea, water currents and wind.</li> <li>• Tug boat assistance.</li> </ul>
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### **Individual Risk**

#### **Individual risk is defined by AIChE/ CCPS (1989) as:**

Risk to a person in the vicinity of a hazard. This includes the nature of the injury to the individual, the likelihood of the injury occurring and the time period over which the injury might occur.

Individual risk is useful in understanding and managing risk at a location where people might be present. It is also useful in understanding the risk to a particular person, or a group of people, based on knowledge of the geographical location of that person or those people.

In this study, the nature of the injury for both individual and societal risk calculations will be immediate fatality resulting from fire, explosion, or exposure to toxic vapors.

### **Individual Risk Contours**

Individual risk at any point is given by the following equations (CCPS, 1989):



$$IR_{x,y} = \sum_{i=1}^R IR_{x,y,i}$$

$$IR_{x,y,i} = f_i \times P_{f,i}$$

**Where,**

$IR_{x,y}$	=	The total individual risk of fatality at geographical location $x, y$ (probability of fatality per year).
$IR_{x,y,i}$	=	The individual risk of fatality at geographical location $x,y$ from incident outcome case ( $i$ ) (probability of fatality per year).
$n$	=	The total number of incident outcome cases considered in the analysis.
$f_i$	=	Frequency of incident outcome case ( $i$ ), (per year).
$p_{f,i}$	=	probability that incident outcome case ( $i$ ) will result in a fatality at location $x, y$ .

As a initial estimate (for simplicity) in the present case assumes that each incident outcome case has an equal impact (probability of fatality  $p_{f,i} = 1$ ) throughout its geographical impact zone. Therefore, within the impact zone for each incident outcome case, the individual risk from that incident outcome case  $IR_{x,y,i}$  is equal to the frequency of that incident outcome case (Equation 2). Outside the impact zone,  $IR_{x,y,i}$  is zero.

The respective impact zones from the each incident are superimposed on a map of the region of the plant and its surroundings as shown in following **Figure 7.7**.

**Population Distribution**

Likely number of people present at the location is assumed as follows:

Location	A	B	C	D	Total
Facilitation cener employees and users of facility	10	20	10	10	50
Visitors	0	125	0	75	200
<b>Total</b>	<b>10</b>	<b>145</b>	<b>10</b>	<b>85</b>	<b>250</b>

Location is then determined by adding the individual risk from all incident outcome case impact zones that impact that location (Equation). For example, in the area labeled “C” in the above figure, application of equation gives the results listed in following table.

**Table 7.17: Individual Risk Calculation for Area “C” In Figure**

Incident Outcome Case	$f_i$ (per year)	$p_{f,i}$	$IR_i$ (per year)
Event 1	$1 \times 10^{-4}$	1	$1 \times 10^{-4}$
Event 2	$1 \times 10^{-4}$	1	$1 \times 10^{-4}$
Event 4	$4.5 \times 10^{-4}$	1	$4.5 \times 10^{-4}$
Event 6	$9.2 \times 10^{-4}$	0	0
<b><math>IR = 4 IR_i =</math></b>			<b><math>6.5 \times 10^{-4}</math></b>



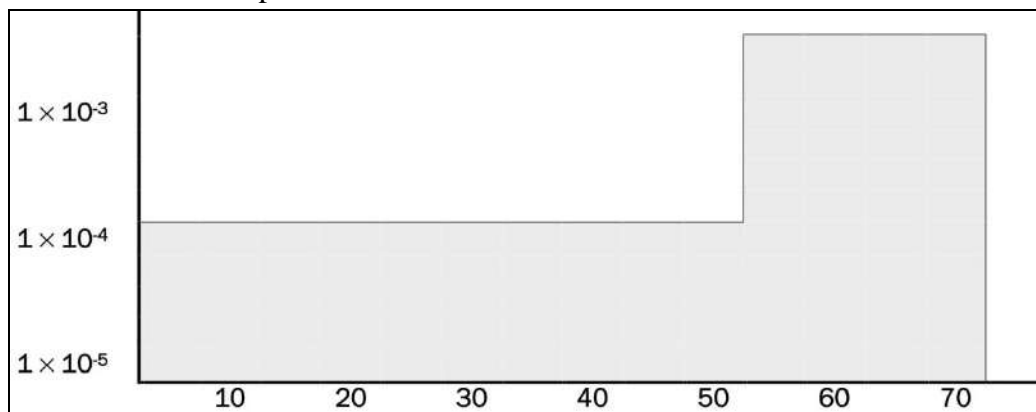
A similar calculation for the other areas in the figure gives the results summarized in the following table. The following figure is an individual risk contour plot for this example problem, with the individual risk values for each area listed in the following table.

**Table 7.18: Individual Risk Calculation For Locations As Marked In the Figure**

Location	Event impacting region	Total individual risk of fatality (per year)
A	Event 3.	$1 \times 10^{-4}$
B	Event 5, 7.	$1.45 \times 10^{-3}$
C	Event 1, 2, 4.	$6.5 \times 10^{-4}$
D	Event 8.	$1 \times 10^{-5}$

### Individual Risk Profile, or Risk Transect

The individual risk profile (risk transect) is a graph showing the individual risk as a function of distance from the source of the risk in a particular direction. For the example problem, following figure is the individual risk profile in the air side direction.



**Figure 7.7: Individual Risk Transect In the Air Side Direction**

Note that for most QRA's, the individual risk contours are plotted for orders of magnitude of risk (for example,  $10^{-4}$ ,  $10^{-5}$  etc.). In this example, the specific values of risk calculated are plotted.

### Other Individual Risk Measures

In developing the individual risk contour map and the individual risk transect (both figures), no information about the surrounding population was needed. First Figure represents the risk to a person if he were to be at a particular location 100% of the time (8760 hours per year). For the example problem, several other individual risk measures can be calculated with additional data on the population surrounding the plant. Second figure shows the location of people \*in the area surrounding the terminal facility.

The **maximum individual risk** is the highest value of individual risk at any geographical location. For the example, the absolute maximum individual risk (regardless of whether or not there is any person at that location) is  $6.5 \times 10^{-4}$  per year, at all locations in utility building. The maximum individual risk for any actual person is  $3.25 \times 10^{-4}$  per year, for the two people at utility building.



The prevailing wind directions in this example result in a higher risk to people somewhat farther away from the facility, but located in a direction toward which the wind blows more frequently.

The **average individual risk** is the average of all individual risk estimates over a defined population. It is important to define a population which does not include a large number of people at little or no risk, as this will give a low bias to the result. Average individual risk is given by CCPS (1989) as:

$$IR_{AV} = \frac{\sum_{x,y} IR_{x,y} \times P_{x,y}}{\sum_{x,y} P_{x,y}}$$

Where;

$IR_{AV}$  = average individual risk in the exposed population  
(probability of fatality per year)

$P_{x,y}$  = number of people at location  $x, y$

Applying above equation to the population in the example (second figure), averaging only over the population which is subject to risk from the facility (individual risk > 0) gives:

**Location**                      **A**                      **B**                      **C**                      **D**  
 →

$$IR_{AV} = \frac{[(10)(1 \times 10^{-4}) + (5)(1.45 \times 10^{-3}) + \{(5)(1 \times 10^{-4}) + (5) \times (4.5 \times 10^{-4})\} + (50)(1 \times 10^{-4})]}{75}$$

$$IR_{AV} = \frac{[9.32 \times 10^{-4}]}{75}$$

$$IR_{AV} = 1.24 \times 10^{-4} \text{ per year (for the exposed population)}$$

$$IR_{AV} = \frac{[(10)(1 \times 10^{-4})]}{\sum_{x,y} P_{x,y}}$$

If all people in the area, even those who incur no risk from the facility (100 users moving out of vulnerable zone), are included in the individual risk calculation, the denominator in the above calculation is 250, and the average individual risk is:

$$IR_{AV} = \frac{[9.2 \times 10^{-3}]}{250}$$

$$IR_{AV} = 3.68 \times 10^{-5} \text{ per year (for the total population)}$$



Another average individual risk which might be of interest is the average individual risk to on-site employees (the people marked \* in second figure). The average individual risk for the terminal employee population (those people in vulnerable regions) is:

$$IR_{AV} = \frac{[(10)(1 \times 10^{-4}) + (5)(1.45 \times 10^{-3}) + \{(5)(1 \times 10^{-4}) + (5) \times (4.5 \times 10^{-4})\} + (5)(1 \times 10^{-4})]}{50}$$

$$IR_{AV} = 8.65 \times 10^{-5} \text{ per year (for the terminal employees)}$$

The Fatal Accident Rate (FAR) is calculated from the average individual risk, and is normally used as a measure of employee risk in an exposed population. Using the average individual risk for the Terminal employee population, FAR is calculated from the following equation:

$$FAR = (1.14 \times 10^4) IR_{AV} \text{ (for employees population)}$$

Where;

$IR_{AV}$  = has units of probability of fatality per year.

FAR = has units of fatalities per  $10^8$  man-hours of exposure.

$$FAR = (1.14 \times 10^4) IR_{AV}$$

$$FAR = 0.98 \left( \frac{\text{fatalities}}{10^8 \text{ manhours of exposure}} \right)$$

$$FAR = (1.14 \times 10^4) (8.65 \times 10^{-5})$$

### 7.2.6.2 Societal Risk Calculations

Societal risk measures the risk to a group of people (CCPS, 1989). Societal risk measures estimate both the potential size and likelihood of incidents with multiple adverse outcomes. In this example, the adverse outcome considered is immediate fatality resulting from fire, explosion, or exposure to toxic vapors. Societal risk measures are important for managing risk in a situation where there is a potential for accidents impacting more than one person.

#### F-N Curve

A common measure of societal risk is the Frequency-Number (F-N) Curve. The first step in generating an F-N Curve for the example problem is to calculate the number of fatalities resulting from each incident outcome case, as determined by:

$$N_i = \sum_{x,y} P_{x,y} \times P_{f,i}$$

Where;

$N_i$  = number of fatalities resulting from Incident Outcome Case ( $i$ )

For the example,  $P_{f,i}$  in the above equation equals 1. Because the impact zones for the example are simple, this calculation can be done graphically by superimposing the impact zones from



figure onto the population distribution and counting the number of people inside the impact zone.

The data must then be put into cumulative frequency form to plot the F-N Curve:

Where;

$F_N$  = frequency of all incident outcome cases affecting  $N$  or more people, per year.

$f_i$  = frequency of incident outcome case ( $i$ ) per year.

$$F_N = \sum_i f_i \text{ for all incident outcome cases } (i) \text{ for which } N_i \geq N$$

**Table 7.19: Estimated Number of Fatalities from Each Incident Outcome Case**

SN	Event	Event Frequency/ Yr	Cumulative Frequency/ Yr	Estimated Number of Fatalities (N)
Event 8	Sea plane mishap followed by fuel fire/ explosion.	$1 \times 10^{-5}$	$1 \times 10^{-5}$	55
Event 4	Flammable gas cylinder at store release followed by fire/vapor cloud explosion.	$4.5 \times 10^{-4}$	$4.6 \times 10^{-4}$	10
Event 1	Fuel stock accidental spill followed by pool fire.	$1 \times 10^{-4}$	$5.6 \times 10^{-4}$	5

### Societal Risk (F – N Curve)

Societal risk criteria are generally presented as curves on F – N plots. Mathematically, the equation for an F – N criterion curve may be presented as; [Ball 19981].

$$F = k \times N^{-a}$$

Where,

F = the cumulative frequency of N or more fatalities.

N = the number of fatalities.

a = aversion factor (often between 1 and 2).

k = constant.

The slope of the societal risk criterion (when plotted on a log – log basis) is equal to “ –a ” and represents the degree of aversion to multi-fatality events embodied in the criterion. When the F – N curve slope is equal to -1, the risk criterion is termed ‘risk neutral’. A risk criterion for which the curve slope is more negative than -1 is said to be more risk averse. An anchor point aShaheed the curve (e.g. N=10 fatalities, F=10<sup>3</sup>/year) and a slope (e.g. -1) is usually enough information to plot a risk criterion F – N curve. if any portion of the calculated F – N curve exceeds the criterion line, the societal risk is said to exceed that risk criterion. In the present case the slope is negative and the curve is well below the criterion line indicates insignificant societal risk.



The estimated consequences of the thermal radiations are well contained within the premises of the factory and surrounding population is not likely to be affected.

**Table 7.20: QRA Results**

<b>Risk Measures</b>	<b>Result</b>
<b>Individual Risk</b>	
Risk Contours	See Figure 7.7
Risk Transect	See Figure 7.8
Maximum	$6.5 \times 10^{-4}$ per year
Maximum for Actual Person	$3.25 \times 10^{-4}$ per year
Average, Exposed Population	$1.24 \times 10^{-4}$ per year
Average, Total Population	$3.68 \times 10^{-5}$ per year
Average, terminal employees population	$8.65 \times 10^{-5}$ per year
Fatal Accident Rate (FAR)	0.98 fatalities per 108 man-hours of exposure
<b>Societal Risk</b>	
F - N Curve	See Table 7.13

**Limitations:**

(Summary of analytical method, its assumptions and limitations).

Apart from the maximum credible releases, the conservative approach appears in adoption of atmospheric conditions, used in the dispersion calculation. In general, the assumptions/ conditions will result in the largest damage distances. Hence, it must be remembered that this analysis will be pessimistic & conservative in approach & is only a planning tool. Its use should not be extended without understanding its limitations.

**Disclaimer:**

Information contained in this report is believed to be reliable but no representation; guarantee or warranties of any kind are made as to its accuracy, suitability for a particular application or results to be obtained from them. It is up to the manufacturer to ensure that the information contained in the report is relevant to the product manufactured/ handled or sold by him as the case may be. We make no warranties expressed or implied in respect of the adequacy of this document for any particular purpose.

***7.2.7 Risk Mitigation Measures Suggested***

- 1) Avoid any fuel storage at Facilitation centre.
- 2) The design consideration should consider that any spill of HSD at DG set not to enter the storm drain.
- 3) Fire Detection & Alarm System and Fire Fighting Systems as per NBC and relevant IS codes, as applicable.
- 4) Providing of Lightning arrestor system for entire project to abate the impact of lightning hazard.
- 5) Provision of e-surveillance close circuit TV system (SCCTV), X-ray machines for scanning Registered Baggage and VHF-FM sets (Walkie-Talkie, base stations and mobile stations).



6) Safety Signs And Symbols:

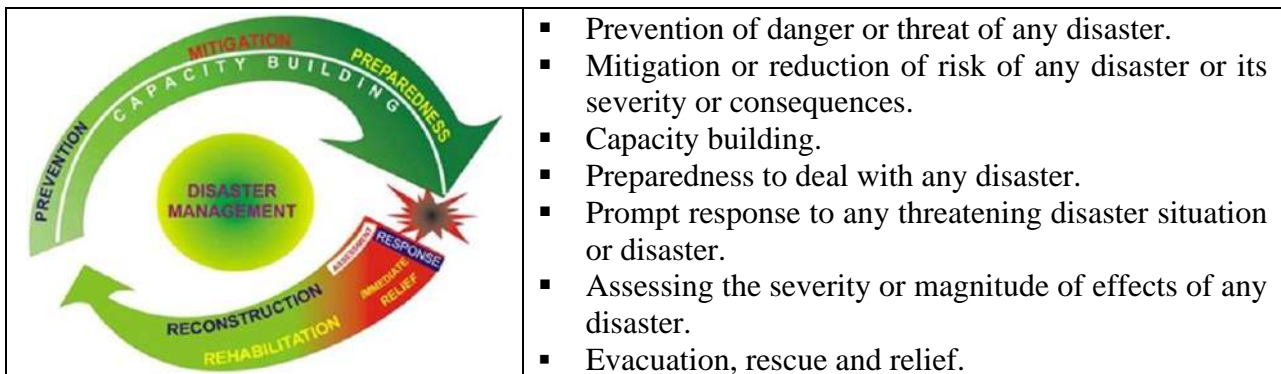
- Provide water runway markers;
  - ✓ Where shoals or other hazards could endanger a seaplane, marker buoys shall be installed to clearly indicate the hazardous area.
  - ✓ Hazardous areas markers air craft warning light at terminal building.
- Provide prohibition signs at walkway;
  - ✓ Restricting the walkway to seaplane operations only.
  - ✓ Restricting passengers from the walkwaying area until all seaplanes and propellers have come to a complete stop.
- Preventive Measures:
  - ✓ Safety Inspection: Regular inspection of equipment and systems mandated by Chief Fire Officer in the NOC granted.
  - ✓ Approved plan: Scrupulous adherence to approved plan of building.
  - ✓ Approved Plan: Protection of system put in place to handle disaster.
- Maintenance of equipment and systems
  - ✓ Preventive maintenance of following systems;
  - ✓ Fire hydrant system.
  - ✓ Sprinkler system.
  - ✓ Detectors calibration.
  - ✓ CCTV system.
  - ✓ Emergency power system.
  - ✓ Rescue equipments.
  - ✓ Emergency communication systems.
- Precautions and preparedness during maintenance phase
  - ✓ Environment, Health & Safety Policy communication to all the employees & workmen through display boards, Posters, EHS Meetings & Pep Talk & etc.
  - ✓ Appointment of OHSAS certified contactor
  - ✓ Observe “No Smoking” rule
  - ✓ Periodical maintenance of safety equipments by certified, competent person at regular intervals.
  - ✓ Work Permit Systems.
  - ✓ Use of Proper PPE's like Helmet, Goggles, boot & hand gloves etc
  - ✓ Use of safety nets while working from heights, use of life line
  - ✓ Safety trainings/ safety checks/ and use of PPE
  - ✓ Storm water drain channel of adequate capacity
  - ✓ Earthquake Resistant structure
  - ✓ Maintaining obstruction free walkways and doorways
  - ✓ Proper storage and handling of any potentially hazardous chemicals, gases.
  - ✓ Educating/ training of all concerned on adoption of safe practices at maintenance site.
  - ✓ Documentation, investigation of every dangerous occurrence and required notifications and reports to the appropriate authorities.



- 7) Disaster Management;
  - Prepare site specific Disaster Management Plan.
  - Safety training in fire fighting and first aid to maintenance workers and fire/ security personnel.
  - Carry out regular Mock Drill of the DMP with fire department of aviation sector for PTB/ PARKING/ APRON/ JETTY structures and awareness programs for residents.
  - Provide a rescue boat for fire fighters in Final Approach Take Off (FATO) area during operations in the water body.
  - Consider Mock Drill scenarios like water rescue, passenger evacuation into a further life-threatening environment, e.g. deep water; evacuation target to achieve a response time not exceeding three (03) minutes to any point of each operational water runway, in optimum visibility and surface conditions; also consider recovery of disabled aircraft from the movement area.
  - Minimize the likelihood of collisions between wildlife and seaplane.
  - Consider integration of port oil contingency plan with the overall area contingency plan under the co-ordination of Coast Guard.
- 8) A forestation and reforestation of the land
- 9) It is suggested that provide refuge area at top of the terminal building to facilitate rescue by helicopter during emergency.

### 7.3 Disaster Management Plan

Disaster management means a continuous and integrated process of planning, organizing, coordinating and implementing measures which are necessary or expedient for;



DM plan is intended to provide guidance to all emergency respondents within the department with a general concept of potential emergency assignments before, during, and following emergency situations. This document is designed to cover the following with dovetailing information for linkage to DDMP:

- Emergency prevention;
- Emergency preparedness;
- Emergency mitigation;



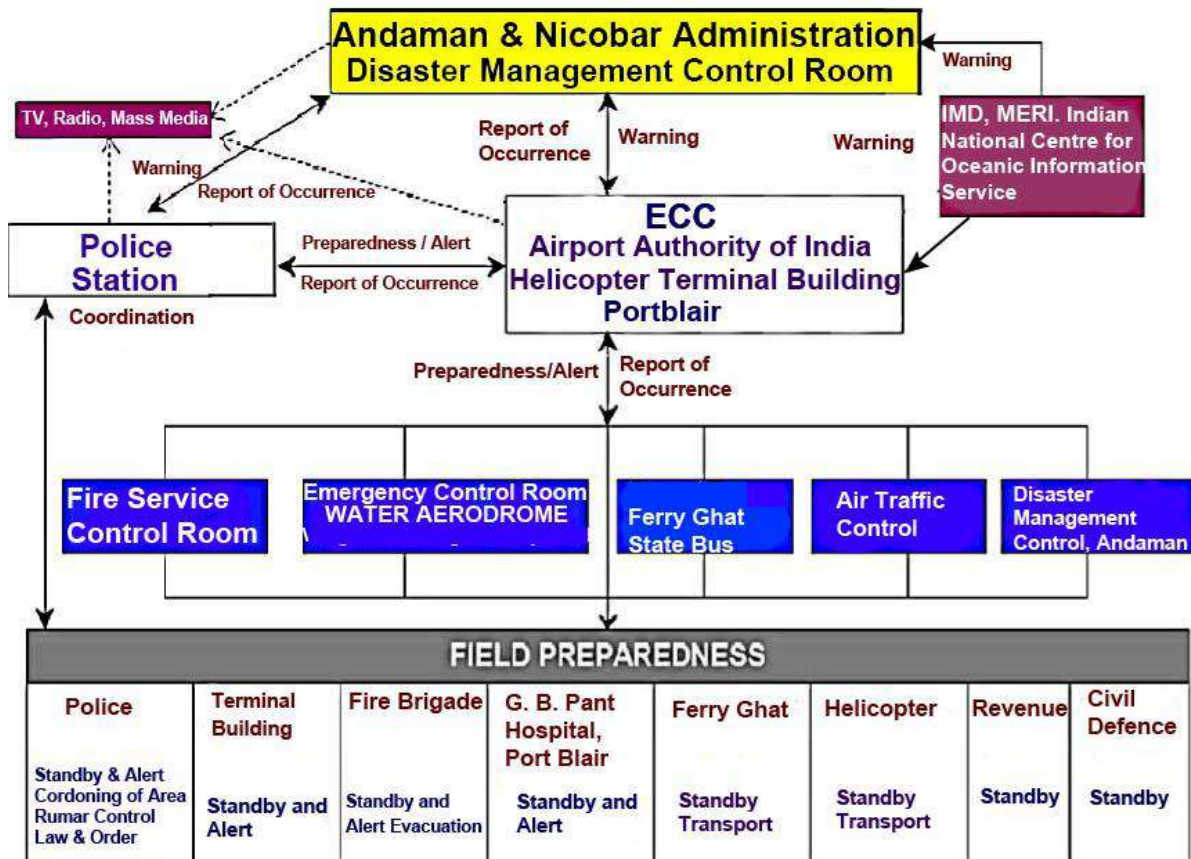
- Activities for preparing for and prevention of emergencies such as training and maintenance;
- Overall control and coordination arrangements for emergency response.

**AUTHORITY**

- Andaman and Nicobar Administration

**ACT, RULE's, CODE**

- National Building Code 2016.
- The project is falling under ICRZ area as per ICRZ notification, 2011 and 2019.
- Fire department of Aviation sector for PTB/PARKING/APRON/JETTY structures.
- DGCA norms/ guidelines (Aviation standard).
- The Indian Ports Act, 1908 and amendments thereon.
- The Wildlife (Protection) Act, 1972 and amendments thereon.
- The Water (Prevention & Control of Pollution) Act, 1974 and amendments thereon.
- The Water (Prevention & Control of Pollution) Cess Act, 1977 and amendments thereon.
- The Forest (Conservation) Act, 1980 and amendments thereon.
- The Air (Prevention & Control of Pollution) Act, 1981 and amendments thereon.
- The Environmental (Protection) Act, 1986 and amendments thereon.
- The Public Liability Insurance Act, 1991 and amendments thereon.
- The Biological Diversity Act, 2002 and amendments thereon (<http://envfor.nic.in>).
- The Indian Explosives Act, 1884 and amendments thereon (<http://explosives.nic.in>).





**Figure 7.8: Emergency Preparedness Flow Chart**

### 7.3.1 Mitigations and Preparedness

#### 7.3.1.1 Preparedness

##### 1) Warning System

- Nodal agencies for early warning of different natural hazards;

<b>Disasters</b>	<b>Agencies</b>
Earthquakes	IMD, MERI.
Floods	Meteorology Department, Irrigation Department Central Water Commission.
Cyclones	IMD (Indian Meteorological Department).
Epidemics	Public Health Department.
Road accidents	Police.
Industrial & Chemical Accidents	Industry, Police.
Fires	Fire Brigade, Police.
Tsunami	Indian National Centre for Oceanic Information Services.
Landslides	Geological Survey of India.

- Warning of fire or emergency received at fire &/ security department by fire call point, CCTV panel, by watch ward staff, leak detector, smoke detector, intercom in flats, mobile, bell in lifts, hooters at control room.
- Two way communication to emergency respondents by walk, talky.
- Warning to occupants by PAS/ hand held loudspeaker and Siren electrical/ hand operated located at strategic location and operated from at ECC by fire &/ security department.

##### 2) Siren Code

Emergency Level 1 & 2	: One continuous wailing sound of 30 seconds duration. Repeat after a minute.
Emergency Level 3	: Three interrupted wailing sounds of 15 seconds duration each with a gap of 30 seconds. Repeat after a minute gap.
All Clear	: Shaheed whistle of one minute duration.

##### 3) Emergency Control Centre

<b>Emergency</b>	<b>Operation Phase</b>
Level 1	Security Office.
Level 2	Security Office/ Reception.
Level 3	Fire Command Room/ BMS.

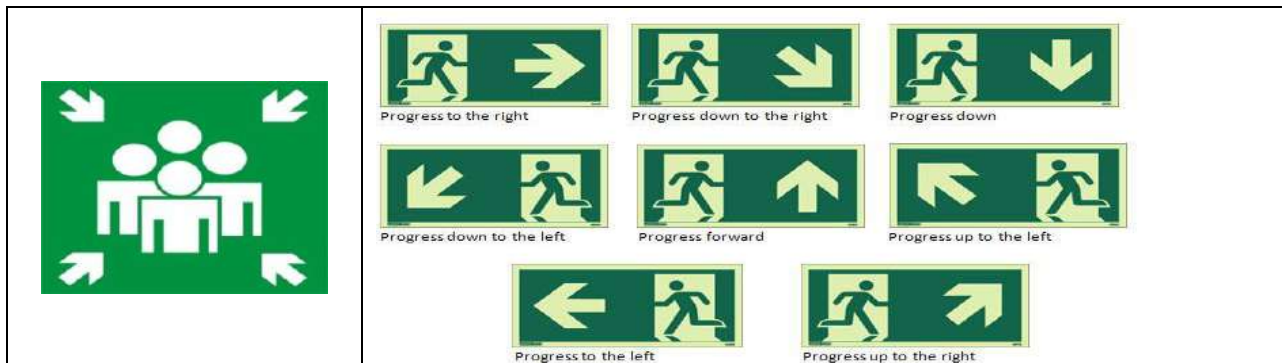
- ECC equipped with following items;



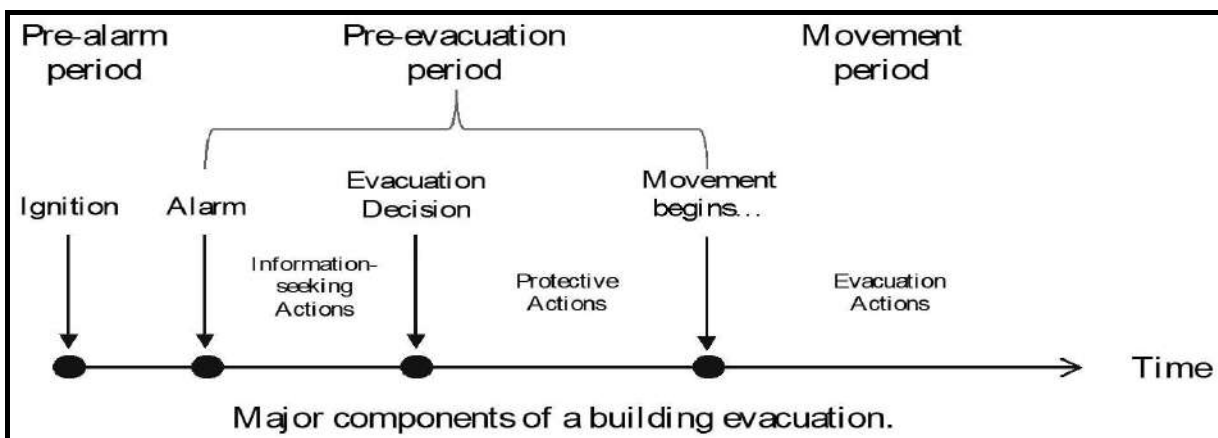
- ✓ Copy of “DMP” and Technical Manuals on operating, maintenance procedures.
- ✓ Telephone (Internal and External).
- ✓ Networked Computer Systems, Note pads, pencil etc.
- ✓ Personal Protective Equipments (PPE).
- ✓ Public Address System (PAS).
- ✓ Control panels & layout drawing for CCTV, fire hydrant and water sprinkler, Fire Alarm, ventilation, electrical single line diagram.
- ✓ Rescue kit.
- ✓ Essential keys and access cards or the location details of the same.
- ✓ Television sets tuned to major news channels. Video Conferencing Setup.
- ✓ Pantry, Dormitory, Drinking water and Toilet facilities.

4) Assembly Point

Emergency Level	Construction Phase	Operation Phase – Building
Emergency Level 1	Site Office.	Near Security Cabin.
Emergency Level 2	Near Site Office.	Outside Respective Building.
Emergency Level 3	Near Site Office.	Assembly Point.



**Figure 7.9: Signage to Assembly Point**



**Figure 7.10: Major Components of a Building Evacuation**

Evacuation by helicopters during tsunami event need refuge space at higher level preferably at roof level.





**Note:** Evacuation by helicopters during fire event may pose difficulties namely air turbulence generated by the helicopters together with the smoke & heat coming from the building increase the risk of performing unsuccessful landing and rescue operations [Biava et al., 2012],  
*Source : National emergency communication plan by NDMA.*

➤ Assumptions

- ✓ Occupants are uniformly distributed over the floor area and so the time required for first person to approach exit will be negligible.
- ✓ Horizontal travel time 33 or 50 m/min if building is sprinkled or not.
- ✓ Occupants per exit width as per NBC 2016, Table No. 21.
- ✓ Discharge capacity limiting evacuation condition is assumed out of congestion, free walk and discharge capacity limiting.

5) Impact

- Direct negative impact of the identified disasters studied on terminal staff and passengers in terms of potential loss of property and life injury
- The time delay to start evacuation represent large part of the total evacuation time. Any poor response by occupants to evacuation process will have Direct Impact on delayed evacuation having potential of serious consequences
- Likely overcrowding at Assembly Point located on open ground.

6) Risk Mitigation Measures –

- Following measures are essential for effective evacuation;
  - ✓ Mock Drills,
  - ✓ Training;
  - ✓ Awareness programs.
  - ✓ Ensure dedicated obstruction free path way up to assembly points.
- Provide effective system for dispersal of persons at assembly point and shift the occupant to Emergency Assembly point as specified by authority.

**7.3.1.2 Policies**

- ❖ Withdraw the staff in case of the human life is in peril.
- ❖ Any equipment including PPE deployed in the rescue is inspected and replaced as required on the advice of the supplier.
- ❖ To insure all our rights and obligations under the relevant insurance policy and all losses are claimed
- ❖ The entire family would evacuate together as a unit. However, to avoid stampede, confusion and in cases of inadequate transport or limited time, emergency evacuation would be undertaken in the following order - Seriously injured & sick, children, women & physically challenged, old and able-bodies.



### **7.3.1.3 Decontamination Support**

- ❖ Sources of contamination such as accidental oil spills e.g. Diesel, transformer oil; paint brush washings during maintenance phase and floor washing collected during sprinkler operation are likely.
- ❖ The measures for handling decontamination include spill control kit for oils and Drench tank water for collection of contaminated water for checking before safe disposal.

### **7.3.1.4 Special Population Support**

- ❖ Special consideration during evacuation required for maintenance workers (if any) and differently abled persons.

### **7.3.1.5 Training & Capacity Building**

- ❖ Orientation Exercise:

Involves bringing together the people who are involved in the emergency plan, or part of the emergency plan and orientate them to it. It can be useful in inducting new members to the Team, imparting awareness among persons having no previous experience of the plan, a new plan or new staff.

- ❖ Drills:

These test a single emergency response function and involve an actual field response. Drills are generally practiced or tested under realistic conditions.

- ❖ Table – Top Exercise:

This is a means to undertake some problem solving and team building and familiarizes team members with what they might need to do as an emergency scenario unfolds. It is very useful in developing what ifs and responses.

- ❖ Functional Drill:

This is used to assess the allocation of resources and manpower. It also evaluates the communication between different groups and assesses the adequacy of current procedures and policies. The exercise is a simulation and while it covers the complete extent of the deployment of resources at the simulated level it does not go beyond the exercise room.

- ❖ Mock Drill/ Full Scale Exercise:

Evaluates the operational capability of the system in an interactive manner, allows for coordination of information, communication capabilities to be explored, inter-tenant and tenant landlord cooperation to be explored and for negotiation skills to be deployed. Full scale exercises will have a number of observers and invitation to the relevant government agency to attend. Observations will be recorded and actions will be implemented based on learning points that are discussed at the review session where necessary.



❖ **Note: Real Emergencies during Exercises**

There is always the potential for a real emergency to arise during the conduct of a drill. This situation calls for an immediate cessation of the exercise/ drill and Emergency respondents should stand by for further instructions.

**7.3.1.6 Plan Management**

<b>Activity</b>	<b>Responsibility On</b>	<b>Frequency</b>
Development & approval.	Project Proponent.	At project proposal stage.
Maintaining.	Fire Department.	Maintaining copies at concerned Dept.
Revision.	Fire Department.	Two years.
Updating.	Fire Department.	By creating – Live page.
Implementation.	Fire Department.	Need bases.
Review.	Fire Department.	Review of SOP, check list yearly.
Rehearsal/ Drill.	Fire Department.	As per following table.

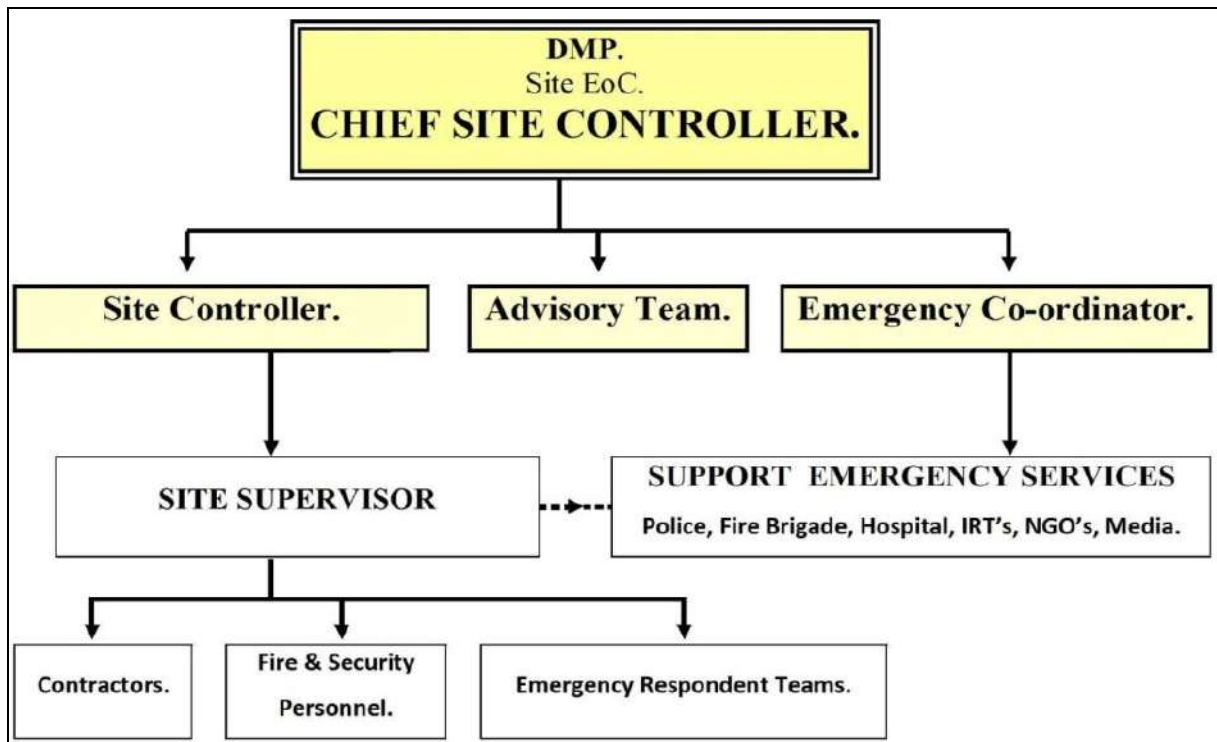
**Table 7.21: DMP Rehearsal/ Mock Drill Schedule**

1	Quarterly.	<ul style="list-style-type: none"> <li>▪ Fire Drill and evacuation exercise. Planned or false alarm.</li> <li>▪ Hydrant system preparedness.</li> <li>▪ Emergency contact telephone numbers in red page and annexure no. 2 to be checked quarterly for accuracy by calling the individual/ organization listed.</li> <li>▪ Inventory of rescue equipments inspection.</li> </ul>
2	Half yearly	<ul style="list-style-type: none"> <li>▪ Table-top run through with testing Overall Plan Mobilization of Emergency Control Room, Evacuation.</li> <li>▪ Practical demo of Fire Extinguisher.</li> <li>▪ Use of spill kit Practical demo. Flammable materials release Awareness program.</li> <li>▪ Ground &amp; roof inspection.</li> </ul>
3	Annually.	<ul style="list-style-type: none"> <li>▪ Full scale Mock Drill including rescue operations.</li> <li>▪ Review of SOP's.</li> </ul>

**7.3.2 Response Plan**



**7.3.2.1 Disaster Management Organization**



**Figure 7.11: Disaster Management Organization**

**Table 7.16: DMP Organisation**

SN	Designation For DMP	Construction phase	Operation phase
		Designation/ Agency/ Group	Designation/ Agency/ Group
1	Site Main Controller	Project Manager.	Airport Authority/ Management.
2	Site Incident Controller	Site Manager.	Terminal Manager.
3	Emergency Coordinator	EHS Manager.	Admin Manager.
4	Supervisor	<ul style="list-style-type: none"> <li>▪ Site Supervisor.</li> <li>▪ Contractor Supervisor.</li> </ul>	Safety Officer.
5.1	SAR Team	Security guards, first aiders, fire fighters, staff & workmen, external IRT's.	Aircraft Rescue and Firefighting trained persons, first aid trained persons, NDRF, IRT's.
5.2	Engineering Team	<ul style="list-style-type: none"> <li>▪ Electricians.</li> <li>▪ Operators.</li> </ul>	<ul style="list-style-type: none"> <li>▪ Electricians.</li> <li>▪ Operators.</li> </ul>
5.3	Advisory Team	Architect, Consultants.	
6	All others at site	Contractors, staff, workers, visitors, drivers, construction workers colony.	Contractors, staff, workers, passengers, drivers.



### 7.3.2.2 Roles & Responsibilities

Roles and responsibilities for all the emergency respondents are detailed in respective SOP's in Section 7.3.6 of this report.

### 7.3.2.3 Emergency Response Guide

**Table 7.23: Emergency Response Guide**

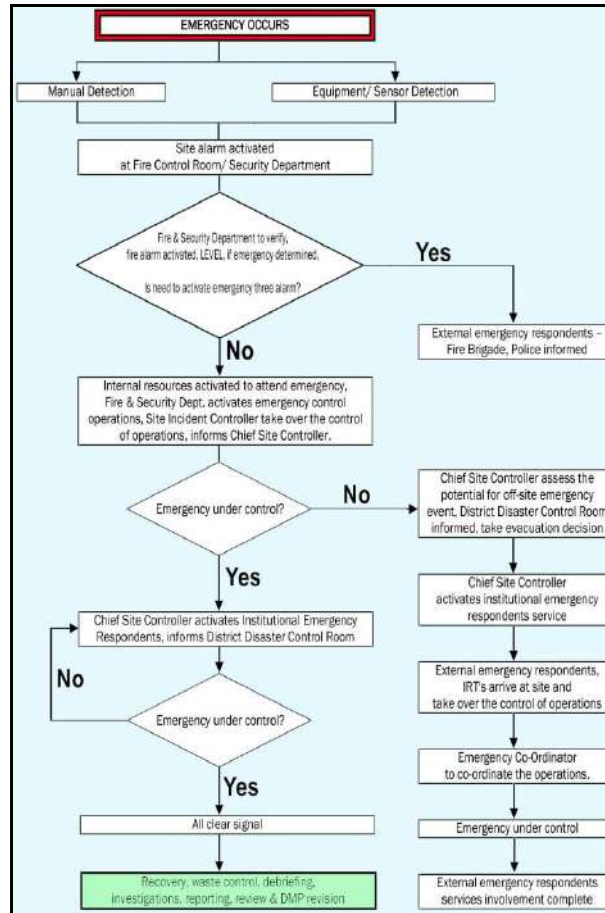
SN	TASK	Site Main Controller	Site Incident Controller	Emergency Coordinator	Supervisor	Emergency response teams	All others at site
1	Raising the site emergency alarm.		*				
2	Inform police, fire brigade and mobilizing site emergency services.		*				
3	Determination of level of emergency, help from advisory team, if required.	*					
4	Mobilizing ECC and AP.		*				
5	Mobilizing Emergency Respondent teams, IRT's, NGO's.			*			
6	Mobilize resources for emergency response teams			*			
7	Ensure co-ordination between site emergency services.			*			
8	Review situation, assess the emergency level, consult advisory team, take external help if required, inform district disaster control cell, and declare Off Site Emergency.	*					
9	Evacuation.			*			
10	Ensure operations as per SOP.					*	
11	Ensure proper coordination between all IRT's.				*		
12	Head count at assembly point.						*
13	Feed back of head count to SAR.		*				
14	Ensure traffic, law & Order and crowd control.		*				
15	Withdraw the staff if the human life is in peril.		*				
16	Ensure any conflict resolved at the earliest.	*					
17	Authorize release of information to the media.	*					
18	Release of authorized information to the media.			*			
19	Emergency under control, inform to CSC.		*				
20	Authorize to raise 'All Clear' alarm.	*					
21	Raise 'All Clear' alarm.		*				

**Table 7.24: Disaster Category**

Category 1:	Events can be controlled by Fire/ Security department with local resources.
Category 2:	Events action plan requires additional help from local fire brigade and evacuation.
Category 3:	Events action plan requires mobilization of external agencies, resources and



evacuation.



**Figure 7.12: DMP Steps to Declare Category 3 Emergency/ Off Site Emergency**

### 7.3.2.4 Rescue & Relief Operation

The priority of the SAR will be to:

- Protect life;
- Maintain safety;
- Protect assets;
- Ensure security; and
- Maintain or return business continuity.

### 7.3.2.5 Response Activities Specific to Disaster

SOP's specific to disaster enclosed in Section 7.3.6 of this report.

### 7.3.2.6 Requisition of Services/Assistance

Emergency co-ordinator to establish communication to district disaster control room for requisition of services/ assistance of IRT's/ NGO's.

### 7.3.3 Recovery



### 7.3.3.1 Recovery

- Deactivation of the ECC once the recovery operations are over as declared by chief site controller.
- Replenishment of used stocks of fire fighting materials
- Follow up of injured at hospital.
- Record keeping
- Clean and rehabilitate the disaster site.
- Determine priorities for restoration work and seek the advice of a conservator as to the best methods and options, and obtain cost estimates.
- Contact insurers.
- Analyze the disaster and improve the plan in the light of experience.

### 7.3.3.2 Medical

- Information and help desk at site.
- Informing the relatives of the injured.
- Follow up of injured at hospital, if any.

### 7.3.3.3 Damage Assessment for Insurance Survey

Damage Assessment for insurance survey with following objectives;

- Reduce the loss in terms of assets if a disaster happens; and
- Reduce lost income in the event that the facility becomes unavailable or partly unavailable.

### 7.3.4 Financial Arrangements

**Table 7.26: Inventory of Resources**

			<b>Remark</b>
<b>1</b>	<b>Fire/ Explosion Protection;</b>		
	Fire detection and alarm system.		Designed as per NBC 2016 and also in compliance with fire department of Aviation sector for PTB/ PARKING/ APRON/ JETTY structures.
	Smoke detection and alarm system.		
	Flammable Gas detection and alarm system.		
	Fire control room.		At Terminal building
	Water sprinkler system		With automatic fire alarm system.
	Fire Tender	<b>1 no</b>	At Air Side min 5000 liters (foam based) capacity in H3 category as per DGCA norms/ guidelines (Aviation standard)
	<b>Fire Hydrant System</b>		



**CHAPTER 7: ADDITIONAL STUDIES**

	<ul style="list-style-type: none"> <li>▪ Portable Fire extinguishers: DCP, foam, ABC type, sand buckets</li> </ul>		Jetty : min 02 nos. fire extinguisher of capacity 50 Kg. (foam based)
	<ul style="list-style-type: none"> <li>▪ water supply pumps</li> </ul>		
	<ul style="list-style-type: none"> <li>▪ fire hydrants, Fire Hose Reel, Fire Hose Box.</li> </ul>		
	<ul style="list-style-type: none"> <li>▪ DG set for Emergency power</li> </ul>		
	<ul style="list-style-type: none"> <li>▪ Paved Court yard to carry the fire tender load</li> </ul>		
	<ul style="list-style-type: none"> <li>▪ Fire stopping cable ducts penetration</li> </ul>		
	<ul style="list-style-type: none"> <li>▪ Fire control room</li> </ul>		
<b>2</b>	<b>Security Threat Protection;</b>		
	X-ray machines		for scanning Registered Baggage (RB)/ Hand Baggage (HB), including provision of required number of ETDs, DFMDs and HHMS's as per BCAS norms.
	Surveillance Close Circuit TV system (SCCTV) and		provision of adequate number of close circuit TV monitors, in the security control room, terminal manager room, APD office etc.
	Peripheral Compound wall		
	Emergency Control Centre		
<b>3</b>	<b>Evacuation Resources;</b>		
	<b>Personnel Protective Equipments (PPE)*</b>		
	<b>Search &amp; Rescue kit **</b>		
	<b>Safety Signage &amp; Symbols ***</b>		Retro reflective road signage's in the car park and approach road
	Rescue boat and fire fighters	<b>1 no.</b>	during Final Approach Take Off (FATO) Area during operations in the water body.
	DMP (operating manual) Fire Audit, fire fighting and first aid Training, Mock Drill, Fire Drill, Safety Awareness Program. Inspection.		
	Watch and ward/fire & security staff.		
	Public address system and car calling system.		<b>Terminal building</b>
	Access Control System		as per BCAS requirements
	<b>Communication facilities</b> Internet, VPN bandwidth, Wi-Fi system Telephone Exchange digital/ IP EPABX system intercom instruments, UPS/ Battery etc.		



**CHAPTER 7: ADDITIONAL STUDIES**

	VHF FM sets (Walkie-Talkie, base Stations and Mobile Stations).		
	Flight Information Display System (FIDS)		With adequate number of display devices in departure, arrival and security hold area for passenger facilitation.
<b>4</b>	<b>Cyclone Protection;</b>		
	Lighting arrestor		advance lightening protection system at terminal building
	Aviation indication light		
	Provisions at store		
<b>5</b>	<b>Earth Quake, Land Slide Protection;</b>		
	Earth quake resistant design & construction		
	Structural Audit		
<b>6</b>	<b>Flood Protection;</b>		
	Storm water drain of adequate capacity		
	Dewatering pumps		
	Life jackets,		
	Retaining wall		

**Table 7.27: Resources List**

<b>Search &amp; Rescue Kit*</b>		
▪ Torch with battery.	▪ Hand Operating Siren.	▪ First aid box.
▪ Whistles.	▪ Metal Cutting set.	▪ Wheel chair.
▪ Ropes- Nylon	▪ Siren/ Portable Mega Phone	▪ Mud pan.
▪ Ladder.	▪ Barricade tape.	▪ Bucket.
▪ Search light.	▪ Flags.	▪ Pulley, crab winch
▪ Two way radio.	▪ Stretcher.	▪ Hydraulic jack.
<b>Safety Signage &amp; Symbols***</b>		
Exit signs at each exit door.	▪ Evacuation plan. (you are here).	▪ First aid.
▪ Escape route	▪ Near each change of direction in the escape route.	▪ Danger at electrical rooms.
▪ Emergency Control Centre (ECC)	▪ Assembly point.	▪ Display of emergency contact numbers
<b>Personal Protective Equipment**</b>		
▪ Safety Helmet.	▪ Safety Shoes/ Boots.	▪ Masks.
▪ Safety Goggles.	▪ Orange Jacket.	▪ Life jackets

Resources list is indicative and may need site specific changes.

**7.3.5 Common Role & Responsibilities -**

**7.3.5.1 Chief Site Controller**

1. The Site Main Controller shall take responsibility of overall main control of the site.
2. Ensure that all the key persons are available on site/ performing the task.



3. Ensure smooth working of all the emergency respondents and make sure that all conflicts (if any) are resolved.
4. Ensure that adequate safety measures for responders and affected communities are in place all the time.
5. Delegate any extra duty to relevant person depending upon the situation.
6. Ensure financial support for the disaster control activities and relief materials.
7. Withdraw the staff in case of the human life is in peril.
8. Authorize release of information to the media.
9. Keep contact with District Disaster Control Room. Declaring off site emergency (if situation escalates). Get the de-warning from District Control Room and announce the same.
10. Give authorization for clearance signal to the Site Incident Controller and emergency coordinator when everything becomes normal.
11. Determine priorities for restoration work and seek the advice of a conservator as to the best methods and options, and obtain cost estimates.

#### **7.3.5.2 Site Incident Controller**

1. Identify the areas likely to be affected by the emergency. Give information as required by the Fire Brigade and Police.
2. Carry out fire fighting and evacuation operations, keep communication with emergency teams and the affected persons in the building especially in lifts and rooms.
3. Head count at assembly point and feed back to SAR team.
4. Assist the law and order machinery.
5. Guide the search and rescue team with geographic information and persons trapped.
6. Get the de-warning authorization from the Chief Site Controller and communicate the same to Security Head for giving all clear alarm.
7. Update the Record and documentation.

#### **7.3.5.3 Emergency Co-ordinator**

1. Assumes responsibility for all overall response and recovery operations, as appropriate.
2. Call Police, Fire Brigade and mobilizing site emergency services and resources required for emergency response teams working and Coordinate between all emergency respondents representatives of Govt. authorities/ IRT's/ NGO's and ULB's etc.
3. Emergency Co-coordinator to Mobilize ECC if not affected or alternate ECC if required and feasible; Assembly point and head count.
4. Give immediate assessment to the authority on damage, massive casualty etc.
5. Liaise with the law and order machinery.
6. Assure occupants of continuous communication and take all measures to keep up their morale high.
7. Establish media management/ guidance to volunteers and aid agencies and for rumour control.
8. Provide additional security in affected areas and maintain law and order situation.



9. Follow up of injured at hospital.
10. Set up of help desk and Information centres to provide response information to the public, relatives of victims and media.
11. Release of authorized information to the media and take steps to reduce/ eliminate panic.
12. Replenish depleted resources such as fire fighting materials, rescue materials.
13. Termination of emergency and ‘All Clear Alarm’.
14. Analyze the disaster and improve the DMP in the light of experience.
15. Contact insurers
16. Develop situation report of the affected areas and share with all Stakeholders. Establish a program to restore both the disaster site and the damaged materials to a stable and usable condition.
17. Disseminate precautionary information on post disaster health hazards and remedies.
18. Establish, promulgate, coordinate, maintain, and implement the DMP
19. Organize fire drill, safety audits, Mock drills and periodic training and DMP awareness program.

#### **7.3.5.4 Supervisor**

1. Security supervisor/ watch and ward & security persons to activate at site alarm from control room.
2. On receiving emergency alert supervisor of the affected area to proceed to site (if not already at incident spot) as directed from ECC.
3. Supervise and assist the search and rescue team for evacuation, search of the trapped persons and rescue of the same to assembly area.
4. Carry out head count at assembly point and give feed back to Site Incident Controller.
5. Security supervisor/ watch and ward & security persons carry out Traffic control, law and order situation and crowd control at Assembly point. Keep the fire tender routes free from obstruction.
6. Supervisor of the non affected area to keep attention to announcements and follow Emergency Co-ordinator instructions.
7. Security supervisor/ watch and ward & security persons to activate at all clear site alarm from control room.
8. Clean and rehabilitate the disaster site.
9. Maintain an updated list of emergency telephone numbers at ECC.

#### **7.3.5.5 Emergency Respondent Teams – SAR Team**

1. On receiving emergency alert SAR team members to proceed to ECC, get equipped with required PPE and proceed to incident site or as directed from ECC.
2. Fire fighting trained persons to carry out Fire fighting operations and try to put it out with help of people around you if safe to do so. On arrival of fire brigade; assist and provide required information.



3. Use PAS, megaphone, cell phones to keep two way communication with emergency teams and the affected persons.
4. Carry out evacuation of the building as per directions from ECC. Ensure the safe evacuation of all occupants from the building.
5. Search for the trapped persons and rescue of the same to assembly area.
6. first aid trained persons to provide first aid to injured where ever necessary and shift to first aid room for further action.

#### **7.3.5.6 Emergency Respondent Teams – Engineering Team**

1. On receiving emergency alert proceed to respective work places or as directed from ECC.
2. Restore power supply in case affected to emergency equipments and emergency lighting. (Loss of power will mean loss of fire systems if prolonged).
3. Ensure adequate warning to Emergency Co-ordinator before stopping power to lifts, bring the lifts to safe position.
4. Ensure uninterrupted water supply to fire hydrant system. (Water re-connection is a priority if affected in the incidence).
5. Ensure uninterrupted power supply to fire water pumps and emergency lighting.
6. Restore and maintain communication network such as; PAS system, siren, phones, TV, radio systems.
7. Ensure working of drainage, de watering pumps.
8. Assist the search and rescue team in case of any metal cutting operation, vehicle failures etc.

#### **7.3.5.7 Emergency Respondent Teams – Advisory Team**

1. When informed of the disaster/ potential disastrous event at site, proceed to ECC or keep available for communication.
2. Collect relevant information and Take stock of situation time to time and advise the Site Main Controller.
3. Give feedback on revision of the DMP in view of the lessons learnt from the incident.

#### **7.3.5.8 All Others at Site**

1. Keep calm, Do not panic.
2. Switch on the transistor radio and obey any instructions you receive on the TV, radio, Public Address System, siren alarm or verbal mode of communication.
3. Co-operate in evacuation head count procedure at Assembly Point.
4. Persons of non affected building/ area keep attention to announcements and follow Emergency Co-Ordinator instructions.
5. Public Information/Media to Gather, coordinate and release factual information.
6. Re-occupy when safe to do so as instructed by ECC.

#### **7.3.6 Specific Incident Action Plan (IAP)**



### **7.3.6.1 Tsunami**

#### **DO’S:**

- Stay away from downed power lines.
- In high flood-prone areas, keep materials on hand like sandbags, plywood, plastic sheeting, and plastic garbage bags.
- Be aware of drainage channels and areas known to flood, so that you or your evacuation routes are not cut off.
- Follow recommended evacuation routes. Not to take shortcuts. They may be dangerous.
- If you choose or are told to evacuate, move to a safe area before access is cut off by flood water.
- Monitor local radio/ television broadcasts.
- Eat something to make you feel better and more capable of helping others. When you can move out of the place carry with you essential food, water container, torch, transistor radio and medicines you normally use.
- Turn off the main water valve and electricity.
- Leave early enough to avoid being trapped.

#### **If you are visiting an area at risk from tsunamis;**

- Check with the hotel or campground operators for tsunami evacuation information and find out what the warning system is for tsunamis. It is important to know designated escape routes before a warning is issued.
- One of the early warning signals of a tsunami is that the sea water recedes several meters, exposing fish on shallow waters or on the beaches. If you see the sea water receding, you must immediately leave the beach and go to higher ground far away from the beach.
- Staying away from all low-lying areas is the safest advice when there is a tsunami warning.

#### **If you are on a boat;**

- Since tsunami wave activity is imperceptible in the open ocean, do not return to port if you are at sea and a tsunami warning has been issued for your area. Tsunamis can cause rapid changes in water level and unpredictable dangerous currents in harbors and ports.
- Use a Weather Radio or stay tuned to a local radio or television station to keep informed of local watches and warnings.

#### **If you are on land;**

- If you feel an earthquake that lasts 20 seconds or Longer when you are in a coastal area, you should;
- Drop, cover, and hold on.
- You should first protect yourself from the earthquake damages.

#### **When the shaking stops;**

- Move quickly to higher ground away from the coast. A tsunami may be coming within minutes.



## CHAPTER 7: ADDITIONAL STUDIES

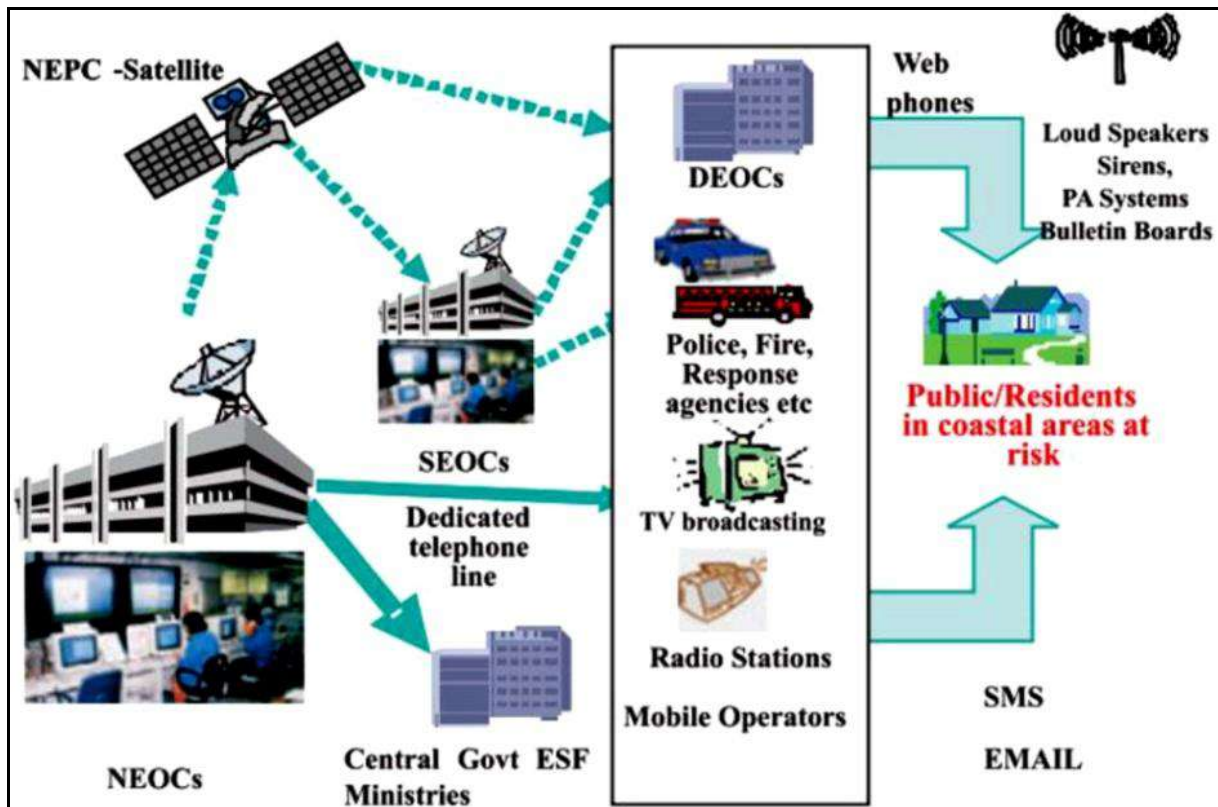
- Avoid downed power lines and stay away from damaged buildings and bridges from which heavy objects might fall during an aftershock.

### **If you are at the beach or near the ocean and you feel the earth shake;**

- Move immediately to higher ground, no need to wait for a tsunami warning to be announced
- Stay away from rivers and streams that lead to the ocean as you would stay away from the beach and ocean if there is a tsunami.
- A regional tsunami from a local earthquake could strike some areas before a tsunami warning could be announced.

### **DON'TS:**

- Do not panic.
- Avoid driving into water of unknown depth. Moving water can quickly sweep your vehicle away.
- Do not allow children to play in flooded areas.
- Do not drink water from open sources/ containers without filtering or purification.
- Do not use fresh food that has come in contact with floodwaters.
- Do not move into flooded areas because the authorities may have removed the manholes for efficient drainage and the indicators may get shifted due to water currents.
- Do not walk on footpath covers may have been dislocated due to current.
- Do not enter damaged buildings or structures.
- Do not touch electric poles, utility wires/ cables.
- Do not use telephones except in life-threatening situations.



**Figure 7.13: Tsunami Early Warning Systems**

Inflatable motorised boats, helicopters and search & rescue equipments are required immediately after a tsunami to carry out search and rescue of people trapped in inundated areas.

### 7.3.6.2 Fire/Explosion

#### DO'S:

- In case of noticing fire:
  - ✓ Actuate nearest fire alarm button and/ or inform the Supervisor and follow further instructions, raise verbal fire alarm to activate other persons in the area. and proceed to assembly point.
  - ✓ Dial '(101 fire brigade emergency number)' and inform fire/ security department location and incidence.
- Extinguish the fire if; you have been trained in the use of a fire extinguisher, it is safe to do so or you have someone in support.
- Contain the fire by closing windows and doors to minimize the danger of the fire and smoke spreading
- Supervisor to inform fire brigade and mobilize fire fighting trained persons,
- Cordon off the area, move upwind and evacuate the area.
- Keep the gas cylinder cool with water spray.
- Use AFFF (Aq. Film Forming Foam) to blanket the oil, Diesel spill area.
- If there's a lot of smoke, cover face with wet cloth and crawl along the floor where the air will be cleanest.



- In case cloth on fire lie on ground and cover in blanket.
- In case of burn injury, pour water on burn for at least for 10 minutes. Remove tight items such as; watch before swelling occurs. Avoid breaking the burn blisters on skin and removing pieces of burnt cloth.
- Supervisor to guide and assist to carry out fire fighting and evacuation operations.
- Watch and ward & security persons carry out Traffic control, law and order situation and crowd control at Assembly point. Keep the fire tender routes free from obstruction.

**DON'TS:**

- Do not enter the site unless instructed if you are outside and disaster alarm is heard.
- No smoking.
- Avoid use of lift during fire at building.
- Do not panic. Avoid running all over the place prevent others from doing so.

**7.3.6.3 Security Threat**

**BOMB THREAT LETTERS/ PACKET/ PARCELS/ BOOKS BOMB**

**DO'S:**

- Inform Site Incident Controller.
- Keep calm, switch on the transistor radio and obey any instructions you receive on the TV, radio, public address system, siren alarm or verbal mode of communication.
- Cordon off the area.
- Evacuate the area.
- Be careful about entering into a room in which or seat which an explosion has occurred to bring you there. It may be used to trap you.
- Examine carefully without moving or tilting the suspected object, its shape, size construction, finish, marking and special features, if any. Note these particulars down. Try to identify it ascertain whether the object has been moved or handled before you saw it.
- Consideration should be given to suspicious vehicles/packages at the ECC and Assembly points also.
- Do examine all closed covers.
- Do handle object gently, carefully and cautiously.
- Site Incident Controller to Guide and assist the Bomb detection squad.
- Emergency Co-Ordinator to Mobilize Bomb detection squad and Investigate any alleged or suspected activities that may involve criminal offenses.
- Supervisor to Ensure occupants do not attempt to re-enter the building until it is safe to do so.

**DON'TS:**

In case of noticing any doubtful object/ threat call,

- Do not run, walk fast away from the object
- Do not create panic.



- Do not open a closed room/ door/ window/ cupboard/ box in the normal way tap wood cover and open with a ling pole or in any other improvised manner.
- Do not switch on any electric line, if the room is dark. Use hand torch for illumination.
- Do not touch, lift, drag kick, hit or move the suspected object, examine room or place quickly to see, if there is any wire or string held taut, any loose pair of insulated wires connected door/ window/ cupboard/ box or any lighted fuse or lighted rope if so.
- “Do Not Take The Bomb Away From The Public. Take The People Away From The Bomb”.
- Don’t bend or press hard on unknown parcels thin or bulky, against a source of a strong light, if cover is not uniformity translucent, suspect.

#### **7.3.6.4 Air Craft Mishap**

##### **Aircraft Accident:**

Any occurrence associated with the operation of an aircraft that takes place between the time a person boards the aircraft with the intention of flight and the time such person has disembarked, in which a person suffers death or serious injury as a result of the occurrence or in which the aircraft receives substantial damage.

##### **An aircraft accident may include incidents such as follows;**

- Flight control system malfunction or failure;
- Inability of any required flight crewmember to perform normal flight duties as a result of injury or illness;
- Failure of engine;
- In-flight fire; or
- In flight collision of aircraft;
- Damage to property, other than the aircraft.

##### **DO’S:**

- Respond to instructions from ECC.
- Air Carrier/Aircraft Operator to provide full details of aircraft related information, as appropriate, to include number of persons, fuel, and dangerous goods on board etc.
- Air Carrier/ Aircraft Operator Provide the specific or best estimate of location On/Near Airport or Closest Intersection, Landmark etc., of the emergency.
- Passengers will leave baggage and cargo on the aircraft. All persons should be detained until cleared by the designated law enforcement personnel.
- While gathered at the Assembly Areas remain cognizant of emergency vehicles, ground vehicles, aircraft, helicopter and maintain personal safety.
- Airport Authority/ Management manager exercise overall management responsibility for the coordination and support of response efforts for the Airport including directions on dealing with press, media inquiries. In conjunction with Airport staff, sets priorities for response efforts and ensures that all Airport actions are accomplished within the priorities established.



- SAR Team to provide emergency medical services to the airport during emergency conditions to include triage, stabilization, first aid, medical care, and the transportation of injured.
- Emergency Coordinator/ ATC tower manager to formally establish Command (announce the who and where of the command post) and provide radio size-up of incident (description of what is happening). Assumes command in response to certain hijack and other criminal situations and coordinates airfield aircraft movements and closures.
- SAR team to ensure that the public within the affected area receives complete, accurate, and consistent information about lifesaving procedures, health preservation instructions, emergency status and other information, and relief programs and services.

**DON'TS:**

- Do not panic.
- Airport personnel or other city personnel should not make any statements to the news media during an emergency situation at the airport or aircraft accident scene unless previously directed.

**7.3.6.5 Cyclone**

**DO'S:**

**Before the cyclone season;**

- Check your building and roof are in good condition.
- Trim tree branches well clear of your house.
- Clear property of loose material that could cause injury and damage during extreme winds.

**Upon a cyclone warning;**

- Listen to local radio/TV for further information.

**On warning of local evacuation;**

- Heed warnings and follow advice given.

**When the cyclone strikes;**

- Disconnect all electrical appliances.
- Stay inside and shelter well-clear of windows.
- Listen to your radio for cyclone updates.
- If driving, stop - clear of trees, power lines and streams.
- If in a public building, get away from glass.

**After the cyclone;**

- Listen to local radio for official warnings and advice.
- Beware of fallen power lines, damaged buildings and trees, and flooded water courses.

**DON'TS:**



### **Upon a cyclone warning;**

- In Case of receiving cyclone warning follow the instructions from ECC.
- Don't ignore warnings and don't go sightseeing.

### **When the cyclone strikes;**

- Beware the calm 'eye'. Don't assume the cyclone is over if a calm period is due to the 'eye', violent winds will soon resume from the opposite direction.
- If driving, stop - clear of trees, power lines and streams.
- If in a public building, get away from glass.

### **After the cyclone;**

- Don't go outside until advised officially that it is safe.
- If you had to evacuate, don't go home until advised. Use route recommended and stay calm.
- Don't make unnecessary telephone calls.

### **7.3.6.6 Earthquake**

#### **During An Earthquake:**



#### **DO'S;**

- Practice drop, cover, protect head with both hands and Hold on to it so that it do not move away from you Wait there until the shaking stops.
- Keep calm and keep others calm Practice Drop, Cover, protect head with both hands and hold on to it so that it do not move away from you Wait there until the shaking stops.
- Keep away from buildings, especially old, tall buildings or detached buildings, electricity wires and poles, slopes and walls. They are liable to collapse.
- Keep the roads clear for the movement of relief and rescue teams.

#### **DON'TS;**



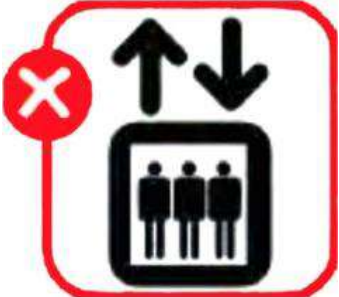

- Do not panic. Remain calm and self assured and help others who are distressed.
- DO NOT use the elevators.
- Do not turn on switches if you have electric connection in your place. Use your torch.

Note: Expect earthquake aftershocks be aware that items, especially those stored overhead may well have become dislodged.



**Indoors:**

**Escape. When you are inside building.**

	
If you are in structurally sound building stay there.	If you are inside an old weak structurally take the fastest and safest way out.
	
Do not use elevators.	After the shaking stops, take the staircase to reach open space.

**DO'S;**

- Take cover under a sturdy desk, table, or bench or against an inside wall, and hold on. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.
- Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures or furniture.
- Stay in bed—if you are there when the earthquake strikes—hold on and protect your head with a pillow, unless you are under a heavy light fixture that could fall.
- In that case, move to the nearest safe place.
- Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load bearing doorway.
- Stay inside until the shaking stops and it is safe to go outside. Most injuries during earthquakes occur when people are hit by falling objects when entering into or exiting from buildings.
- Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.
- Let younger children, elderly and disabled people leave first.

**DON'TS;**

- Do not touch any metal object in contact with loose, hanging electric wires.



- Do not go near damaged structures or enter badly damaged buildings
- Do not go sightseeing or wandering in the streets aimlessly to see what is happening around.
- Do not spread rumours.
- Do not touch any metal object in contact with loose, hanging electric wires.
- Do not go near damaged structures or enter badly damaged buildings
- Do not go sightseeing or wandering in the streets aimlessly to see what is happening around.
- Do not spread rumours.
- Do not rush to the doors or the exits and keep well away from windows, mirrors and furniture.

**When you are outside building.**

<p>If you are not next to an exit and situated in high rise building/ upstairs stay inside, do not panic, keep calm and take necessary action.</p>	<p>If you are near an exit, leave the building as soon as possible, do not rush to the exit point, get out calmly and orderly manner.</p>
<p>Move away from power lines, posts, walls, false ceiling, parapet, falling flower pots and other elements that may fall or collapse.</p>	<p>Stay away from building with glass panes.</p>

**DO’S;**

- Stay there if safe.
- Move away from buildings, streetlights, and utility wires.
- You must keep the roads free for movement of rescue and relief teams.

**DON’TS;**



- Do not run and do not wander in the street or on the roads for sightseeing. Walk towards an open place, in a calm and composed manner.

**When on the road:**

<p>If you are near hillside, move away –in case land slide or falling rocks.</p>	<p>While driving vehicle pull to the side of the road and stop.</p>	<p>Do not attempt to cross bridges/ flyovers which may have been damaged.</p>

**In A Moving Vehicle:**

**DO’S;**

- Move to side of the road and stop. Stop as quickly as safety permits and stay in the vehicle.
- Proceed cautiously once the earthquake has stopped, watching for road and bridge damage.
- DON’TS;
- Avoid stopping near or under buildings, trees, overpasses, and utility wires.

**Trapped Under Debris:**

**DO’S;**

- Cover your mouth with a handkerchief or clothing.
- Tap on a pipe or wall so rescuers can locate you. Use a whistle if one is available.
- Shout only as a last resort—shouting can cause you to inhale dangerous amounts of dust.
- Rescue operation - Let the unconscious person lie on side position. Check for injuries and first treat yourself, then help others.

**DON’TS;**

- Do not light a match.
- Do not move about or kick up dust.

**7.3.6.7 Evacuation**

**DO’S;**

- Remain calm.
- Walk out of the building quietly and orderly manner.
- Follow the evacuation route only.
- Follow instruction from guides on any confusion about the route and assembly area.
- Switch off the machinery and power supply before leaving the area.



- Help ladies and old people to safe area.
- Remain in the assembly area wait for further instructions.
- Check for all the employees at the assembly area. If anybody is missing, the matter should be immediately reported to the co-coordinator of Bomb Threat Committee.
- Use staircase during evacuation.
- While Evacuation keep clear of buildings and glass in particular.

**DON'TS;**

- Do not run. Walk calmly.
- Do not argue or try to obtain details about the bomb from anybody leading to time loss.
- Do not obstruct the flow of evacuation.
- Do not leave any personal belongings.
- Do not obstruct passage to anybody.
- Do not make noise at the assembly area.
- Do not spread rumours.
- Do not use lift during evacuation.

**7.3.6.8 Epidemic/Pandemic**

*An indicative list of Do's and Don'ts are as follows.*

**DO'S;**

- To maintain personal hygiene and physical distancing.
- To practice frequent hand washing. Wash hands with soap and water or use alcohol-based hand rub. Wash hands even if they are visibly clean.
- To cover your nose and mouth with handkerchief/tissue while sneezing and coughing.
- To throw used tissues into closed bins immediately after use.
- To maintain a safe distance from persons during interaction, especially with those having flu-like symptoms.
- To sneeze in the inner side of your elbow and not to cough into the palms of your hands.
- To take their temperature regularly and check for respiratory symptoms. To see a doctor if you feel unwell (fever, difficulty in breathing and coughing). While visiting doctor, wear a mask/cloth to cover your mouth and nose.
- For any fever/flu-like signs/symptoms, please call ECC for further instructions.
- Self-quarantine yourself for 14 days if you come into contact with someone who tests positive for COVID-19.

**DON'TS;**

- Shake hands.
- Have a close contact with anyone, if you're experiencing cough and fever.
- Touch your eyes, nose and mouth.
- Sneeze or cough into palms of your hands.
- Spit in Public.



## CHAPTER 7: ADDITIONAL STUDIES

- Travel unnecessarily, particularly to any affected region.
- Participate in large gatherings, including sitting in groups at canteens.
- Visit gyms, clubs and crowded places etc.
- Spread rumours or panic.



## **Chapter 8: PROJECT BENEFITS**

It is seen that the Project is aimed to fulfill the objective of Sustainable Development. It will certainly improve social status. In what way and to what extent this will reach is submitted herein below.

### **8.1 Improvements in the Physical Infrastructure**

This Project will improve the physical infrastructure of this area.

- Since existing structure is being utilized, drainage pattern will not be disturbed

### **8.2 Improvements In the Social Infrastructure**

This Project will improve the social infrastructure of this area.

- It will not disturb the existing pattern of social relations and democratic set up. This mainly because the Proponent is accepted by local culture, without any disturbance to the existing pattern of social relations or hierarchy.
- Likewise the health level goes along with flow of funds and avenue of livelihood. Dependence on Government institutes like PHC (Primary Health Centre) also goes along with political stability of the area.
- Health awareness and economic independence may also help in Family Planning decision-making.
- What is stated above about the human health is equally true about animal husbandry and veterinary assistance. This may improve now.
- Living in harmony is an important aspect of the society. This can happen only if all the components are comfortably placed. Persons engaged in their respective vocation and accruing job satisfaction leads to this. This will become possible by this venture.

### **8.3 Employment Potential: (Skilled, Semi-Skilled and Unskilled)**

The industry and its supporting activity need many types of people right from manual to managerial strength, in a pyramid. So in manufacturing activity all three types i.e skilled, semi skilled and unskilled people are required.

For the proposed project about 30-40 persons are expected to employ for the skilled, semi-skilled and unskilled category. The preference will be given to local population for employment in the semi-skilled and unskilled category; this will increase the employment opportunity in the surrounding area. The ideology of the company is to give employment opportunity to nearby villagers and this is the most positive aspect of company regarding enhancement of the society. Secondary jobs and indirect employment are also bound to be generated to provide day-to-day needs and services to the work force and industrial activity. This will also increase the demand for essential daily utilities in the local market. Due to proposed project there will be development of communication facilities in the area.



The employed people will be benefited financially. This financial gain will fulfill their monetary requirements, which in turn will increase their standard of living.

The overall potential including the garages, loading-unloading actions, eateries, small shop owners is substantial. The local people can get a good share out of this. In the factory, science and technology prevails and there some outsiders will have to be engaged at least for the time being. If the second generation local people acquire that skill, they too will be able to fill the gap and accrue benefit of higher jobs. If this activity of manufacturing becomes stable by that time, perhaps expansion may become possible further and then employment availability may further enhance.

It can be stated that by this activity employment potential is certainly increasing in all walks of life – skilled, semi-skilled and unskilled.

#### **8.4 Direct Revenue Earning to the National and UT Exchequer**

This project will contribute additional revenue to the Central & UT exchequer in the form of applicable taxes for interstate movement, corporate taxes etc. Indirect contribution to the Central & UT exchequer will be there due to Income by way of registration of trucks, payment of road tax, income tax from individual as well as taxes from associated units. Thus, the proposed project will help the Government by paying different taxes from time to time, which is a part of revenue and thus, will help in developing the area.

#### **8.5 Other Tangible Benefits**

Both tangible and non-tangible benefits will result from this activity and many of those are described above. Apart from direct employment, many other benefits will accrue like

- Aesthetics improvement by general greening with emphasis on biodiversity.
- Developed economy strengthens democratic set-up.
- Developed economy brings with it literacy and healthful living.
- Improved safety-security in surrounding with better Law and Order.
- Symbiosis and sustainable development will be the ultimate objective.

#### **8.6 Chapter Conclusion**

Overall benefits of the project are as follows:

- This project will connect areas of island to Port Blair and ultimately it will promote tourism, resulting into growth in economic condition of these remote areas.
- This project will serve job opportunities to local people in terms of direct and indirect employment.



## CHAPTER 8: PROJECT BENEFITS

- Demands of community services and commercial development also create additional employment for the poor strata of society by way of maid/servant, sweeper, security guard etc. so the project will provide positive impact on the economic development of the region in terms of employment opportunities.
- Connecting to main or developed land will results into infrastructural development of these islands.
- Considering clean ecosystem of this island, foreign tourists are assumed to be attracted at these places, resulting into good foreign exchange amount.
- AAI proposed to install Solar panels for generation of electricity, which will reduce the additional load on electricity board.



**Chapter 9: ENVIRONMENTAL COST BENEFIT ANALYSIS**

The proposed project falls in Category 7(a) of the Schedule vide EIA notification 2006 amended to date involving preparation of Environment Impact Assessment study and Environment Management Plan. The environmental cost benefit analysis was not made mandatory in the project specific Terms of References accorded to the company (*Refer Annexure 1*). Also the Standard Terms of References published by the MOEF&CC on April 2015 does not include the environmental cost benefit analysis in the General & Specific TOR.



## **Chapter 10: ENVIRONMENTAL MANAGEMENT PLAN**

### **10.1 Introduction**

Every development is associated with the positive and negative impacts on environmental components. Though the probable negative impacts cannot be nullified completely the much required developmental activities cannot be impeded.

Environmental Impact Assessment helps in identifying potential environmental impacts of a proposed project activity. Based on the finding of the impact assessment, Environment Management Plan is devised to minimize the adverse impacts and enumerate various steps to be taken for improvement of the environment. Environmental Management Plan helps in formulation, implementation and monitoring of environmental parameters during & commissioning of project. Environment Management Plan (EMP) is the tool to ensure a safe and clean environment. A project may have identified proper mitigation measures but without a management plan to execute it, the desired results may not be obtained. The Environment Management Plan envisages proper implementation of mitigation measures to reduce the adverse impacts arising out of the project activities.

Some of the major objectives of the EMP are:

- Ensure the project implementation with minimal impacts on all environmental components
- Minimize the impacts on socio- economic indicators of local and adjoining regions
- Maintain the highest level of readiness for setting the needs of any deviation in sustainability practices
- Systematic implementation with adequate manpower, budget and action plan for EMP
- To demonstrate the effectiveness of EMP workability along with the project proponent’s commitment.

### **10.2 Organization and Environmental Cell**

**Table 10.1: Environment Cell**

<b>SN</b>	<b>Responsible Person</b>	<b>Facet</b>	<b>Aspect</b>
1	Chief Engineer	Construction Phase	Material waste minimization, labour camp sanitation, Noise, oil grease& vibration nuisance control, accident prevention.
		Post Construction	Remediation of repulsive sites
2	Environment Coordinator	Air	Car census, PUC control, Noise mitigation
		Water	Water budget, O&M of waste water treatment plants
		Solid waste	Segregation, collection, catering
		Greening	Tree plantation, Lawn development, storm water



**CHAPTER 10: ENVIRONMENTAL MANAGEMENT PLAN**

		Monitoring	Field observation, Laboratory tests, interpretation & reporting
		Public relation & Press	Documentation, updating, rehabilitation, training, meeting, report
3	Supervisor	Occupational Health	Routine surveillance, Abatement, control & disposal training

### 10.3 Environmental Management Measures

#### 10.3.1 Air Environment

##### 10.3.1.1 Construction Phase

Not Applicable as the Passenger Facilitation Centre is being provided in the existing shed on the existing jetty.

##### 10.3.1.2 Operational Phase

Major pollutants envisaged from the proposed airport will be from aircrafts exhaust, vehicular traffic, and speed boat as ground support, pickup and dropping and from DG sets. The major pollutants will be NO<sub>x</sub> and Carbon monoxide besides particulates and SO<sub>2</sub>. The baseline ambient air quality levels in the project area are within the permissible limits as specified as National Ambient Air Quality Standards. The following methods of abatement will be employed for the air pollution control at the source level during operation phase of proposed airport.

- Shut down combustion engines when not in use;
- Single engine taxiing and reduced taxiing would be effective in reducing emissions of HC and CO from aircrafts;

#### 10.3.2 Noise Environment

##### 10.3.2.1 Construction Phase

Not Applicable as the Passenger Facilitation Centre is being provided in the existing shed on the existing jetty.

##### 10.3.2.2 Operation Phase

The seaplanes at idle position are likely to generate comparatively minimal level of as compared to that of takeoff operations since for idle position thrust will not be required the seaplanes will be moored to dock. The anticipated noise levels during seaplanes at idle position is 65 d(BA).

The duration of seaplanes being at idle position will be extremely short since 9 Passengers will board/deplane at any given point of time.



### **10.3.3 Water Environment**

The proposed project consists of pre-casting of floating jetty hence water is not required for the project

### **10.3.4 Soil Environment**

#### **10.3.4.1 Construction Phase**

Not Applicable as the Passenger Facilitation Centre is being provided in the existing shed on the existing jetty.

### **10.3.5 Solid Waste management**

Solid waste generation is not envisaged.

## **10.4 Details of EMP Budget Allocation**

The proposed budgetary allocation has been made with a view to install new pollution control devices & management of overall environment during the Construction & operational phase the basis and estimated costing of the EMP budget is as depicted in the following table.

**Table 10.2: EMP Budget for Construction Phase**

<b>SN</b>	<b>Attributes</b>	<b>Parameter</b>	<b>Total Cost (in lakhs)</b>
1	Noise Environment	Provision of acoustic enclosures,	2.0
2	Environmental Monitoring (Refer Table 6.1)	Air, Noise, Soil, Water, Ecology & Marine Water Sampling	0.8
3	Occupational Health	Provision of PPEs, First aid, medical check-ups	2.0
	<b>Total Cost</b>		<b>4.8</b>



EIA Report for “Development of Water Aerodrome” located at Shaheed Dweep, Village – Bharatpur, Taluka – Port Blair, District – South Andaman, Andaman & Nicobar

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**Table 10.3: EMP Budget for Operational Phase**

SN	Component	Particulars		Budgetary Allocation Capital Investment (INR, in lakhs)	Budgetary Allocation Recurring Expenditure (INR, in lakhs/yr)
1	Environment Monitoring & Management (Refer Table 6.2)	Quarterly Environment Monitoring (Per year)		--	25.0
		Ambient Air Monitoring	PM <sub>10</sub> , PM <sub>2.5</sub> , SO <sub>2</sub> , NO <sub>x</sub> , CO		
		Noise Monitoring	dB(A)		
		Biotic Environment	Terrestrial & Aquatic		
		Sewage water (Treated & Untreated)	pH, COD, BOD, TSS, TDS, Oil & Grease		
2	Occupational Health	Periodic medical check-ups of staff, provision of PPEs, Trainings, First aid kits etc		5.0	2.0
3	Oil Spill Contingency	Procurement of necessary equipment and chemicals and their maintenance		10.0	2.0
<b>Total Cost (INR , Lakhs)</b>				<b>15.0</b>	<b>29.0</b>



## 10.5 Traffic Management

### **External Traffic Management:**

The proposed project site is presently not connected through the road. The project proponent has proposed 5-6m wide approach road till the site premises for ease of transportation.

Existing number of registered vehicles on Shaheed Dweep is as follows:

**Table 10.4: Max PCU’s Calculation**

SN	Type of Vehicles	No. of Vehicles	Passenger Car Equivalency (PCE) <sup>1</sup>	Vehicles in PCU’s
1	Two Wheelers (Personal)	212	0.75	159
2	Two Wheelers (Commercial)	30	0.75	23
3	LMV (Commercial)	190	1.00	190
4	Three Wheelers	27	2.00	54
5	Others	13	3.70	48
<b>Total</b>				<b>474</b>

<sup>1</sup> - as per IRC 106-1990 guidelines

The sea plane proposed for use in this project is having capacity of 9 Passengers. It is proposed to develop the infrastructure facility for 180 Passengers per day. The proposed project will create at max addition of ~ 100 trips per day of cars i.e. 10 cars per hr considering 10 hrs of daytime operations.

The existing design capacity of road as per IRC 106-1990 guidelines is 1900 PCU’s/hr (2 lane 1 way). The additional 10 cars per hour (i.e. 10 PCU’s/hr) is very marginal to the design capacity and will not significantly affect the current traffic situation. Traffic will continue to run smoothly (just as in existing condition) without congestion and no widening of road is anticipated.

### **Internal Traffic Management:**

The internal traffic management plan is as detailed out in below table:

**Table 10.5: Salient Features of Internal Traffic Management**

Items	Details
Access Points	<ul style="list-style-type: none"> <li>➤ Total 1 Access point is proposed via 6.0m wide road</li> <li>➤ Entry/Exit is proposed via proposed approach road that is for 6.0 m</li> <li>➤ Parking is proposed on ground floor and shall have capacity of 10 vehicles in Phase I and during Phase II additional 10 vehicles parking will be provided via mechanical parking</li> <li>➤ Strict enforcement for “no pick-up and drop-off” zones at turning points of proposed entrance points to avoid any bottlenecks. Pick-up and Drop-off Zones are to be clearly marked at the entrance of PTB.</li> <li>➤ Sufficient intersection sight distance shall be available for outbound</li> </ul>



**CHAPTER 10: ENVIRONMENTAL MANAGEMENT PLAN**

	vehicles from subject site. It is recommended to avoid installing landscaping of more than 0.6m which can hamper the driver’s sight distance at turning portions.
Vehicle Entry Check	<ul style="list-style-type: none"> <li>➤ If manual vehicle check is introduced, then checking point shall be strategically located to avoid queue spill over on public roads during peak hours.</li> <li>➤ Boom barrier with electronic ID check is highly recommended at entrance.</li> </ul>
Pedestrian Entry	<ul style="list-style-type: none"> <li>➤ A separate entry gate of minimum of 1.2 m width is recommended for pedestrian access to the premises. It is recommended for safe movement of pedestrians and to avoid any conflicts with vehicular traffic during peak hours.</li> </ul>
Speed	<ul style="list-style-type: none"> <li>➤ It is recommended to install a low speed limit signs (10 km/hr) on internal road from pedestrian safety perspective.</li> </ul>
Traffic Calming	<ul style="list-style-type: none"> <li>➤ Considering safety aspect, speed bumps are proposed on internal road near drop-off areas and near main entrance lobby.</li> <li>➤ It is recommended to install a rubber speed bump of maximum height of 2 to 3 inch shall be provided at midblock portions to keep the vehicle speed in control.</li> </ul>
Signages	<ul style="list-style-type: none"> <li>➤ It is recommended to install guide signs (Entry Demarcation, Directional Arrows, Visitors Parking, No Parking, etc.) for users to implement the suggested vehicle circulation.</li> <li>➤ Directional guidance arrows (left/right) shall be installed on driveways to enforce the recommended circulation.</li> </ul>
Fire Tender Pathway	<ul style="list-style-type: none"> <li>➤ “No Parking Zone” shall be clearly marked or painted with cross marks in yellow colour.</li> <li>➤ Also, fire tender pathway at minimum <u>6.0 m clear carriageway</u> shall be maintained on internal roads.</li> </ul>
Other Miscellaneous	<ul style="list-style-type: none"> <li>➤ It is recommended to review the Internal Traffic Management Plan in future with full build-out of the project with actual traffic conditions to modify or maintain the locations of the traffic calming devices from a safety perspective.</li> </ul>

### 10.6 CER Activity

The proposed project has been funded by the Central Funding and will provide the boost the tourism and increase in employment.

### 10.7 System of Reporting of Non Compliance /Violations of Environmental Norms

The Project Proponent will develop a system of reporting non compliance/violations of environmental norms in the following manner:



## **CHAPTER 10: ENVIRONMENTAL MANAGEMENT PLAN**

In case of Non compliance, the lower officer will report to the project head. The project head will report to the Andaman and Nicobar Administration. To close the non compliance board seating will be called in which the action plans to attend the non compliance will be discussed. After discussion the board resolution will be passed which should be implemented in a time bounded manner.

The key elements of the process include:

- i. Identification of Non-Conformance and/or Non-Compliances;
- ii. Recording of Non-Conformance and/or Non-Compliance
- iii. Evaluation of the Non-Conformance and/or Non-Compliance to determine specific corrective and preventative actions;
- iv. Corrective and preventative to be assigned to responsible person and
- v. Management Review of corrective actions to ensure the status and effectiveness of the actions.

The Environment Management Cell ensures to monitor the mitigation actions in place so as to avoid repeat of such Non compliances / violations.



**Chapter 11: Summary and Conclusions**

The proposed project of Water Aerodrome envisages catering further to the tourism of Andaman and Nicobar Island.

The EIA study has been carried out with respect to the TORs awarded by EAC, MoEF&CC and Standard TORs. All the impacts likely to have an effect on the environment have been identified and efficient/adequate mitigation measures have been proposed for the same. Based on the environmental assessment, the associated potential adverse environmental impacts can be mitigated to an acceptable level by adequate implementation of the measures as stated in the EIA and EMPs.

Further, the proponent also undertakes activities that will provide the boost to the tourism as well as increase in employment which shall have beneficial impacts on the socio-economic environment. Employment generation due to the proposed project is also considered positive impact on the socio-economic environment. Measures like energy conservation and greenbelt development are also noteworthy.

Looking to the overall project scenario, employment potential and allied development plans; it has been noticed that the proposed project would significantly help in the improvement of the society and nation at large.

All the relevant safety norms with latest technology have been incorporated in the proposed project. Hazards and associated risks, safety and security provision associated with the project activities appear to be acceptable. Hence the project in totality may be considered environmentally safe.



## **CHAPTER 12. DISCLOSURE OF CONSULTANT**

### **12.1 Disclosure of Consultant**

**M/s Enviro Resources** is a NABET Accredited EIA Consultant Organization vide Certificate No. NABET/EIA/2225/RA 0277 vide letter no. QCI/NABET/ENV/ACO/23/2801 dated March 28, 2023. The registered office of Enviro Resources is at 1904 Roopnagar CHS Opp. Milap, S V Road, Kandivali West, Mumbai 400067, Maharashtra.

**M/s Enviro Resources** is accredited by QCI-NABET for sectors as mentioned in **Table 12.1**.

**Table 12.1: Accredited Sectors as Approved by QCI-NABET**

<b>SN</b>	<b>Name of Sector</b>	<b>Schedule as per MoEF&amp;CC Notification</b>	<b>Category</b>
1	Mining of Minerals (Opencast only)	1 (a) i	B
2	Synthetic Organic Chemicals Industry	5 (f)	A
3	Distilleries	5 (g)	B
4	Sugar Industry	5 (j)	B
5	Airports	7 (a)	A
6	Highways	7 (f)	A
7	Building and Construction Projects	8 (a)	B
8	Townships and Area Development Projects	8 (b)	B

**M/s Enviro Resources** is engaged in providing following environmental consultancy services to their valuable clients:

- 1) Obtaining **Environmental Clearance** from Department of Environment of State Govt. and MoEF & CC, GOI
- 2) Environmental Impact Assessment (**EIA**) studies and Environmental Management Plan (**EMP**)
- 3) Environmental Due Diligence Services
- 4) Consent to Establish, Operate, Renewal & its amendments from State Pollution Control Board
- 5) **CRZ Clearance** from Central & State CZMA (Coastal Zone Management Authority)
- 6) **Forest Clearance** from MoEF & CC, GOI
- 7) Environmental **Compliance Report** preparation for Environmental Clearances, Consent to Establish and Consent to Operate
- 8) Designing and Commissioning of **ETP, STP, WTP** & Zero Liquid Discharge (**ZLD**) Plant
- 9) Preparation of Quantitative Risk Analysis (**QRA**), **HAZOP, HAZID**, Disaster Management Plan (**DMP**) Reports.
- 10) Preparation of On-site & Off-site Emergency Preparedness Plan
- 11) Reply for legal directions & Revocation of closure.





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**Certificate of Accreditation**

**Enviro Resources, Mumbai**

1604 Roopnagar CHS, S.V.Road, Kandivali West, Mumbai -400067, Maharashtra

The organization is accredited as **Category-A** under the QCI-NABET Scheme for Accreditation of EIA Consultant Organization, Version 3: for preparing EIA-EMP reports in the following Sectors –

S.No	Sector Description	Sector (as per)		Cat.
		NABET	MoEFCC	
1	Mining of minerals opencast only	1	1 (a) (i)	B
2	Synthetic organic chemicals industry	21	5 (f)	A
3	Distilleries	22	5 (g)	B
4	Sugar Industry	25	5 (j)	B
5	Airports	29	7 (a)	A
6	Highways,	34	7 (f)	A
7	Building and construction projects	38	8 (a)	B
8	Townships and Area development projects	39	8 (b)	B

*Note: Names of approved EIA Coordinators and Functional Area Experts are mentioned in RAAC minutes dated Oct 28, 2022 and supplementary minutes Feb 10, 2023 posted on QCI-NABET website.*

The Accreditation shall remain in force subject to continued compliance to the terms and conditions mentioned in QCI-NABET's letter of accreditation bearing no QCI/NABET/ENV/ACO/23/2801 dated March 28, 2023. The accreditation needs to be renewed before the expiry date by Enviro Resources, Mumbai following due process of assessment.

**Sr. Director, NABET**  
Dated: March 28, 2023

**Certificate No.**  
NABET/EIA/2225/RA 0277

**Valid up to**  
July 06, 2025

For the updated List of Accredited EIA Consultant Organizations with approved Sectors please refer to the QCI-NABET website.

# **Annexure 1**

**(Terms of Reference)**

F.No. 10-54/2019-IA-III  
Government of India  
Ministry of Environment, Forest and Climate Change  
(IA.III Section)

Indira Paryavaran Bhawan,  
Jor Bagh Road, New Delhi - 3

Date: 16<sup>th</sup> December, 2019

To,

**Deputy Director of Civil Aviation**  
**M/s Andaman and Nicobar Administration**  
Helicopter Terminal Building, VIP Road,  
Port Blair - 744103, Andaman and Nicobar  
E Mail: [civilaviation.and@nic.in](mailto:civilaviation.and@nic.in)

**Subject: Development of Water Aerodrome at Shaheed Island, Andaman & Nicobar by M/s Airport Authority of India - Terms of Reference - reg.**

Sir,

This has reference to your proposal No. IA/AN/MIS/124311/2019 dated 9<sup>th</sup> November, 2019, submitting the above proposal to this Ministry for seeking Terms of Reference (ToR) in terms of the provisions of the Environment Impact Assessment (EIA) Notification, 2006 under the Environment (Protection) Act, 1986.

2. The proposal for grant of Terms of Reference (ToR) to the project 'Development of Water Aerodrome at Shaheed Island, Andaman & Nicobar by M/s Airport Authority of India was considered by the Expert Appraisal Committee (Infra-2) in its 46<sup>th</sup> meeting held on 25-26 November, 2019.

3. The details of the project, as per the documents submitted by the project proponent, and also as informed during the above said meeting, are under:-

- (i) The proposal is for development of Water Aerodrome at Shaheed Island, Andaman & Nicobar by Airport Authority of India and Andaman & Nicobar Administration
- (ii) The proposed project is located on Shaheed Island, Andaman & Nicobar. The land side of the proposed project admeasures 3,750 sqm. The land use is currently forest land and Change in Land Use (CLU) is under progress for the proposed activity. The break-up of the plot area on the land side is as mentioned below:

S.No.	Description	Area sqm	% Utilization of Plot Area
1	Terminal Building (PTB)	1050	28.00
2	Utility Building/Services	144	3.80
3	Green Belt	1220	32.50
4	Parking Area	96	2.70
5	Peripheral Roads	1159	31.00
6	Hard Paving	78	2.00
<b>Total Plot Area</b>		<b>3,750</b>	<b>100.00</b>

- (iii) The project is not located in Critically Polluted area.
- (iv) During construction phase water requirement will be ~ 3 KLD and shall be sourced from water tankers. During operation phase, net fresh water requirement is ~ 6.5 KLD and it shall be sourced from local municipal sources.
- (v) The project site is situated at above mean sea level of ~4 meter. Currently project site is covered with vegetation of Kranch plants species with quantum of 53 nos.
- (vi) Investment/Cost of the project is Rs. 22 Crores.



- (vii) Employment potential: During the project operation stage, for the purposes of day-today professional and maintenance works, about 50 staff is envisaged.
- (viii) Benefits of the project: The incoming of tourist at proposed project location will leads to increase in tourism & hotel business at local level. The proposed project will serve employment to local people. Establishment of proposed project will contribute in increase in level of current social infrastructural facilities of Shaheed Island. Considering the above overwhelming positive impacts, there shall be overall development of the area.

4. During deliberations the EAC noted the following:-

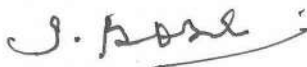
- (i) The proposal is for grant of Terms of Reference to the project Development of Water Aerodrome at Shaheed Island, Andaman & Nicobar by M/s Airport Authority of India.
- (ii) The project/activity has applied under category A of item 7(a) 'Air Ports' of the Schedule to the EIA Notification, 2006 and its amendments.
- (iii) The Water Aerodrome is not a listed project/activity in the Schedule to the EIA Notification, 2006 and its amendments. However, the Committee opined that the activities proposed under the project would have similar type of impacts as of normal Airport.
- (iv) Considering the Water Aerodrome are just emerging in the country as a new mode of transport involving sea/river fronts and its likely impacts on water, air and aquatic biodiversity including flora and fauna, the EAC has taken a view to follow the EC process as per category A of item 7(a) 'Air Ports' of the Schedule to the EIA Notification, 2006.

5. The EAC, in its 46<sup>th</sup> meeting held on 25-26 November, 2019, after detailed deliberations on the proposal, recommended following additional ToR points in addition to the Terms of Reference as specified by the Ministry as Standard ToR in April, 2015 for the said project/activity for preparation of EIA-EMP report. As per the recommendation of the EAC, the Ministry of Environment, Forest and Climate Change hereby accords ToR to the project 'Development of Water Aerodrome at Shaheed Island, Andaman & Nicobar by M/s Airport Authority of India for preparation of the Environment Impact Assessment (EIA) Report and Environment Management Plan (EMP) with the following specific and general conditions in addition to Standard ToR provided at **Annexure**.

- (i) Importance and benefits of the project.
- (ii) The EIA will discuss the compliance to the Pollution Control Laws and the notifications under the E.P. Act 1986 and get a certified report from the Pollution Control Board.
- (iii) The E.I.A. will give a justification for land requirements along with a comparison to the guidelines established by the Airport Authority of India/Ministry of Civil Aviation in this regards.
- (iv) A toposheet of the study area of radius of 10 km and site location on 1:50,000/1:25,000 scale on an A3/A2 sheet (including all eco-sensitive areas and environmentally sensitive places).
- (v) Layout maps of proposed project indicating runway, Aerodrome building, parking, greenbelt area, utilities etc.
- (vi) Cost of project and time of completion.
- (vii) The impacts of demolition and the activities related thereto shall be examined and a management plan drawn up to conform to the Construction and Demolition rules under the E.P. Act, 1986.



- (viii) The report shall examine the details of excavations, its impacts and the impacts of transport of excavated material. A detailed Management Plan shall be suggested.
- (ix) Detail plan for 'deplane waste' and impact of noise on the sensitive environment specially the wildlife sanctuaries and national parks.
- (x) EIA report should contain the water quality, flora and fauna details along with corals in the region.
- (xi) An assessment of the cumulative impact of all development and increased inhabitation being carried out or proposed to be carried out by the project or other agencies in the core area, shall be made for traffic densities and parking capabilities in a 05 kms radius from the site. A detailed traffic management and a traffic decongestion plan drawn up through an organization of repute and specializing in Transport Planning shall be submitted with the EIA. The Plan to be implemented to the satisfaction of the State Urban Development and Transport Departments shall also include the consent of all the concerned implementing agencies.
- (xii) The E.I.A. should specifically address to vehicular traffic management as well as estimation of vehicular parking area inside the Aerodrome premises.
- (xiii) An onsite disaster management plan shall be drawn up to account for risks and accidents. This onsite plan shall be dovetailed with the onsite management plan for the district.
- (xiv) A note on appropriate process and materials to be used to encourage reduction in carbon foot print. Optimize use of energy systems in buildings that should maintain a specified indoor environment conducive to the functional requirements of the building by following mandatory compliance measures (for all applicable buildings) as recommended in the Energy Conservation Building Code (ECBC) 2017 of the Bureau of Energy Efficiency, Government of India. The energy system includes air conditioning systems, indoor lighting systems, water heaters, air heaters and air circulation devices.
- (xv) Details shall be provided regarding the solar generation proposed and the extent of substitution, along with compliance to the ECBC rules.
- (xvi) Details of emission, effluents, solid waste and hazardous waste generation and their management. Air quality modelling and noise modelling shall be carried out for the emissions from various types of aircraft.
- (xvii) The impact of aircraft emissions in different scenarios of idling, taxiing, take off and touchdown shall be examined and a management plan suggested.
- (xviii) The impact of air emissions from speed controlled and other vehicles plying within the Airport shall be examined and management plan drawn up.
- (xix) The management plan will include compliance to the provisions of the MSW Rules, 2016.
- (xx) A detailed management plan, drawn up in consultation with the competent District Authorities, shall be submitted for the regulation of unauthorized development and encroachments within a 05 Km radians of the Aerodrome.
- (xxi) Noise monitoring and impact assessment shall be done for each representative area (as per the Noise Rules of MoEF&CC). A noise management plan shall be submitted to conform to the guidelines of the MoEF&CC and the DGCA.
- (xxii) Noise monitoring shall be carried out in the funnel area of flight path.
- (xxiii) Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract).
- (xxiv) Details of fuel tank farm and its risk assessment.



- (xxv) The report should give a detailed impact analysis and management plan for handling of the following wastes for the existing and proposed scenarios.
- (a) Trash collected in flight and disposed at the Aerodrome including the segregation mechanism.
  - (b) Toilet wastes and sewage collected from aircrafts and disposed at the Aerodrome.
  - (c) Maintenance and workshop wastes.
  - (d) Wastes arising out of eateries and shops situated within the Aerodrome.
- (xxvi) Any litigation pending against the project and/or any direction/order passed by any Court of Law against the project, if so, details thereof shall also be included. Has the unit received any notice under the Section 5 of Environment (Protection) Act, 1986 or relevant Sections of Air and Water Acts? If so, details thereof and compliance/ATR to the notice(s) and present status of the case.
- (xxvii) Submit an affidavit signed by the Board of Directors, that there is no violation and no part of the project has been implemented without Environmental Clearance.
- (xxviii) Public hearing to be conducted and issues raised and commitments made by the project proponent on the same should be included in EIA/EMP Report in the form of tabular chart with financial budget for complying with the commitments made.
- (xxix) Plan for Corporate Environment Responsibility (CER) as specified under Ministry's Office Memorandum vide F.No. 22-65/2017-IA.III dated 1<sup>st</sup> May, 2018 shall be prepared and submitted along with EIA Report.
- (xxx) A tabular chart with index for point wise compliance of above ToR.
- (xxxi) In addition to above, since the proposal also attract IPZ Notification, 2011, following shall also be submitted along with the EIA/EMP Report:
- *Recommendation of A&N CZMA.*
  - *Submit requisite document as per IPZ Notification, 2011 such as Form-1, CRZ map on 1:4000 scale with project activities superimposed on the map.*

### **General Guidelines**

- (i) The EIA document shall be printed on both sides, as far as possible.
- (ii) All documents should be properly indexed, page numbered.
- (iii) Period/date of data collection should be clearly indicated.
- (iv) Authenticated English translation of all material provided in Regional languages.
- (v) The letter/application for EC should quote the MoEF&CC File No. and also attach a copy of the letter prescribing the ToR.
- (vi) The copy of the letter received from the Ministry on the ToR prescribed for the project should be attached as an annexure to the final EIA-EMP Report.
- (vii) The final EIA-EMP report submitted to the Ministry must incorporate the issues mentioned in ToR and that raised in Public Hearing. The index of the final EIA-EMP report, must indicate the specific chapter and page no. of the EIA-EMP Report where the specific ToR prescribed by the Ministry and the issue raised in the Public Hearing have been incorporated. Questionnaire related to the project (posted on MoEF&CC website) with all sections duly filled in shall also be submitted at the time of applying for EC.
- (viii) Grant of ToR does not mean grant of EC.

*J. Bose*

- (ix) The status of accreditation of the EIA consultant with NABET/QCI shall be specifically mentioned. The consultant shall certify that his accreditation is for the sector for which this EIA is prepared.
- (x) On the front page of EIA/EMP reports, the name of the consultant/consultancy firm along with their complete details including their accreditation, if any shall be indicated. The consultant while submitting the EIA/EMP report shall give an undertaking to the effect that the prescribed ToRs (ToR proposed by the project proponent and additional ToR given by the MoEF&CC) have been complied with and the data submitted is factually correct (Refer MoEF&CC Office memorandum dated 4<sup>th</sup> August, 2009).
- (xi) While submitting the EIA/EMP reports, the name of the experts associated with/involved in the preparation of these reports and the laboratories through which the samples have been got analysed should be stated in the report. It shall clearly be indicated whether these laboratories are approved under the Environment (Protection) Act, 1986 and the rules made there under (Please refer MoEF&CC Office Memorandum dated 4<sup>th</sup> August, 2009). The project leader of the EIA study shall also be mentioned.
- (xii) All the ToR points as presented before the Expert Appraisal Committee (EAC) shall be covered.

6. The above ToR should be considered for the project 'Development of Water Aerodrome at Shaheed Island, Andaman & Nicobar by M/s Airport Authority of India, in addition to all the relevant information as per the 'Generic Structure of EIA' given in Appendix III and IIIA in the EIA Notification, 2006.

7. The project proponent shall submit the detailed final EIA/EMP prepared as per ToR to the Ministry for considering the proposal for environmental clearance within 3 years as per the MoEF&CC O.M. No.J-11013/41/2006-IA-II(I) (P) dated 08.10.2014.

8. The consultants involved in preparation of EIA/EMP report after accreditation with Quality Council of India/National Accreditation Board of Education and Training (QCI/NABET) would need to include a certificate in this regard in the EIA/EMP reports prepared by them and data provided by other Organization(s)/ Laboratories including their status of approvals etc. vide Notification of the MoEF&CC dated 19.07.2013.

9. The prescribed ToR would be valid for a period of three years for submission of the EIA/EMP Reports.

10. This issues with the approval of the competent authority.

  
(Dr. Subrata Bose)  
Scientist F

**Copy to:**

The Member Secretary, Andaman and Nicobar Pollution Control Committee, Head Office, Department of Science & Technology, Dollygunj, Port Blair - 744103, South Andaman, A & N Islands.



**7(a): STANDARD TERMS OF REFERENCE FOR CONDUCTING ENVIRONMENT IMPACT ASSESSMENT STUDY FOR AIRPORTS AND INFORMATION TO BE INCLUDED IN EIA/EMP REPORT**

- (i) Reasons for selecting the site with details of alternate sites examined/rejected/selected on merit with comparative statement and reason/basis for selection. The examination should justify site suitability in terms of environmental angle, resources sustainability associated with selected site as compared to rejected sites. The analysis should include parameters considered along with weightage criteria for short-listing selected site.
- (ii) Details of the land use break-up for the proposed project. Details of land use around 10 km radius of the project site. Examine and submit detail of land use around 10 km radius of the project site and map of the project area and 10 km area from boundary of the proposed/existing project area, delineating project areas notified under the wild life (Protection) Act, 1972/critically polluted areas as identified by the CPCB from time to time/notified eco-sensitive areas/inter state boundaries and international boundaries.. Analysis should be made based on latest satellite imagery for land use with raw images.
- (iii) Submit the present land use and permission required for any conversion such as forest, agriculture etc. land acquisition status, rehabilitation of communities/ villages and present status of such activities. Check on flood plain of any river.
- (iv) Examine and submit the water bodies including the seasonal ones within the corridor of impacts along with their status, volumetric capacity, quality likely impacts on them due to the project.
- (v) Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area, any obstruction of the same by the airport.
- (vi) Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/ villages and present status of such activities.
- (vii) Examine the impact of proposed project on the nearest settlements.
- (viii) Examine baseline environmental quality along with projected incremental load due to the proposed project/activities
- (ix) Examine and submit details of levels, quantity required for filling, source of filling material and transportation details etc. Submit details of a comprehensive Risk Assessment and Disaster Management Plan including emergency evacuation during natural and man-made disaster integrating with existing airport
- (x) Examine road/rail connectivity to the project site and impact on the existing traffic network due to the proposed project/activities. A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic.
- (xi) Submit details regarding R&R involved in the project
- (xii) Examine the details of water requirement, use of treated waste water and prepare a water balance chart. Source of water vis-à-vis waste water to be generated along with treatment facilities to be proposed.
- (xiii) Rain water harvesting proposals should be made with due safeguards for ground water quality. Maximize recycling of water and utilization of rain water.

- (xiv) Examine details of Solid waste generation treatment and its disposal.
- (xv) Submit the present land use and permission required for any conversion such as forest, agriculture etc.
- (xvi) Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.
- (xvii) Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.
- (xviii) Examine baseline environmental quality along with projected incremental load due to the proposed project/activities.
- (xix) The air quality monitoring should be carried out as per the notification issued on 16<sup>th</sup> November, 2009.
- (xx) Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.
- (xxi) Submit details of corporate social responsibilities (CSR)
- (xxii) Submit details of the trees to be cut including their species and whether it also involves any protected or endangered species. Measures taken to reduce the number of the trees to be removed should be explained in detail. Submit the details of compensatory plantation. Explore the possibilities of relocating the existing trees.
- (xxiii) Examine the details of afforestation measures indicating land and financial outlay. Landscape plan, green belts and open spaces may be described. A thick green belt should be planned all around the nearest settlement to mitigate noise and vibrations. The identification of species/ plants should be made based on the botanical studies.
- (xxiv) Public hearing to be conducted for the project in accordance with provisions of Environmental Impact Assessment Notification, 2006 and the issues raised by the public should be addressed in the Environmental Management Plan. The Public Hearing should be conducted based on the ToR letter issued by the Ministry and not on the basis of Minutes of the Meeting available on the web-site.
- (xxv) A detailed draft EIA/EMP report should be prepared in accordance with the above additional TOR and should be submitted to the Ministry in accordance with the Notification.
- (xxvi) Details of litigation pending against the project, if any, with direction /order passed by any Court of Law against the Project should be given.
- (xxvii) The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.
- (xxviii) Any further clarification on carrying out the above studies including anticipated impacts due to the project and mitigative measure, project proponent can refer to the model ToR available on Ministry website "<http://moef.nic.in/Manual/Airport>".

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## **Annexure 2**

**(Details of Encroachments within 05  
km Radius of Aerodrome Project Site)**

F No. 2-6/R/AC (SA)/2019-2020/1618  
OFFICE OF THE ASSISTANT COMMISSIONER  
SOUTH ANDAMAN DISTRICT

Port Blair, dated the 07<sup>th</sup> July, 2020.



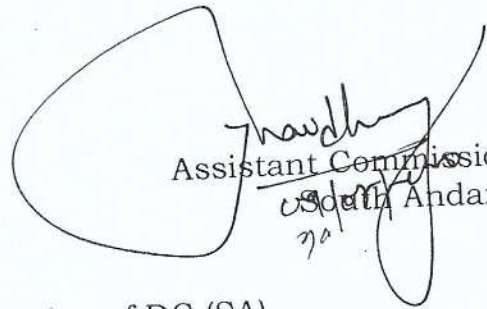
To  
✓ The Deputy Director  
Civil Aviation  
Port Blair

Sub:- EIA Report on Water Aerodrome at Swaraj Dweep & Shaheed  
Dweep- Reg:-

This is with reference to an E-mail from G. Prakash Reddy, General Manager (Engg-Project) on the above cited subject wherein at Point no 3 a detailed management plan, drawn up in consultation with the competent District Authorities for regulation of unauthorized development and encroachments within 05 km radius of the Aerodrome was sought for.

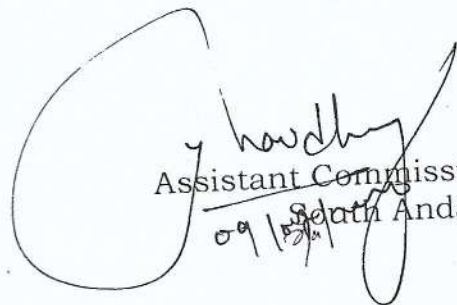
In this regard, enclosed please find herewith a detailed report in respect of water Aerodrome for sea plane operations at Swaraj Dweep and Shaheed Dweep along with notional maps depicting buildings, encroachments and site for water aerodrome, supporting Revenue documents, details of building and list of encroachments furnished by the Tehsildar Port Blair for further appropriate action please.

Encl: As above

  
Assistant Commissioner  
South Andaman  
07/07/20

Copy to:-

1. PA to DC (SA) for kind information of DC (SA).
2. PA to Secretary, (Civil Aviation) for kind information of Secretary, (Civil Aviation).

  
Assistant Commissioner  
South Andaman  
09/07/20

Report

Sub: EIA Report on Water Aerodrome at Swarajdweep & Shaheed Dweep:-  
Reg.

As directed by the Tehsildar, Port Blair a report on Pt. 03 of the of the Note forwarded by the GM(Engg.), M/s Feedback Infra, consultant engaged for EIA of Water Aerodrome for SeaPlane operations, with respect to proposed sites at Swarajdweep and Shaheed dweep is as follows:

Swarajdweep:

1. The proposed site is for approach road to Water Aerodrome FOR Swarajdweep is Sy. No. 16/1/14, area 1865 Sqmtrs., Govt. path/road under Form AM of Village Govindnagar, Swarajdweep island, and Sy. No. 12/1/8 of Village Bharatpur in Shaheeddweep island (documents enclsod).
2. No fresh encroachments, unauthorised constructions are allowed on Govt. land after 2003. Under orders of the then DC (Andamans), the Encroachment Registers have been frozen. All fresh encroachments are prevented in initial stage and reported by Village Revenue Officers, the Chowdharies and Chowkidar, reported by the Patwari to the Tehsildar, Port Blair and removed either summarily, or by the order of the Tehsildar, by the Revenue Inspectors as a conitnuous ongoing process
3. CRZ restrictions are in place monitored and enforced by the Revenue Authorities in Revenue Area and by the Forest Officers in Forest Area.
4. Building plans are strictly enforced as per Approved Master Plan through Town and country Planner, APWD, through Gram Panchayats of respective areas (GP govindapur in Swarajdweep) and (GP Neil Kendra in Shaheeddweep). The respective Panchayat Secretaries are the Authorised Officers and the Revenue Inspector Circle No.(1), is the Monitoring and Enforcement Officer.
5. Diversion of land for Commercial and Residential purposes are strictly regulaged and allowed only to the extent of 500 Sqmtrs. by the Sub-Divisional Magistrate. Beyond 500 Sqmtrs, they are refrred to the Land Use Committee.

Encl. Notional maps depicting buildings, encroachments and site for water aerodrome. Supporting Revenue documents, details of building and encroahcments.

Submitted Please.

*Yashwantrao*

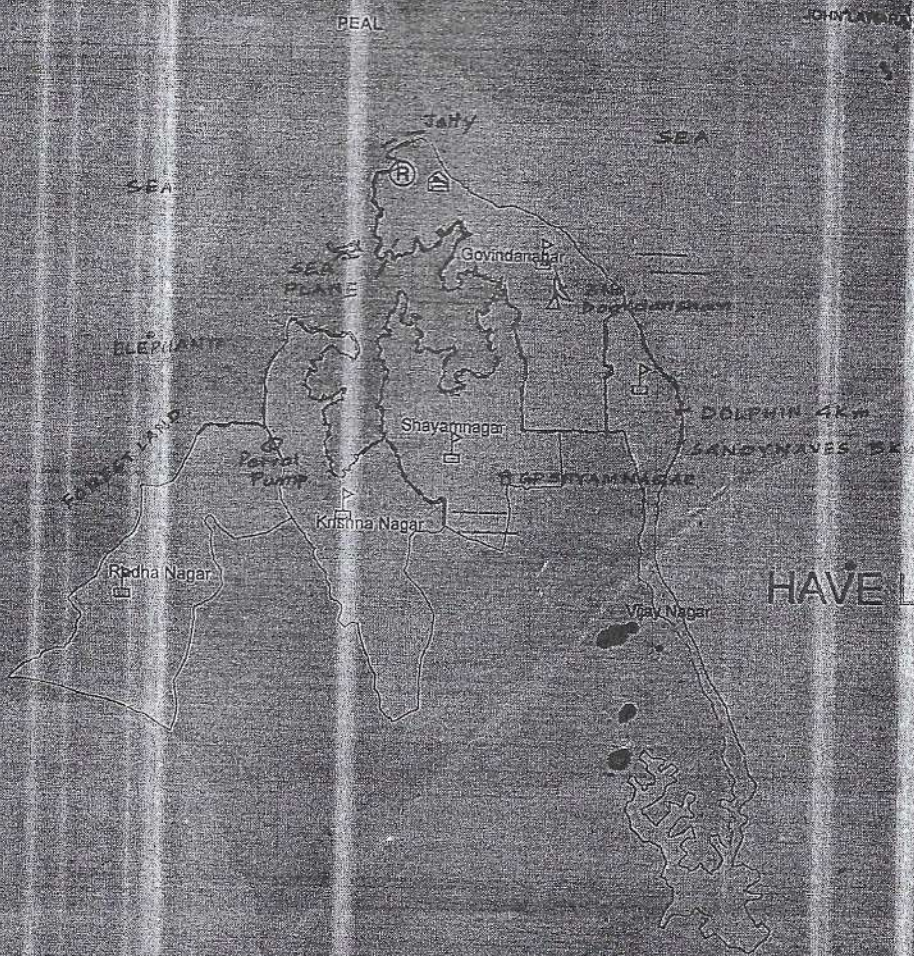
06/07/2020

राजस्व निरीक्षक  
Revenue Inspector  
Circle No: (1)  
पोर्ट ब्लेयर तहसील  
Tehsil Port Blair

*D. D.  
put up a  
summary letter  
re S/Ps.*



N  
1:58,000



5 Km Radii Area  
around Water Aerodrome Swarnadweep

Legend

- POLICE STATION
- WIRELES STATION
- SCHOOLS

SEA PLANE WATER AERODROME  
of Govindnagar  
Swarnadweep

2.74 Hects  
DC(SA)'s order setting Apart Surrendered Land  
as Govto Palb G.Nagar SWJDP

IN THE COURT OF DEPUTY COMMISSIONER  
SOUTH ANDAMAN DISTRICT

IN THE MATTER OF SUB-DIVISION OF LAND  
SMTI. GANGA BISWAS & 12 OTHER -Vs-STATE

ORDER

Whereas land bearing Survey numbers 16/1 area 2.57 hecta, Sy. No.16/3 area 0.17 hecta. classified as Hilly situated at Govinda Nagar village under Port Blair Tehsil Islands recorded in the joint names of (1) Smti.Ganga Biswas D/o Late. Haralal Biswas (2) Smti. Bhanumal Das D/o Late. Pran Krishna Biswas (3) Smti. Rupban Dhali, D/o Late. Pran Krishna Biswas (4) Shri. Subrota Biswas S/o Late.Mani Krishna Biswas (5) Smti. Bichitra Biswas D/o Late. Mani Krishna Biswas (6) Shri. Ram Krishna Biswas S/o. Late. Haralal Biswas (7) Shri. Jeeban Biswas S/o Late. Haralal Biswas (8) Smti. Shyamali Raha, D/o Jamuna Raha (9) Smti. Malina Raha. D/o Jamuna Raha (10) Smti. Padma Biswas, D/o Late. Haralal Biswas (11) Smti. Robin Biswas, D/o Late. Haralal Biswas (12) Smti. Kalidashi Biswas D/o Late. Mani Krishna Biswas (13) Shri. Sujit Biswas S/o Late. Shri. Mani Krishna Biswas.

And whereas the tenants have submitted a proposal for sub-division of subject land duly signed by them. Accordingly the Tehsildar, Ferrargunj has submitted the proposal for sub-division of subject land after obtaining the report from revenue field staff consented by the tenants which is in conformity of the section 68 of the Andaman and Nicobar Islands Land Revenue and Land Reforms Regulation 1966 read with Rule 48 of the Andaman and Nicobar Islands Land Revenue and Land Reforms Rules 1968 as under:-

No.	Name of Tenant	Proposed Sy. No.	Proposed Area in Sq.mts.	L.R. Proposed	Classification of Land
1.	Smti. Ganga Biswas D/o Late. Haralal Biswas	16/3/1	1000.00	0.50	Hilly
		16/1/3	500.00	0.25	
		16/1/5	500.00	0.25	
		Total	2000.00		
2.	Smti. Bhanumal Das D/o Late. Pran Krishna Biswas	16/3/2	350.00	0.17	Hilly
3.	Smti. Rupban Dhali, D/o Late. Pran Krishna Biswas	16/3/3	350.00	0.17	Hilly
4.	Shri. Subrota Biswas S/o Late.Mani Krishna Biswas	16/1/1	250.00	0.12	Hilly
5.	Smti. Bichitra Biswas D/o Late. Mani Krishna Biswas	16/1/2	250.00	0.12	Hilly
6.	Shri. Ram Krishna Biswas S/o. Late. Haralal Biswas	16/1/4	5130.00	2.53	Hilly
		16/1/11	8750.00	4.32	

7.	Shri. Jeeban Biswas / S/o Late. Haralal Biswas	16/1/6	2000.00	1.00	Hilly
8.	Smti. Shyamali Raha, / D/o Jamuna Raha	16/1/7	500.00	0.25	Hilly
9.	Smti. Malina Raha. / D/o Jamuna Raha	16/1/8	500.00	0.25	Hilly
10.	Smti. Padma Biswas, / D/o Late. Haralal Biswas	16/1/9	2000.00	1.00	Hilly
11.	Smti. Robin Biswas, D/o Late. Haralal Biswas	16/1/10	2705.00	1.75	Hilly
12.	Smti. Kalidashi Biswas D/o Late. Mani Krishna Biswas	16/1/12	500.00	0.25	Hilly
13.	Shri. Sujit Biswas S/o Late. Mani Krishna Biswas	16/1/13	250.00	0.12	Hilly
14.	Govt. Revenue Dept. Road	16/1/14	1865.00		


And whereas the tenants have surrendered an area of 1865 Sq.Mtrs. out of total area 2.57 Hect. in Sy. No. 16/1 vide RC.No. 1379/TPB/2014 dated 03/06/2014 to construct a path.

Now therefore, in exercise of powers vested upon me under section 68 & 69 of the Andaman and Nicobar Islands Land Revenue and Land Reforms Regulation 1966 read with Rule 48 of the Andaman and Nicobar Islands Land Revenue and Land Reforms Rules 1968, I hereby allow the sub-division of the subject land in the manner specified in the table above and the area proposed for path bearing Sy.61/1/14 an area 1865 Sq.Mtrs. proposed for foot path is hereby set apart under section 198 of the Andaman and Nicobar Islands Land Revenue and Land Reforms Regulation 1966 for construction of path.

Tehsildar, Port Blair is directed to effect necessary correction in the land records and map.

Let a plain copy of this order be issued to the tenants, Tehsildar Port Blair, Assistant Commissioner, South Andaman and Assistant Commissioner (Settlement).

Given under the hand and seal of this court on this 20th day of September, 2014.

  
(TANVI GARG, IAS)  
DEPUTY COMMISSIONER  
SOUTH ANDAMAN DISTRICT  
RC No. 530/2014/DC (SA) / 2014

FORM 'AM'

UNOCCUPIED LAND SET APART FOR EXERCISE OF HUMAN RIGHTS

Sl. No.	Name of village	Purpose of Heter	C. No.	P. O. No.	Area	Remarks.	District.

*[Signature]*  
 Assistant Settlement Officer  
 A. S. S. Office, [illegible]



List of Building within 5 Km Radius of Water Aerodrome

**Govindnagar Village**

1. Port Management Board Building at Swarajdeep Jetty
2. ALHW Quarters
3. APWD Buildings, Quarters & Office
4. General Pool Quarters
5. Swarajdeep Police Station, DySP Office Bungalow & Quarters
6. Main Residential & Commercial Buildings:
  - i. Sarvana Store
  - ii. Nanigopal Das' House
  - iii. Nikita Lodge
  - iv. Radhakrishna Residency
  - v. Hotel Bilasini
  - vi. Barefoot Mill Resort
  - vii. Gaurongo Das Hotel
7. Fish Landing Centre
8. BigByte Restaurent Building
9. B3 Barefoot Dakshin Restaurent & Dining Hall
10. Seashell Hotel
11. Haywizz Resort
12. N.K. Resort
13. Country Home Resort
14. Virgin Resort
15. Havelock Holiday Beach Resort
16. Sumati Resort
17. N.C. Khan House
18. Under construction PLA Resort
19. Fire Brigade Building
20. Civil Supplies Building
21. Swarajdep Helipad and Reception Building
22. Ganesh Raha Building
23. Deepak's House (Two Double Storied Buildings)
24. Kingdom Resort
25. Havelock Island Beach Resort
26. Prashanto Sikder House
27. Bhakta Ram Mondal House
28. Electricity Power House
29. Krishna Gain House
30. Narayan chandra Gain House
31. Jayanto Bala House
32. Nirapodo Hotel
33. Prashanto Gosaith House
34. Ajiit Kr. Roy commercial Complex housing Banks & Wineshop Hotel
35. Guru Das Fuel Bunk
36. Zonal Library
37. Govt. Senior Secondary School Govindnagar
38. Primary Health Centre Swarajdweep
39. Anil Samaddar's House
40. Royal Palace Hotel
41. Vnor Hotel
42. II Royal Palace (Seasons)
43. Radhakrishna Resort II
44. Bipat Mondal Building
45. Bimal Mondal Building
46. Highland Super Market Building
47. Govindnagar Market and shop complex

48. Govindnagar Gram Panchayat Building
49. A&N State Co-operative Bank Ltd.
50. Anarkali Basti (Residential colony)
51. Fish Market
52. Divisional Forest Office and Camp
53. Dipali Das House and Resort
54. Sumanto House and Resort
55. Jagdish Das House
56. Joy grande Resort
57. Barefoot Scuba & Resort
58. Symphony
59. Holiday Inn Beach Resort
60. Sumit Hotel

#### **Vijay Nagar Village**

1. Ajay Gharami House
2. El Dorado Resort
3. Jadwet Resort
4. Blue Bird Resort
5. Kamal Sutar House
6. Sunrise Resort
7. Senses Resort
8. Wild Orchid
9. Dolphin Resort
10. Manju Resort
11. Sandy Waves
12. Tantu House
13. Coral Reef
14. Ocean Tree & Amitabh House
15. Gol India Resort

#### **ShyamNagar Village Buildidngs**

1. Jalakara Resort
2. Royal Resort
3. Kutub House
4. Two New Buildings under construction
5. Gram Panchayat Shyam Nagar
6. Jain's Resort under Construction
7. Madhav Mondal House

#### **Krishna Nagar Village Buildidngs**

1. Suresh Kullu House
2. Pran Gopal Das House
3. Ramu Chowdhary House
4. Amit Mangu Resort
5. ANIIDCO Petrol Pump
6. Revenue Deptt Site for Emergency Operation Centre and Tehsil Office
7. Govt. Middle School, Krishnanagar

List of Encroacher

PC(2) (Shyam Nagar, Vijay Nagar, Krishnanagar)

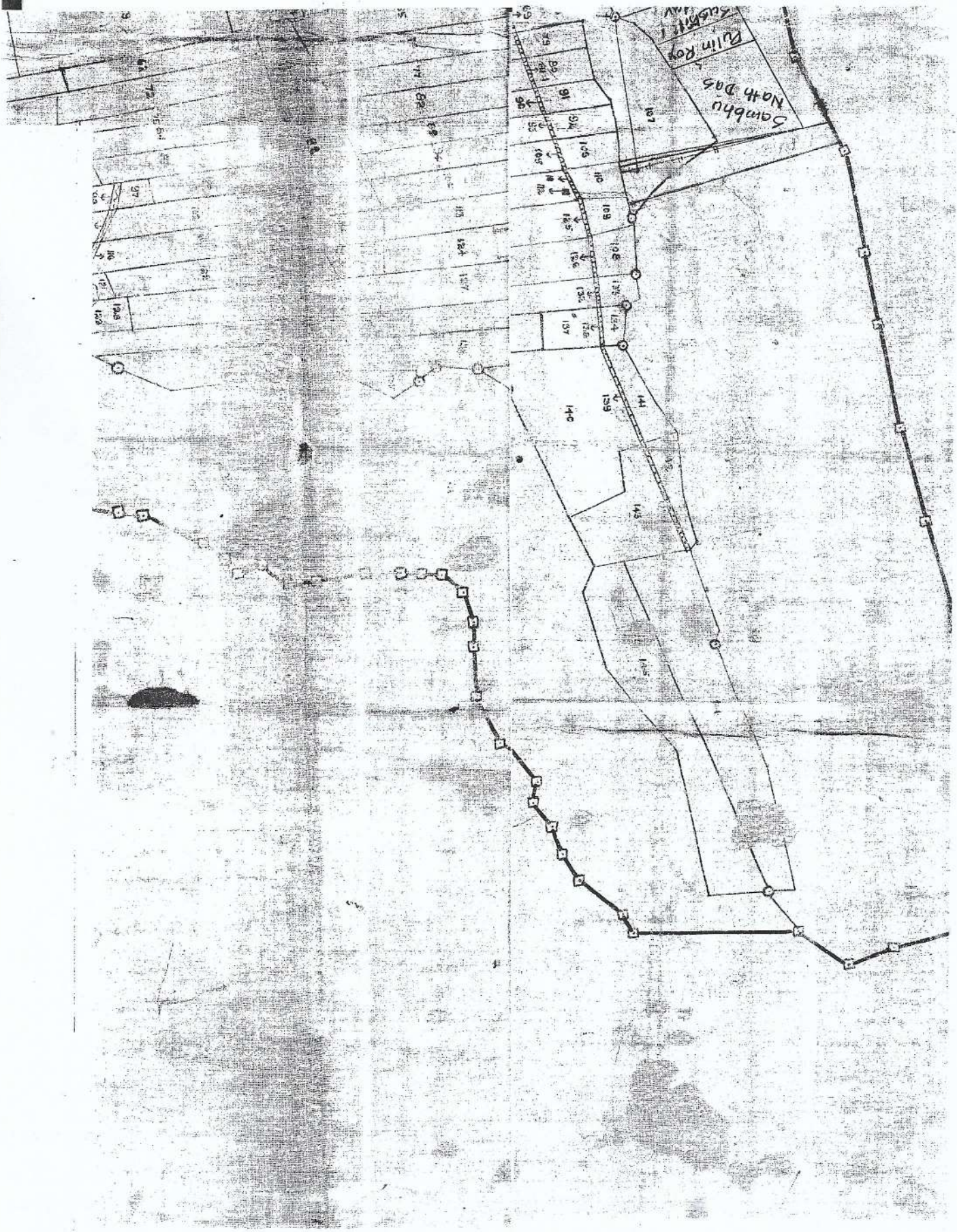
Sl No.	Name of Encroacher	Village	Land Details Encroached area		Remarks
			Sy. No.	Area	
1	D.P. Singh	Vijay Nagar	43 Govt Revenue land	2000 sqmtrs	Construction Swimming pool and Bar
2	Paritosh Halder S/o Late Haren Halder	Krishna Nagar 6 ½	29	2.20 hecets	
3	Bhavesh Halder	Krishna Nagar 6 ½	29	1.9 hecets	
4	Sukaranjan Mridha	Krishna Nagar 6 ½	30	1.02 hecets	
5	Hori Matubber	Krishna Nagar 6 ½	28	2.5 hecets	
6	Bimal Halder	Krishna Nagar 6 ½	30	7.5 hecets	Bimal Halder 9100 sqms Sale to Ripon Saha
7	Khitish Baishnab S/o Jagadish Baishnab	Krishna Nagar 6 ½	30	3.30 hecets	
8	Anil Kirtonia	Krishna Nagar 6 ½	28	2.5 hecets	
9	Alok Kirtonia	Krishna Nagar 6 ½	28	2.5 hecets	
10	Jagadish Matubar	Krishna Nagar 6 ½	29	3 hecets	
11	Bishawnath Kirtonia	Krishna Nagar 6 ½	29	2.5 hecets	
12	Pagla Sarkar	Krishna Nagar 6 ½	30	2 hecets	
13	Repon Saha S/o Subash Saha (Auto Driver) Purchase land Rs 180000/- from Bimal Halder	Krishna Nagar 6 ½	30	9100 sq mtrs	
14	Bishnu Das	Radha Nagar	2/1 (Recorded in from AM as Tree Forest) (Set apart Land)	4 hecets	Has constructed a new house with plinth area of about 250 m <sup>2</sup> , (He already has three more structure on the said land)
15	John Dung Dung S/o Silvanus Dung Dungh	Radha Nagar	2/1 (Recorded in from AM as Tree Forest) (Set apart Land)	0.4 hecets	Started construction of a RCC structure with plinth area of 100 m <sup>2</sup> (He already had a house on the said land)
16	Gopi Nathan	Radha Nagar	2/1 (Recorded in from AM as Tree Forest) (Set apart Land)	0.05 hecets	Has constructed a tin shed with plinth area of 120 m <sup>2</sup>
17	Puran Kerketta	Radha Nagar	2/1 (Recorded	0.10 hecets	Has constructed a tin structure

			in from AM as Tree Forest) (Set apart Land)		
18	Dasarath Ekka	Radha Nagar	1/1 (Recorded in from AM as Tree Forest) (Set apart Land)	1.0 hecets	Has constructed a tin structure
19	Shankari Mondal	Radha Nagar	1/1 (Recorded in from AM as Tree Forest) (Set apart Land)	1.0 hecets	Has constructed a tin structure
20	Mustafa	Shyam Nagar	144 (Recorded in from AM as Tree Forest) (Set apart Land)	0.35 hecets	Has constructed a tin structure
21	Sukumar Mondal S/o Bharat Mondal	Shyam Nagar	147 (Recorded in from AN)	1.0 hecets	Has constructed a tin structure
22	Ajit Mondal	Shyam Nagar	146 (Recorded in form AM as Grazing land) (set apart land)	1.2 hecets	Has constructed a tin structure
23	Rajan Daas	Shyam Nagar	144 (Recorded in form AM as Tree Forest) (set apart land)	0.03 hecets	Has started construction of RCC structure. (Has takeover the land from one Shridam Bairagi)
24	Bharat Mondal S/o Raj Kishore Mondal	Shyam Nagar	144 (Recorded in form AM as tree forest) (set apart land)	0.4 hecets	Has constructed a tin structure (Has taken over the land from one Chandana Das)
25	Gouranga Mondal S/o Prahalad Mondal	Shyam Nagar	144 (Recorded in form AM as tree Forest) (Set apart land)	0.4 hecets	Has constructed a tin structure (Has taken over the land from one Chandana Das)
26	Biswajit SSarkar	Shyam Nagar	144 (Recorded in form AM as tree forest) (Set apart land)	1.2 hecets	Has constructed a tin structure (Has taken over the land from one Akhil Malaktar)
27	Rabindra Nath Basu S/o Bipin Bihari Basu	Shyam Nagar	144 (Recorded in form AM as tree forest) (Set apart land)	1.5 hecets	Has constructed a tin structure (Has taken over the land from one Chandana Das)
28	Chandrana Das	Shyam Nagar	144 (Recorded in form AM as	0.5 hecets	Has constructed a tin structure

			tree forest) ( Set apart land)		
29	Keshab Halder	Shyam Nagar	146 (Recorded in form AM as Grazing land) (Set apart land)	1.5 hecets	Has constructed a tin structure

Submitted to PC(2) / RI(1) for further action please.



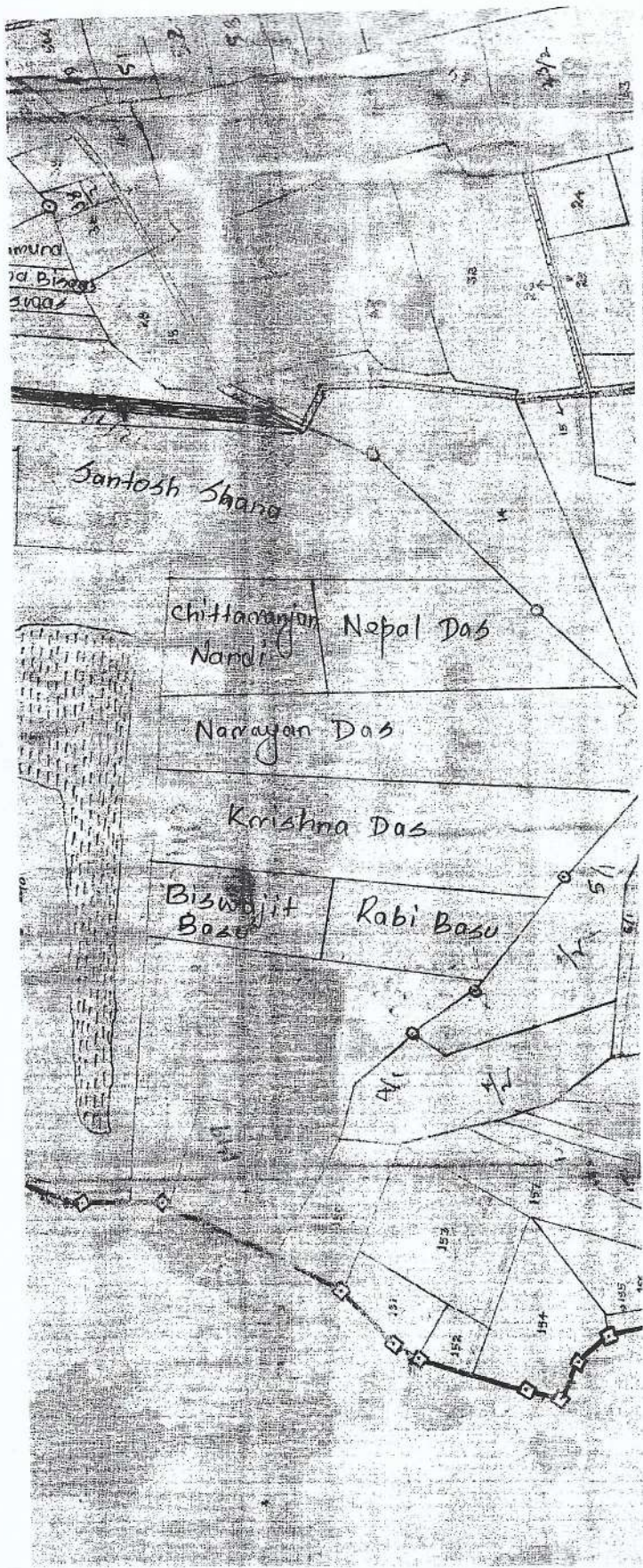


Sambhu Nath Das  
Bhim Roy

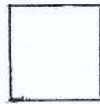
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Encroachment of Govt. land



Proposed land for Water Aerodromes



Proposed Road for water Aerodromes



## **Annexure 3**

**(Proceedings of Public Hearing)**

# COMPILATION OF THE PROCEEDING OF PUBLIC HEARING

FOR

**Environmental Clearance for Development of Water Aerodrome located at  
Shaheed Dweep, Port Blair Tehsil, Andaman District**



**Andaman and Nicobar Administration Pollution Control Committee  
Science and Technology Bhawan, Dollygunj, Port Blair  
Telefax: 03192-250370  
Email: [dstandamans@gmail.com](mailto:dstandamans@gmail.com)**

**MINUTES OF THE PUBLIC HEARING HELD ON 25.09.2020 AT 10.30 AM IN THE PANCHAYAT BHAWAN, NEIL KENDRA PANCHAYAT, SHAHEED DWEEP, SOUTH ANDAMAN FOR ENVIRONMENTAL CLEARANCE FOR DEVELOPMENT OF WATER AERODROME LOCATED AT SHAHEED DWEEP, SOUTH ANDAMAN DISTRICT UNDER THE CHAIRMANSHIP OF SHRI. PREM SINGH MEENA, ASSISTANT COMMISSIONER (SETT), SOUTH ANDAMAN.**

The Directorate of Civil Aviation Andaman & Nicobar Administration have requested for conducting public hearing vide letter no. 6/CA/2017-2018 dated 14.07.2020.

The Terms of Reference (ToR) for development of Water Aerodrome at Shaheed Dweep Island was approved by the Ministry of Environment, Forests and Climate Change (IA.III Section) vide their letter no 10-54/2019-IA-III dated 16.12.2019. The Andaman Nicobar Pollution Control Committee have invited suggestions/ views/ comments / objections from the persons likely to be affected by the grant of Environment Clearance which shall include local authorities, association of persons likely to be affected by the project and environment groups within 25-09-2020. The EIA report / summary of proposed projects can be seen / studied by the interested persons in the Office of the District Magistrate (South Andaman), Zilla Parishad (South Andaman), Port Blair Municipal Council, District Industries Office, Port Blair. The Pradhan, Neil Kendra Panchayat, Shaheed Dweep (erstwhile Neil Island), South Andaman, the ANPCC office (Department of Science and Technology, Dollygunj, Port Blair), Additional Principal Chief Conservator of Forests (C), MoEF&CC, Regional Office (SEZ), 1<sup>st</sup> and 2<sup>nd</sup> Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai-34 on all working days during hours for submitting written suggestions to the ANPCC (Email:dstandamans@gmail.com) and the Executive Summary of the project can also be seen at website of A & N Administration ([www.andaman.gov.in](http://www.andaman.gov.in)) and Dept. of Science and Technology ([www.dstpcc.andaman.gov.in](http://www.dstpcc.andaman.gov.in)).

This has been published in The Daily Telegrams for information of all public and stakeholders to submit their suggestions.

The public hearing was organized in the presence of the following officials:

1. Shri. Prem Singh Meena, Assistant Commissioner (Sett), Office of DC South Andaman.
2. Shri. Rishikesh, Senior Scientific Officer, ANPCC.

At the outset the Senior Scientific Officer-II has welcomed the officials, PRI Members and public present in the public hearing and informed that the Assistant Commissioner, South Andaman will preside over the public hearing proceeding. The purpose of conducting the public hearing is to get public opinion viz, comments, views, objections, apprehensions and suggestions etc. He also informed that the draft Environment Impact Assessment Report (EIA), summary of the EIA report of the proposed project was made available in the Office of the District Magistrate (South Andaman), Zilla Parishad (South Andaman), Port Blair Municipal Council, District Industries Office, Port Blair. The Pradhan, Neil Kendra Panchayat, Shaheed Dweep (erstwhile Neil Island), South Andaman, the ANPCC office (Department of Science and Technology, Dollygunj, Port Blair), Additional Principal Chief

Conservator of Forests (C), MoEF&CC, Regional Office (SEZ). I<sup>st</sup> and II<sup>nd</sup> Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai-34 on all working days during hours for submitting written suggestions to the ANPCC (Email: dstandamans@gmail.com) and the Executive Summary of the project can also be seen at website of A & N Administration (www.andaman.gov.in) and Dept. of Science and Technology (www.dstpcc.andaman.gov.in).

**Shri. Sandeep Dhamne and Shri. Timir Shah** explained in detail about the proposed project namely development of Water Aerodrome located at Shaheed Dweep (erstwhile Neil Island) in South Andaman District.

After the multimedia presentation the suggestions / queries, viewpoints, apprehensions, etc. was invited from the public present there so that their doubts can be cleared by the applicant or forwarded to the Department / Ministry Concern.

**Shri. Jay Krishna Das, PRI Member** appreciated the initiative of the Administration for development of Water Aerodrome in the Island, which will help in the development of the Shaheed Dweep especially in tourism sector. He suggested that a proper separate road may be developed to connect the proposed Water Aerodrome and requested that the job created due to the proposed developmental project the local people of Shaheed Dweep may be given preference.

**Shri. Prasanjit Das** informed that the present location of the proposed Water Aerodrome is very near to the place where the local entrepreneurs (boat operators) anchor their boats. He wants to know whether any adverse effect on the boat operating activities will be there due to the operation of the Sea Plane.

In response to his query **Shri. Sandeep Dhamne** explained about the proposed location of the Water Aerodrome and informed that there will not be any disturbance to boat operators due to the operation of the Sea Plane.

**Shri. Sreemanta Roy and Mr. Bidhan Mondal** suggested that during the development of the project a proper road connectivity may be developed for Bharathpur village.


**Shri. Ramakrishna Biswas, Pradhan, Neil Kendra Panchayat, Shaheed Dweep** welcome the project of Water Aerodrome at Shaheed Dweep and express his happiness aware that the operation of the Sea Plane will increase the connectivity from Port Blair to Shaheed Dweep and boost the tourism activities in the Island. He suggested that while undertaking the developmental work of construction of the Water Aerodrome due care may be taken to protect the corals and mangroves if present in the project area. He also suggested that no big trees should be cut until unless it is very much essential. Further he suggested that some of the youth of the Island are operating boat for their livelihood so their activities should not be disturbed. Preference to the local people may be given for employments which are likely to be generated during the construction of the project and operation of the same.


In response **Shri. Sandeep Dhamne** informed that all necessary precautions will be taken during the development of the project for protection of the environment including marine

eco-system of the area through the Environment Management System based on ISO-14001, Quality Management and Occupational Health and Safety Management System.

He also informed that the project will serve job opportunities to local people in terms of direct and indirect employment.

**Shri. Prem Singh Meena, Assistant Commissioner (Sett), South Andaman** thanks all the people and public representative present in the public hearing. He hoped that the people got the information about the development of Water Aerodrome located at Shaheed Dweep in South Andaman District. He further informed that the proceeding of the public hearing in the Audio Visual record along with the opinion expressed by the public would be forwarded to the Competent Authority of taking necessary action.

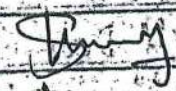













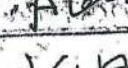
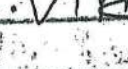














  
Senior Scientific Officer-II  
Representative of ANPCC

  
Assistant Commissioner (Sett)  
South Andaman

The following were present in the public hearing conducted for development of Water Aerodrome Project on 25.09.2020 at 10.30 am in the Panchayat Bhawan, Neil Kendra Panchayat, Shaheed Dweep, South Andaman:

1. K Andiswamy (PRI) Up-Pradhan
2. Joykrishna Das (PRI)
3. Namita Das (PRI)
4. Subash Das (PRI)
5. Rudra Das (PRI)
6. Sandeep Kumar Das (PRI)
7. Ramkrishna Biswas (Pradhan)
8. Shankar Das
9. Gyanmoy Mondal
10. Rupel Adhikary
11. Kajal Das
12. Dilip Kumar SI(Fisheries)
13. Kartick Mistry
14. Priyanka
15. Madhumangal Biswas
16. Shyamal Bairagi
17. A Muthaiah
18. A Manoharan (ALHW)
19. Kartick Roy
20. S P Gunasekharan
21. Ranjan Bhakta (Agri Dept)
22. Sudharsan Halder (Forest Dept)
23. Prasanjeet Das
24. Ashim Debnath
25. Bidhan Mondal
26. Sandhya Malakar
27. Meera Mondal
28. Sheuli Das
29. Dhiman Bala (EOC)
30. Manjuri Paul (AWW)
31. Narayan Das
32. Ajay Singh STS Incharge
33. Dipik Sarkar
34. Chameli Das (PSM)
35. Bharati Baidya (AWW)
36. Urmila Mistry (AWW)
37. Kadam Sarkar (AWW)
38. L Krishnaveni (AWW)
39. Ravi Das
40. Uttam Kumar Das

41. Manas Biswas
42. Sanjay Mondal
43. Dasarath Verma (ZPM)
44. Parimal Das (PRI)
45. Akash Mondal (EOC)
46. Asit Baran Roy
47. Sumala Das (AWW)
48. Sreemanta Roy
49. Parimal Tarafder
50. Gopal Chatterjee
51. Albinus
52. Mohammed Mansoor (Patwari)
53. Santosh Kumar (Police Radio)
54. R Basker (Police)
55. Divya Kumari (AWW)
56. Shantilata Biswas (AWW)
57. Sudeep Kumar Das (Choudhary Rev Dept)
58. Robin Biswas
59. Dr. (Mrs) Baljit Kumar, SVO/VD/SNDP
60. Ashutosh Chatterjee
61. Chinmay Biswas, DRM-EPNK
62. Satyaranjan Roy
63. Sushanta Gharami
64. V Narasimha
65. Ratan Sarkar, (A/A)
66. K Dunnamma
67. Jagrani (AWW)
68. Somra Dhanwar
69. Sriti Mazumder
70. Manojit Mondal
71. Dulal Bain
72. Sukumar Paik
73. K.M.K Sai Baba, ASI P.S Shaheed Dweep on duty
74. R Sujit, J.E Electricity
75. Timie Shah
76. Sandeep Dhamne, Feedback Infrastructure & Ltd.

NAME / नाम	SIGNATURE / हस्ताक्षर
1. K. Andiswamy (PRI) Up-Gradhan	
2. Joy Krishna Das (PRI)	
3. Namita Das (PRI)	
4. Subhash Das (PRI)	
5. Rudra Das (PRI)	
6. Sandeep Kumar Das (PRI)	
7. Ramkrishna Biswas (Gradhan)	
8. Shankor Das	
9. Gyanmoy Mondal	
10. Rupel Adhikary	
11. Kajal Das	
12. Debip Kumar S1 (Foherie)	
13. Kartick Mistry	
14. Priyanka	
15. Madhumangal Biswas	
16. Shyamal Bairagi	
17. A. Muthaiah	
18. A. Manoharan (ALFW)	
19. Kartick Roy	
20. S.P. Gunasekharan	
21. Rajan Bhakta (Agn. Dept.)	
22. Sudhansu Halder (Forest Dept.)	
23. Prasenjeet Das	
24. Ashim Debnath	
25. Bidhan Mondal	
26. Sandhya Malakar	
27. Meera Mondal	
28. Sheela Das	
29. Dhiman Bala (EOC)	
30. Manjuri Paul (AWW)	
31. Narayan Das	
32. Ajay Singh STS Incharge	
33. Dipak Saran	

SNO NAME SIGNATURE

34	Chameli Das (ISM)	
35	Bharali Baidya (AWW)	
36	Urmila Mishra (AWW)	
37	Kadam Sarkar (AWW)	
38	L. Krishnaveni (AWW)	
39	Ravi Das	
40	Uttam Kumar Das	
41	Manas Biswas	
42	Sanjay Mondal	
43	Dasarath Verma (ZPM)	
44	Panimal Das (PRI)	
45	Akash Mondal (EOC)	
46	Asit Baran Roy	
47	Sumala Das (AWW)	
48	Sreemanta Roy	
49	Panimal Tarafder	
50	Gopal Chatterjee	
51	Abunias	
52	Mohammed Mansoor (Patwari)	
53	Santosh Kumar (Police Radio)	
54	R. Barman (Police)	
55	Divya Kumari (AWW)	
56	Shantilata Biswas (AWW)	
57	Sudeep Kumar Das (Choudhary Rev. Dept)	
58	Robin Biswas	
59	Dr. (Mrs) Bijal Kaur S/o/w/suop	
60	Ashutosh Chatterjee	
61	Chinmay Biswas DRM-EPNK	
62	Satyranjan Roy	
63	Suchanta Ghoshan	
64	V. Narasimha	
65	Ratan Sarkar (A/A)	
66	K. Dunnamma	

NAME

Signature

Jagrani (AWW)

Somra Dhanwar

Sriti Mazumder

Manojit Mondal

Dulal Bairi

Sukumar Paik

K.M.K. Sarikaha ASI, P.S. Shohid Dweep andy

R. SUSIT, T.E. Fldt

Timir Dhal

Sandeep Dhamne - feedback Intex P. Ltd.

The Daily telegrams  
05/09/2020

ANDAMAN & NICOBAR ADMINISTRATION  
POLLUTION CONTROL COMMITTEE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY  
Dollygunj, Port Blair, Ph: 250370, email: dstandamans@gmail.com

### PUBLIC NOTICE

Public Hearing for Environmental Clearance for development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District.

Whereas, M/s Directorate of Civil Aviation, has applied for obtaining Environmental Clearance under EIA Notification 2006 for development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District.

And whereas, notification No. S.O. 1533(E) dated 14-09-2006 provides that projects specified in schedule appended to the notification, shall not be undertaken unless it has been accorded Environmental Clearance by the Ministry of Environment & Forests & Climate Change, Govt. of India.

And whereas, the above project come in the category of projects requiring the Environmental Clearance from MoEF&CC under EIA 2016, scheduled under Category A of item 7(a) 'Air Ports'.

And whereas, schedule-IV, appended for the notification aforesaid provides for Public Hearing by the State Pollution Control Board (SPCB) or the Union Territory Pollution Control Committee (UTPCC) inviting suggestions/views/comments/objections from the affected persons before MoEF & CC, Govt. of India takes up the case for the Environmental Clearance. Now, therefore, Andaman Nicobar Administration Pollution Control Committee (ANPCC) invites suggestions/views/comments/objections from the persons likely to be affected by the grant of Environmental Clearance which shall include local authorities, association of person likely to be affected by the project and environmental groups within 25-09-2020. The EIA report / summary of proposed projects can be seen / studied by the interested persons in the office of the District Magistrate (South Andaman), Zilla Parishad (South Andaman), Port Blair Municipal Council, District Industries Office, Port Blair, The Pradhan, Neil Kendra Panchayat, Shaheed Dweep (erstwhile Neil Island) South Andaman, the ANPCC office (Department of Science and Technology, Dollygunj, Port Blair), Additional Principal Chief Conservator of Forests (C), MoEF&CC, Regional Office (SEZ), 1<sup>st</sup> and 2<sup>nd</sup> Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai - 34 on all working days during office hours for submitting written suggestions to the ANPCC (email: dstandamans@gmail.com) and the Executive Summary of the project can also be seen at website of A. & N. Administration ([www.andaman.gov.in](http://www.andaman.gov.in)) and Dept. of Science and Technology ([www.dstpcc.andaman.gov.in](http://www.dstpcc.andaman.gov.in))

A Public hearing for the said project is scheduled to be held as per details given below.

S. No	Name of the project	Date & Time	Venue
1.	Development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District.	25-09-2020 at 10.30AM	Panchayat Bhawan, Neil Kendra Panchayat, Shaheed Dweep (erstwhile Neil Island), South Andaman

Senior Scientific Officer-II  
for Member Secretary  
File No. 4-4(3)/PCC/PH/2020/892  
Dated: 04-09-2020

अंडमान तथा निकोबार प्रशासन  
ANDAMAN & NICOBAR ADMINISTRATION

प्रदूषण नियंत्रण समिति

POLLUTION CONTROL COMMITTEE

DEPARTMENT OF SCIENCE AND TECHNOLOGY

Dollygunj, Port Blair, Ph: 250370, email: [dstandamans@gmail.com](mailto:dstandamans@gmail.com)

### PUBLIC NOTICE

**Public Hearing for Environmental Clearance for development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District.**

Whereas, M/s Directorate of Civil Aviation, has applied for obtaining Environmental Clearance under EIA Notification 2006 for development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District.

And whereas, notification No. S.O. 1533(E) dated 14-09-2006 provides that projects, specified in schedule appended to the notification, shall not be undertaken unless it has been accorded Environmental Clearance by the Ministry of Environment & Forests & Climate Change, Govt. of India.

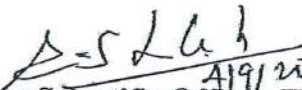
And whereas, the above project come in the category of projects requiring the Environmental Clearance from MoEF&CC under EIA 2016, scheduled under Category A of item 7(a) 'Air Ports'.

And whereas, schedule-IV appended for the notification aforesaid provides for Public Hearing by the State Pollution Control Board (SPCB) or the Union Territory Pollution Control Committee (UTPCC) inviting suggestions/views/comments/objections from the affected persons before MoEF & CC, Govt. of India takes up the case for the Environmental Clearance.

Now, therefore, Andaman Nicobar Administration Pollution Control Committee (ANPCC) invites suggestions/views/comments/objections from the persons likely to be affected by the grant of Environmental Clearance which shall include local authorities, association of person likely to be affected by the project and environmental groups within 25-09-2020. The EIA report / summary of proposed projects can be seen / studied by the interested persons in the office of the District Magistrate (South Andaman), Zilla Parishad (South Andaman), Port Blair Municipal Council, District Industries Office, Port Blair, The Pradhan, Neil Kendra Panchayat, Shaheed Dweep (erstwhile Neil Island), South Andaman, the ANPCC office (Department of Science and Technology, Dollygunj, Port Blair), Additional Principal Chief Conservator of Forests (C), MoEF&CC, Regional Office (SEZ), 1<sup>st</sup> and 11<sup>th</sup> Floor, Handloom Export Promotion Council, 34, Cathedral Garden Road, Nungambakkam, Chennai - 34 on all working days during office hours for submitting written suggestions to the ANPCC (email: [dstandamans@gmail.com](mailto:dstandamans@gmail.com)) and the Executive Summary of the project can also be seen at website of A & N Administration ([www.andaman.gov.in](http://www.andaman.gov.in)) and Dept. of Science and Technology ([www.dstpcc.andaman.gov.in](http://www.dstpcc.andaman.gov.in))

A Public hearing for the said project is scheduled to be held as per details given below:

S. No	Name of the project	Date & Time	Venue
1.	Development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District.	25-09-2020 at 10.30 AM	Panchayat Bhawan, Neil Kendra Panchayat, Shaheed Dweep (erstwhile Neil Island), South Andaman

  
4/9/20  
Senior Scientific Officer-II

for Member Secretary

File No. 4-4(3)/PCC/PH/2020/89

Dated: 04-09-2020

To,

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F.No. 4-4/PCC/PH/2020/ 950

अंडमान तथा निकोबार प्रशासन

ANDAMAN & NICOBAR ADMINISTRATION

प्रदूषण नियंत्रण समिति

POLLUTION CONTROL COMMITTEE

DEPARTMENT OF SCIENCE AND TECHNOLOGY

Dolly Gunj,

Port Blair, Dated: 21/09/2020

To,

The Pradhan  
Panchayat Bhawan, Neil Kendra Panchayat  
Shaheed Dweep  
South Andaman.

Sub: - Public Hearing for Environmental Clearance for development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman

District- reg;

Sir,

I am directed to inform you that M/s Directorate of Civil Aviation has applied for obtaining Environmental Clearance under EIA Notification 2006 for development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District.

The Deputy Commissioner, South Andaman has given his consent to conduct the Public Hearing for the above project on 25.9.2020 at 10.30 am. In this connection it is requested to kindly make proper sitting arrangement along with PA system at Panchayat Bhawan, Neil Kendra Panchayat for conducting the Public Hearing. The propose Public Hearing will be conducted under the Chairmanship of Deputy Commissioner, South Andaman or his representative not below the rank of additional District Magistrate.

In this connection you are very kindly requested to make it convenient to attend the public hearing and also give vide publicity among the panchayat members and general public regarding the public hearing so that they can present their suggestions during the public hearing.

Yours faithfully

*A-S Kish*  
21/9/20  
Sr. Scientific Officer-II

Copy to:

1. Panchayat Secretary, Neil Kendra Panchayat, Shaheed Dweep

*A-S Kish*  
21/9/20  
Sr. Scientific Officer-II

Environmental clearance  
Most Important

No.4-4/PCC/PH/2020/912

अंडमान तथा निकोबार प्रशासन  
ANDAMAN & NICOBAR ADMINISTRATION

प्रदूषण नियंत्रण समिति

POLLUTION CONTROL COMMITTEE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY  
Dollygunj, Port Blair, Ph: 250370

Dated: 13-07-2020

To

The Director  
District Industries Centre  
Andaman Nicobar Administration  
South Andaman  
Port Blair

Subject: Environmental Clearance under EIA notification 2006.

Sir,

I am directed to inform you that Directorate of Civil Aviation, Andaman and Nicobar Administration has submitted applications for conducting public hearing for development of Water Aerodrome located at Swaraj Dweep, Shaheed Dweep and Long Island, Andaman and Nicobar Islands. In this regard, the following documents are forwarded for reference:

1. Hard copy of draft Environment Impact Assessment (EIA) Report for all the three projects
2. Hard copy of summary of the draft EIA report for all the three projects.
3. Copy of the public notices of all three projects.

You are very kindly requested to give wide publicity and also made available the documents to the persons likely to be affected by the grant of Environmental Clearance which shall include local authorities, association of person likely to be affected by the project and environmental groups to submit their suggestions/views/comments/objections if any on or before 25-09-2020 for Swaraj Dweep and Shaheed Dweep projects and 27-09-2020 for Long island project respectively in the Department of Science and Technology, Dollygunj, Port Blair, South Andaman, e-mail: dstandamans@gmail.com.

Yours faithfully,

  
Senior Scientific Officer-II

Environmental clearance  
Most Important

No. 4-4/PCC/PH/2020/910  
अंडमान तथा निकोबार प्रशासन  
ANDAMAN & NICOBAR ADMINISTRATION  
प्रदूषण नियंत्रण समिति  
POLLUTION CONTROL COMMITTEE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY  
Dollygunj, Port Blair, Ph: 250370

Dated: 10-09-2020

The Chief Executive Officer  
Zilla Parishad, South Andaman  
Port Blair

Subject: Environmental Clearance under EIA notification 2006.


Sir,

I am directed to inform you that Directorate of Civil Aviation, Andaman and Nicobar Administration has submitted applications for conducting public hearing for development of Water Aerodrome located at Swaraj Dweep and Shaheed Dweep, Port Blair Tehsil, Andaman District. In this regard, the following documents are forwarded for reference:

1. Hard copy of draft Environment Impact Assessment (EIA) Report for both the projects
2. Hard copy of summary of the draft EIA report for both the projects.
3. Copy of the public notices for both the projects.

You are very kindly requested to give wide publicity and also made available the documents to the persons likely to be affected by the grant of Environmental Clearance which shall include local authorities, association of person likely to be affected by the project and environmental groups to submit their suggestions/views/comments/objections if any on or before 25-09-2020 in the Department of Science and Technology, Dollygunj, Port Blair, South Andaman, e-mail: dstandamans@gmail.com.

Yours faithfully,

  
Senior Scientific Officer-II



Environmental clearance  
Most Important

No.4-4/PCC/PH/2020/908  
अंडमान तथा निकोबार प्रशासन  
ANDAMAN & NICOBAR ADMINISTRATION  
प्रदूषण नियंत्रण समिति  
POLLUTION CONTROL COMMITTEE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY  
Dollygunj, Port Blair, Ph: 250370

Dated: 10-09-2020

To  
The Deputy Commissioner (South Andaman)  
Office of the Deputy Commissioner  
Andaman and Nicobar Administration  
Port Blair, A & N Islands

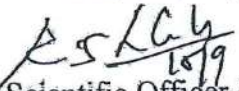
Subject: Environmental Clearance under EIA notification 2006.  
Sir,

I am directed to inform you that Directorate of Civil Aviation, Andaman and Nicobar Administration has submitted applications for conducting public hearing for development of Water Aerodrome located at Swaraj Dweep and Shaheed Dweep, Port Blair Tehsil, Andaman District. In this regard, the following documents are forwarded for reference:

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3. Copy of the public notices for both the projects.

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Yours faithfully,

  
Senior Scientific Officer-II

प्राप्ति/RECEIVED  
भा.डा.स. दिनांक.....  
केन्द्रीय डायरी/CENTRAL DAIRY  
उपायुक्त का कार्यालय  
DEPUTY COMMISSIONER'S OFFICE  
पोर्ट ब्लेयर/PORT BLAIR  
10/09/2020

Environmental clearance  
Most Important

No. 4-4/PCC/PH/2020/907

अंडमान तथा निकोबार प्रशासन  
ANDAMAN & NICOBAR ADMINISTRATION

प्रदूषण नियंत्रण समिति

POLLUTION CONTROL COMMITTEE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY  
Dollygunj, Port Blair, Ph: 250370

Dated: 10-09-2020

To

The Pradhan  
Neil Kendra Phanchyat  
Shaheed Dweep, South Andaman District

Subject: Environmental Clearance under EIA notification 2006.

Sir,


I am directed to inform you that Directorate of Civil Aviation, Andaman and Nicobar Administration has submitted application for conducting public hearing for development of Water Aerodrome located at Shaheed Dweep, Port Blair Tehsil, South Andaman District. In this regard, the following documents are forwarded for reference:

1. Hard copy of draft Environment Impact Assessment (EIA) Report
2. Hard copy of summary of the draft EIA report.
3. Copy of the public notice.

You are kindly requested to give wide publicity and also made available the documents to the persons likely to be affected by the grant of Environmental Clearance which shall include local authorities, association of person likely to be affected by the project and environmental groups to submit their suggestions/views/comments/objections if any on or before 25-09-2020 in the Department of Science and Technology, Dollygunj, Port Blair, South Andaman, e-mail: dstandamans@gmail.com.

Further you are requested to provide the Panchayat Hall at Neil Kendra Panchayat on 25-09-2020 at 10:30 AM and make necessary sitting arrangements for smooth conduct of Public Hearing on the date, time and venue mentioned. It is also requested to give wide publicity among the locals to attend the public hearing.

Yours faithfully,

  
Senior Scientific Officer-II

F.No. 4-4(3)/PCC/PH/2020/ 895

अंडमान तथा निकोबार प्रशासन  
ANDAMAN & NICOBAR ADMINISTRATION  
प्रदूषण नियंत्रण समिति  
POLLUTION CONTROL COMMITTEE  
DEPARTMENT OF SCIENCE AND TECHNOLOGY

Dated: 04-09-2020

To

The Chief Editor,  
The Daily Telegrams,  
Port Blair

Subject: Publication of Public Notice - reg

Sir/Madam,

Kindly arrange to publish the enclosed Public Notice in "The Daily Telegrams" for proposed public hearing of the project titled 'Development of WATER AERODROME located at Shaheed Dweep (erstwhile Neil Island), Port Blair, South Andaman District' either on 05.09.2020 or 06.09.2020 for the information of the general public. The Bill in duplicate may be please be sent in favor of 'The Director (S&T), A&N Administration' for making early payment. This has approval of the competent authority.

This may be treated as MOST URGENT.

Yours faithfully,


  
4/9/20  
Senior Scientific Officer-II

Copy to:

1. The News Editor, Pradeshik Samachar AIR, Port Blair with a request to broadcast the enclosed public notice for the information of the general public.
2. The News Editor, Dweep Darpan Doordarshan Kendra, Port Blair with a request to broadcast the enclosed public notice for the information of the general public.

Senior Scientific Officer-II

**Department of Science & Technology**  
Andaman & Nicobar Administration



सत्यमेव जयते

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31/12/2020	
<a href="#">Guidelines for Environmental Management of Dairy Farms and Gaushalas</a>	
31/12/2020	
<a href="#">Nodal officer for handling COVID-19 Public Grievances</a>	
30/12/2020	
<a href="#">Andaman and Nicobar Idol Immersion Rules,2018</a>	
12/12/2020	
<a href="#">Public Hearing for Environmental Clearance for development of WATER AFRODROME located at Long Island, Rangat Tehsil, North &amp; Middle Andaman District</a>	
27/09/2020	
<a href="#">Public Hearing for Environmental Clearance for development of WATER AFRODROME located at Swaraj Dweep(erstwhile Havelock Island), Port Blair, South Andaman District</a>	
25/09/2020	
<a href="#">Public Hearing for Environmental Clearance for development of WATER AFRODROME located at Shaheed Dweep(erstwhile Neil Island), Port Blair, South Andaman District</a>	
25/09/2020	
<a href="#">Public Hearing for Environmental Clearance for Andaman and Nicobar dual power project (55MW) at Hope Town, South Andaman District, Andaman &amp; Nicobar Islands</a>	
12/08/2020	
<a href="#">E waste (Management) Rule 2016</a>	
31/03/2020	
<a href="#">NGT order dated 16-01-2019 in the matter of OA 606 of 2018</a>	
31/03/2020	
<a href="#">Status on implementation of NGT order dated 16-01-2019 in the matter of OA No. 606 of 2018</a>	
31/03/2020	
<a href="#">Undertaking format to be submitted by the PIBOs</a>	
31/01/2020	
<a href="#">Notification on ban on single use plastic items in Andaman and Nicobar Islands</a>	
31/12/2019	
<a href="#">Applications are invited for eligible candidates for filling up of posts on short term contract basis.</a>	
31/12/2019	
<a href="#">Guidelines for siting of Stone Crusher Units in Andaman and Nicobar Islands</a>	
30/12/2019	
<a href="#">Guidelines for treatment of effluent and sewage of Hotels/Resorts/Lodges/Restaurants and Automobile Service Centre</a>	
30/12/2019	

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Sl.No	Department/Title	Subject	Upload Date	Last Date of Submission	Download
1	Dept. of Science and Technology	Notice of Public Hearing for Environmental Clearance for development of WATER AERODROME located at Long Island, Tehsil Rangat, North and Middle Andaman District.	10-09-2020	N/A	pdf
2	Directorate of Health Services	Expression of Interest (EOI) for Empanelment of Hospitals in the cities of Chennai, Kolkata and Vishakapatnam for beneficiaries of AN Islands under Ayushman Bharat-Pradhan Mantri Jan Arogya Yojana (AB-PMJAY)	10-09-2020	N/A	pdf
3	Dept. of Science and Technology	Notice of Public Hearing for Environmental Clearance for development of WATER AERODROME located at Shaheed Dweep(erstwhile Neil Island), Port Blair, South Andaman District	07-09-2020	N/A	pdf
4	Dept. of Science and Technology	Notice of Public Hearing for Environmental Clearance for development of WATER AERODROME located at Swaraj Dweep(erstwhile Havelock Island), Port Blair, South Andaman District	05-09-2020	N/A	pdf

U: 0.00 kbit/s  
D: 1.47 kbit/s

9:20 AM  
23/09/2020

## Annexure 4

### Recommendation letter of AN CZMA

**By e-mail/ Speed Post**

**No.APCCF/EPA/1/Vol-XVIII/1082**

वन एवं पर्यावरण विभाग

**DEPARTMENT OF ENVIRONMENT & FORESTS**

अपर प्रधान मुख्य वन संरक्षक (तटवर्ती अंचल विनियम एवं वन संरक्षण)/नोडल अधिकारी,  
वन(संरक्षण)अधिनियम/सदस्य सचिव, अण्डमान तथा निकोबार तटवर्ती अंचल प्रबंध प्राधिकरण  
**APCCF (CRZ & FC) / NODAL OFFICER, FCA & MS, A&NCZMA**  
वन सदन, हैडो, पोर्ट ब्लेयर/VAN SADAN, HADDO, PORT BLAIR  
\*\*\*\*\*

पोर्ट ब्लेयर/ Port Blair, दिनांक/Dated 23<sup>rd</sup> March, 2023

सेवा में/ To,

Dr. H. Kharkwal,  
Scientist 'E' (CRZ),  
Ministry of Environment, Forest and Climate Change,  
Indira Paryavaran Bhawan, Prithvi Wing,  
2<sup>nd</sup> Floor, No.215, Jor Bagh Road,  
New Delhi - 110003.

विषय/Sub: Development of Water Aerodrome at Swaraj Dweep and Shaheed Dweep Island-  
ANCZMA recommendation-reg.

संदर्भ/Ref: Letter No. APCCF/EPA/1/Vol-XVIII/1049 dated 17th March, 2023.

महोदय/Sir

In continuation of this office letter cited above, I am directed to inform that both the projects viz. Development of Water Aerodrome at Swaraj Dweep and Shaheed Dweep were placed before Expert Appraisal Committee in their meeting dated 22nd July 2022 and 12th-28th May, 2021 & 21st -22nd July, 2022 respectively for consideration and the EAC had asked the Project Proponent to realign the projects to avoid the area where some of the activities are not permissible and to submit revised application along with fresh recommendation of ANCZMA. Accordingly the Project Proponent has revised both the proposals by omitting onshore facilities such as Passenger Terminal Building, Utility Building, Parking Area, Walkway towards Floating Jetty, etc. and submitted the revised application (Form-I) for seeking fresh CRZ Clearance from ANCZMA. Both the revised proposals were placed before ANCZMA in their meeting held on 03.03.2023 for consideration and recommendation. The ANCZMA under the provisions of IPZ Notification, 2011 and in accordance with relevant ICRZ plan of the concerned islands recommended both the revised proposals for approval of the Ministry.

In view of the above, I am further directed to request you to kindly communicate the CRZ Clearance for both the proposals at the earliest. Documents pertaining CRZ Clearance in respect of both the revised proposals have already been submitted by this office vide letter mentioned under reference.

भवदीय / Yours faithfully,

2/06  
23.3.2023

सहायक वन संरक्षक / Assistant Conservator of Forests  
(तटवर्ती अंचल/Coastal Zone)  
वन सदन, पोर्ट ब्लेयर / Van Sadan, Port Blair

प्रतिलिपि / Copy to:-

The Director, Department of Civil Aviation, A&N Administration for kind information please.

**Annexure 5**

**(Form I as per IPZ Notification 2011)**

**FORM - I****I. BASIC INFORMATION**

S. No.	Item	Details																																															
1	Name of the project	Development of Water Aerodrome at Shaheed Dweep in Andaman & Nicobar Islands by Andaman & Nicobar Administration																																															
2	Location or Site Alternatives under consideration	<p>The proposed project site was selected based on analysis of environmental factors, approachability to site &amp; suitability of water operations area as summarized below:</p> <table border="1"> <thead> <tr> <th>Sr. No</th> <th>Parameters for site selection</th> <th>Site 1 (Selected Site)</th> <th>Site 2 (Alternate site considered earlier)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Road Availability for ease of transport</td> <td>Existing road will be used</td> <td>Construction of road is possible</td> </tr> <tr> <td>2</td> <td>Tree density</td> <td>No trees</td> <td>Tree density was moderate</td> </tr> <tr> <td>3</td> <td>Water Supply</td> <td>Readily available</td> <td>Supplied by local body, for nearby habitation.</td> </tr> <tr> <td>4</td> <td>Proximity of CRZ area</td> <td>ICRZ notification will be applicable</td> <td>ICRZ notification will be applicable</td> </tr> <tr> <td>5</td> <td>HTL</td> <td>Its away from HTL</td> <td>It was close to HTL</td> </tr> <tr> <td>6</td> <td>Eco-Sensitive Zone</td> <td>Not present in 10 km radius</td> <td>Not present in 10 km radius</td> </tr> <tr> <td>7</td> <td>Creek to be affected</td> <td>No creek nearby.</td> <td>Non-perennial back water will be affected</td> </tr> <tr> <td>8</td> <td>Mangrove</td> <td>Not Present</td> <td>Not Present</td> </tr> <tr> <td>9</td> <td>Presence of suitable water regime for takeoff and landing</td> <td>Water depth is sufficient for takeoff during low tide period</td> <td>Water depth is sufficient for takeoff during low tide period</td> </tr> <tr> <td>10</td> <td>Site to be Selected</td> <td>Selected</td> <td>Not Selected</td> </tr> </tbody> </table>				Sr. No	Parameters for site selection	Site 1 (Selected Site)	Site 2 (Alternate site considered earlier)	1	Road Availability for ease of transport	Existing road will be used	Construction of road is possible	2	Tree density	No trees	Tree density was moderate	3	Water Supply	Readily available	Supplied by local body, for nearby habitation.	4	Proximity of CRZ area	ICRZ notification will be applicable	ICRZ notification will be applicable	5	HTL	Its away from HTL	It was close to HTL	6	Eco-Sensitive Zone	Not present in 10 km radius	Not present in 10 km radius	7	Creek to be affected	No creek nearby.	Non-perennial back water will be affected	8	Mangrove	Not Present	Not Present	9	Presence of suitable water regime for takeoff and landing	Water depth is sufficient for takeoff during low tide period	Water depth is sufficient for takeoff during low tide period	10	Site to be Selected	Selected	Not Selected
Sr. No	Parameters for site selection	Site 1 (Selected Site)	Site 2 (Alternate site considered earlier)																																														
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10	Site to be Selected	Selected	Not Selected																																														

	Village	Bharatpur			
	Tehsil	Port Blair			
	District	South Andaman			
	State (Union Territory)	Andaman & Nicobar UT			
3	Size of the project (In terms of Total Area)	SN	Description	Area in Sq.m	Dimensions (mts)
		1	Use of Water Runway	54000	900 x 60
		2	Floating Jetty	432	48 x 9
4	CRZ Classification of the Area	CRZ- IV			
5	Expected Cost of the Project	11.41 Crores			
6	Contact Information: Address for correspondence Pincode E-mail Telephone No. / Fax No.	Ravichandran, Dy. Director Directorate of Civil Aviation, Andaman & Nicobar Administration Helicopter Terminal Building, Port Blair, Andaman & Nicobar 744103, Ph 03192-233601 E mail: <a href="mailto:civilaviation.and@nic.in">civilaviation.and@nic.in</a>			

## II. ACTIVITY

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	No	The existing passenger shed available at Shaheed Dweep jetty will be used as a passenger facilitation center.
1.2	Details of CRZ classification as per the approved Coastal Zone Management Plan?	Yes	The proposed water runway and floating Jetty falling under CRZ- IV as per IPZ notification 2011. Project layout superimposed on approved CZMP in 1:4000 scale is attached as Annexure 4
1.3	Whether located in CRZ -I area?	No	The project boundary considered for this project is only the water runway for sea plane and floating jetty which are within CRZ-IV area.
1.4	The distance from the CRZ-I areas.	No	Distance of project site from CRZ-I area is approximately 200 mts.
1.5	Whether located within the hazard zone as mapped by Ministry of environment and Forest/ National Disaster Management Authority?	No	--
1.6	Whether the area prone to cyclone, tsunami, tidal surges, subduction, earthquake etc?	Yes	Andaman & Nicobar Islands falls in Seismic Zone V.
1.7	Whether the area prone for saltwater ingress?	No	--

1.8	Clearance of existing land, vegetation and buildings?	No	--
1.9	Creation of new land uses?	No	--
1.10	Pre-construction investigations e.g. bore holes, soil testing?	No	--
1.11	Construction works?	No	No construction will be carried out at site, only deployment of pre-constructed floating dock by anchor.
1.12	Demolition works?	No	--
1.13	Temporary sites used for construction works or housing of construction workers?	No	Local labours from nearby area will be hired for the work.
1.14	Above ground buildings, structures or earthworks including linear structures, cut and fill or excavations	No	--
1.15	Underground works including mining or tunneling?	No	--
1.16	Reclamation works?	No	--
1.17	Dredging?	No	--
1.18	Offshore structures?	No	Deployment of pre-constructed floating jetty.
1.19	Production and manufacturing processes?	No	--
1.20	Facilities for storage of goods or materials?	No	--
1.21	Facilities for treatment or disposal of solid Waste or liquid effluents?	No	--
1.22	Facilities for long term housing of operational workers?	No	--
1.23	New road, rail or sea traffic during construction or operation?	No	--
1.24	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc?	No	--
1.25	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	--
1.26	New or diverted transmission lines or pipelines?	No	--
1.27	Impoundment, damming, culverting, realignment or other changes to the hydrology of watercourses or aquifers?	No	--
1.28	Stream crossings?	No	--
1.29	Abstraction or transfers of water from ground or surface waters?	No	--

1.30	Changes in water bodies or the land surface affecting drainage or run-off?	No	--
1.31	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Local labourers will be ferried to the site for deploying the floating jetty by mechanized boats and will be ferried back.
1.32	Long-term dismantling or decommissioning or restoration works?	No	--
1.33	Ongoing activity during decommissioning which could have an impact on the environment?	No	--
1.34	Influx of people to an area in either temporarily or permanently?	Yes	<b>Construction phase:</b> Local labours from nearby area will be hired for the work temporarily. <b>Operation phase:</b> Temporary influx of 50 passengers is envisaged during Seaplane operations.
1.35	Introduction of alien species?	No	--
1.36	Loss of native species or genetic diversity?	No	--
1.37	Any other actions?	No	--

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
2.1	Land especially undeveloped or agricultural land (ha)	No	
2.2	Water (expected source & competing users) unit: KLD	No	--
2.3	Minerals (MT)	No	--
2.4	Construction material – stone, aggregates, sand / soil (expected source – MT)	No	Pre constructed Floating Jetty (49 x 9 mts) shall be towed and placed at the site.
2.5	Forests and timber (source – MT)	No	--
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), energy (MW)	No	--
2.7	Any other natural resources (use appropriate standard units)	No	--

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)	No	--
3.2	Changes in occurrence of disease or affect disease vectors (e.g. insect or water borne diseases)	No	--
3.3	Affect the welfare of people e.g. by changing living conditions?	Yes	There will be positive impact due to proposed project. Direct or indirect employment opportunities for the local people will increase. The living condition and welfare of the people will improve. Tourism sector will get a boost.
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.,	No	--
3.5	Any other causes	No	--

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
4.1	Spoil, overburden or mine wastes	No	--
4.2	Municipal waste (domestic and or commercial wastes)	No	--
4.3	Hazardous wastes (as per Hazardous Waste Management Rules)	No	--
4.4	Other industrial process wastes	No	--
4.5	Surplus product	No	--
4.6	Sewage sludge or other sludge from effluent treatment	No	--
4.7	Construction or demolition wastes	No	--
4.8	Redundant machinery or equipment	No	--

4.9	Contaminated soils or other materials	No	--
4.10	Agricultural wastes	No	--
4.11	Other solid wastes	No	--

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
5.1	Emissions from combustion of fossil fuels from stationary or mobile sources	No	--
5.2	Emissions from production processes	No	--
5.3	Emissions from materials handling including storage or transport	No	--
5.4	Emissions from construction activities including plant and equipment.	No	--
5.5	Dust or odours from handling of materials including construction materials, sewage and waste	No	--
5.6	Emissions from incineration of waste	No	--
5.7	Emissions from burning of waste in open air (e.g. slash materials, construction debris)	No	--
5.8	Emissions from any other sources	No	--

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
6.1	From operation of equipment e.g. engines, ventilation plant, crushers	No	--
6.2	From industrial or similar processes	No	--
6.3	From construction or demolition	No	--
6.4	From blasting or piling	No	--
6.5	From construction or operational traffic	No	--
6.6	From lighting or cooling systems	No	--
6.7	From any other sources	No	--

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
7.1	From handling, storage, use or spillage of hazardous materials	No	--
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of Discharge)	No	--
7.3	By deposition of pollutants emitted to air into the land or into water	No	--
7.4	From any other sources	No	--
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	--

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	No	Emergency Response Disaster Management Plan shall be prepared.
8.2	From any other causes	No	--
8.3	Could the project be affected by natural disasters causing environmental damage (e.g. floods, earthquakes, landslides, cloud burst etc)?	No	Emergency Response Disaster Management Plan shall be prepared.

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

S.No.	Information/Checklist confirmation	Yes/No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data
9.1	Lead to development of supporting facilities, ancillary development or development stimulated by the project	No	--

	which could have impact on the environment e.g.: Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.), Housing development, Extractive industries, Supply industries and Other		
9.2	Lead to after-use of the site, which could have an impact on the environment	No	--
9.3	Set a precedent for later developments	No	--
9.4	Have cumulative effects due to proximity to other existing or planned projects with similar effects	No	--

### III. ENVIRONMENT SENSITIVITY

S.No.	Areas	Present (Yes/No)	Aerial distance (within 15 km) of Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological, landscape, cultural or other related value.	Yes	Sir Hugh Ross Island Wildlife Sanctuary is present towards Southeast of project site at an approximate aerial distance of 7 km.
2	Areas which are important or sensitive for ecological reasons - Wetlands, watercourses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	Floating jetty is falling under CRZ IV as per ICRZ notification, 2011.
3	Areas used by protected, important or sensitive species of flora or fauna for breeding, nesting, foraging, resting, overwintering, migration.	Yes	Mangrove Forest & Corals in Andaman Sea are in close proximity.
4	Inland, coastal, marine or underground waters.	Yes	The project offshore facilities will be located in Andaman Sea.
5	State, National boundaries	No	Not present within 15 km radius from project site.
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas.	Yes	The nearby area from project site itself serves as tourist place.
7	Defense installations	No	Not present within 15 km radius from project site.
8	Densely populated or built-up area.	No	--
9	Areas occupied by sensitive man-made land uses ( <i>hospitals</i> ,	Yes	Present at nearby locations.

	<i>schools, places of worship, community facilities)</i>		
10	Areas containing important, high quality or scarce resources. <i>(Ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)</i>	No	--
11	Areas already subjected to pollution or environmental damage. <i>(Those where existing legal environmental standards are exceeded)</i>	No	--
12	Areas susceptible to natural hazard which could cause the project to present environmental problems. <i>(Earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)</i>	Yes	The A&N Islands falls under Zone V as per IS 1893 (Part-I): 2002 classification. The site is located under CRZ IV as per ICRZ notification, 2011. Adequate safety measures shall be adopted during operations to prevent environmental problems.

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

Date: 02/10/07

Place:

Signature of the applicant:

  
 उप - निदेशक, नागरिक विमानन  
 Deputy Director, Civil Aviation  
 अ. तथा. नि. प्रशासन  
 A & N Administration  
 Ravichandran, Dy. Director  
 Directorate of Civil Aviation,  
 Andaman & Nicobar Administration,  
 Helicopter Terminal Building, Port Blair 744103, Andaman & Nicobar Islands  
 E mail: [civilaviation.and@nic.in](mailto:civilaviation.and@nic.in) Ph 03192-233601

## **Annexure 6**

**(Undertaking by Directorate of Civil Aviation, Andaman & Nicobar Administration declaring that there is no violation and no part of the project has been implemented without Environmental Clearance)**

**No. 6/CA/2017-2018**  
**ANDAMAN AND NICOBAR ADMINISTRATION**  
**DIRECTORATE OF CIVIL AVIATION**  
\*\*\*

**UNDERTAKING**

This is to confirm that the proposed project of Water Aerodrome at Shaheed Dweep (erstwhile Neil Island), Village - Bharatpur, Taluka - Port Blair, District - South Andaman, Andaman & Nicobar Islands is a new activity. Hence, Directorate of Civil Aviation, Andaman & Nicobar Administration has not violated EIA Notification dated 14<sup>th</sup> September, 2006 & amendments.

This is for your information & necessary action.

  
**(Ravichandran)**  
Deputy Director (Civil Aviation)

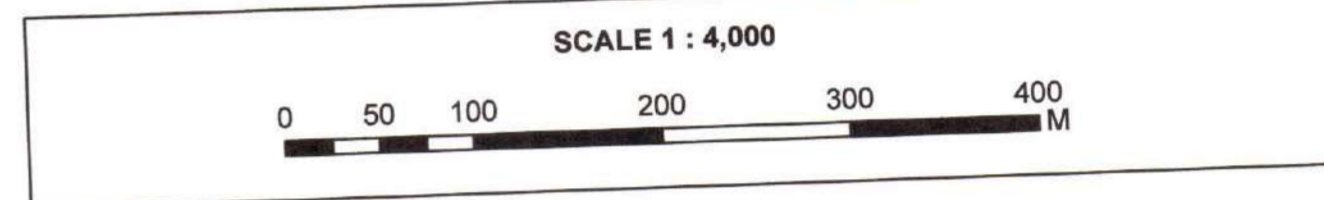
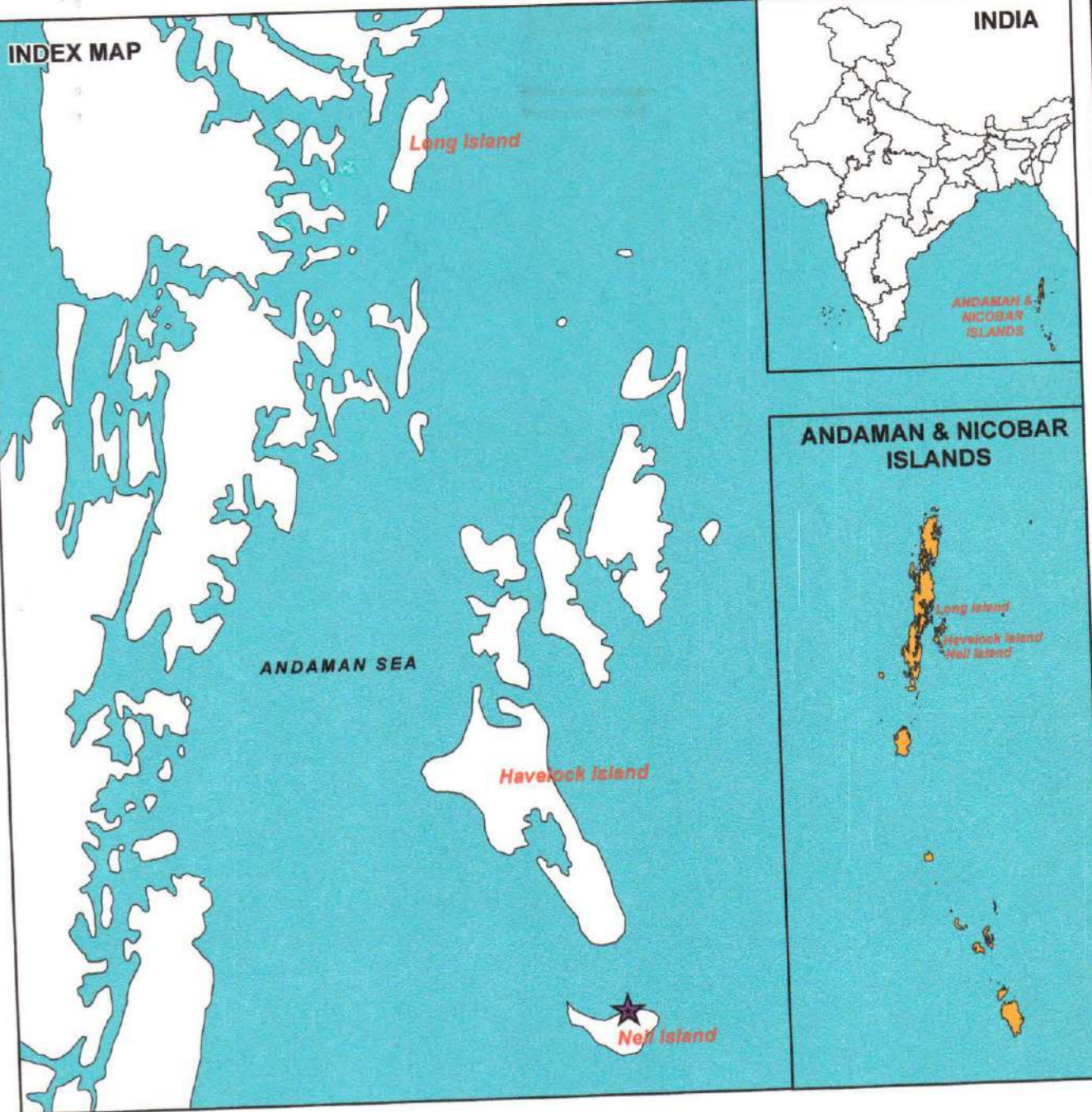
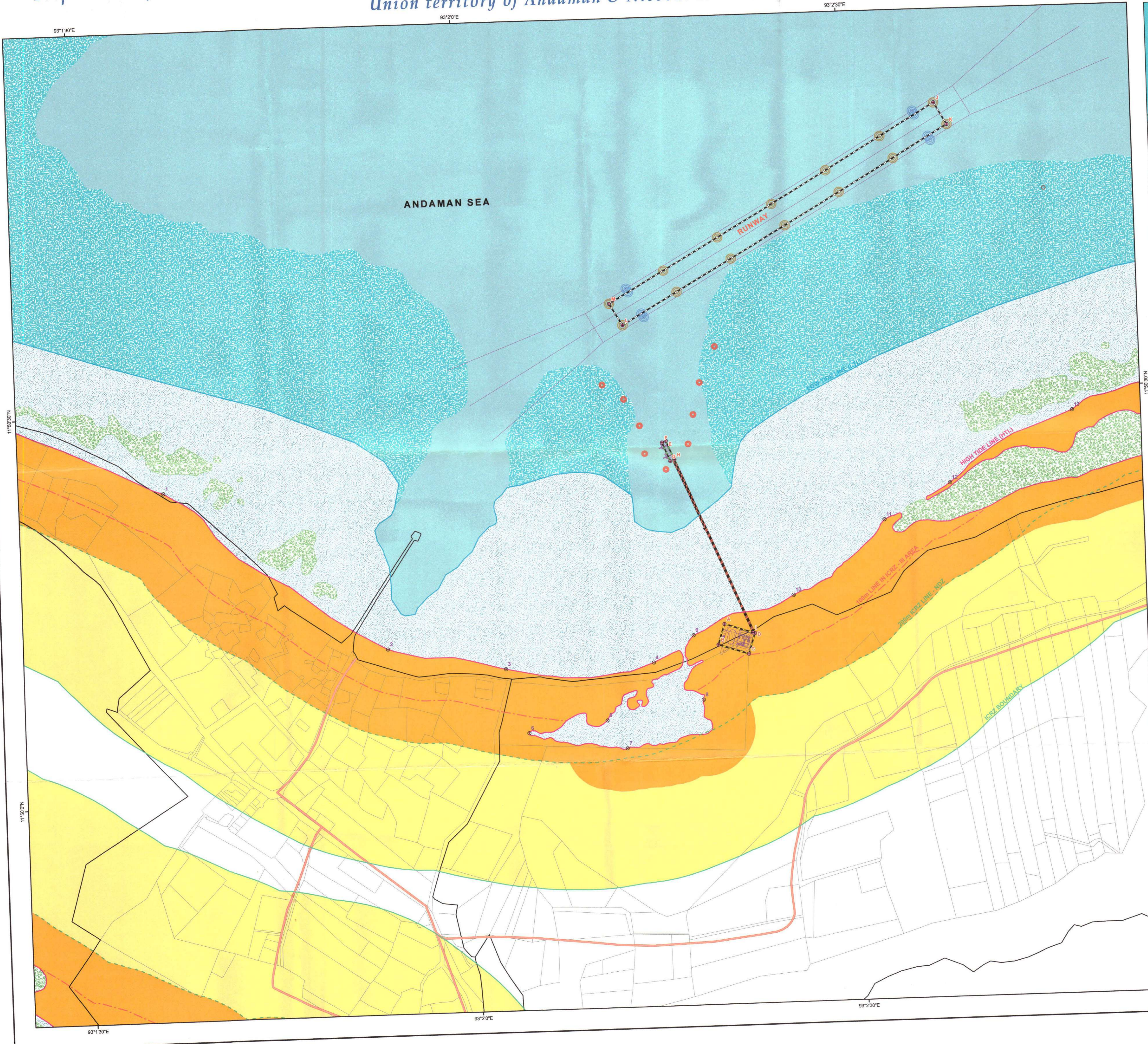
Date: 23<sup>rd</sup> March, 2021

Place: Port Blair

## **Annexure 7**

**(CRZ Map on 1:4000 scale with the project activities superimposed on the map)**

# Preparation of Local Level Island Coastal Regulation Zone for the Proposed Water Aerodrome at Shaheed Dweep (Neil) Island, Union territory of Andaman & Nicobar Islands



**LEGEND**

**SOURCE : GPS SURVEY AS PER ICRZ NOTIFICATION 2011**

- LOW TIDE LINE (LTL)
- HIGH TIDE LINE (HTL)
- 100m LINE IN ICRZ - III AREA
- 200m ICRZ LINE - NDZ
- ICRZ BOUNDARY (500m FOR SEA, 100m FOR BAY, 100m OR WIDTH OF THE CREEK WHICHEVER IS LESS ALONG THE TIDAL INFLUENCED WATER BODIES)
- ROAD
- SURVEY BOUNDARY
- VILLAGE BOUNDARY
- MANGROVES (ICRZ - IA)
- CORALS & CORAL REEFS (ICRZ - IA)
- RESERVE FOREST WITHIN ICRZ AREA (ICRZ - IA)
- ICRZ - IB
- NO DEVELOPMENT ZONE (ICRZ - III)
- 200m TO 500m FROM HTL (ICRZ - III)
- ICRZ - IV
- HTL REFERENCE POINT

**SOURCE : CLIENT**

- PROPOSED PROJECT SITE BOUNDARY CORNER
- PROPOSED PROJECT SITE DETAILS
- PROPOSED RUNWAY
- PROPOSED JETTY
- PROPOSED FLOATING WALKWAY
- PROPOSED TERMINAL BUILDING
- PROPOSED BUOY AT RUNWAY CORNERS
- PROPOSED BUOY (THRESHOLD MARKING)
- PROPOSED NUN BUOY
- PROPOSED ISOLATION BAY

**Note:**

- The map comes with a report wherein description of ICRZ zonation of project layout details are given. This map is to be referenced and used along with the report bearing the same reference no: AU/IRS/KSR/209-B-2020 DT. 21.12.2020
- The DGPS Survey was carried out specific to the referred project site boundary only hence, validation of HTL and ICRZ Boundary is limited to the clearance of the same. Institute of Remote Sensing do not carry responsibility for ICRZ status of other plots or neighbourhood.

PREPARED BY  
**INSTITUTE OF REMOTE SENSING**  
**ANNA UNIVERSITY**  
**CHENNAI - 600 025**

REF NO. AU/IRS/KSR/209-B-2020 DT. 21.12.2020

FOR  
**M/s. FEED BACK INFRA PRIVATE LIMITED**  
**WATER DIVISION**  
**3rd FLOOR, GALA IMPECCA**  
**ANDHERI KURLA ROAD, JB NAGAR**  
**ANDHERI EAST, MUMBAI - 400 059.**

PREPARED BY: *[Signature]*

VERIFIED BY: *[Signature]*

APPROVED BY: *[Signature]*  
**Prof. D. Thirumalaivasan, B.E.M.Tech.Ph.D.,**  
**Director**  
**Institute of Remote Sensing**  
**Anna University, Chennai-600 025.**

Enclosure 3: Points to be updated in form 2

**Following points need to be updated in Form 2**

Sr. no	Existing Details	Details to be updated																		
8	<p><b>Project Configuration</b></p> <table border="1"> <thead> <tr> <th>Sn</th> <th>Plant/Equipment/Facility</th> <th>Configuration</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>Passenger Terminal Building</td> <td>600.25 m2</td> </tr> <tr> <td>2</td> <td>Utility Building</td> <td>141 m2</td> </tr> </tbody> </table>	Sn	Plant/Equipment/Facility	Configuration	1	Passenger Terminal Building	600.25 m2	2	Utility Building	141 m2	<p><b>Not applicable</b></p>									
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31	<p><b>Manpower Requirement:</b></p> <table border="0"> <tr><td>(a)Permanent Employment-During Construction</td><td>  0</td></tr> <tr><td>(b)Permanent Employment-During Operation</td><td>  50</td></tr> <tr><td>(c)Temporary Employment- During Construction</td><td>  0</td></tr> <tr><td>(d)Temporary Employment- During Operation</td><td>  0</td></tr> <tr><td>(e)No. of working days</td><td>  270</td></tr> <tr><td>(f)Total Manpower</td><td>  50</td></tr> </table>	(a)Permanent Employment-During Construction	0	(b)Permanent Employment-During Operation	50	(c)Temporary Employment- During Construction	0	(d)Temporary Employment- During Operation	0	(e)No. of working days	270	(f)Total Manpower	50	Permanent requirement during operation: 30										
(a)Permanent Employment-During Construction	0																							
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(c)Temporary Employment- During Construction	0																							
(d)Temporary Employment- During Operation	0																							
(e)No. of working days	270																							
(f)Total Manpower	50																							

32	<p><b>Green Belt in Ha:</b></p> <table border="0"> <tr> <td>(a)Total Area of Green Belt</td> <td>  0.13</td> </tr> <tr> <td>(b)Percentage of Total Project Area</td> <td>  34.67</td> </tr> <tr> <td>(c)No. of Plants to be Planted</td> <td>  1049</td> </tr> <tr> <td>(d)Funds Allocated for Plantation</td> <td>  2503000</td> </tr> <tr> <td>(e)Uploaded Green Belt plan</td> <td>  <a href="#">Copy of Green Belt Plan</a></td> </tr> </table>	(a)Total Area of Green Belt	0.13	(b)Percentage of Total Project Area	34.67	(c)No. of Plants to be Planted	1049	(d)Funds Allocated for Plantation	2503000	(e)Uploaded Green Belt plan	<a href="#">Copy of Green Belt Plan</a>	Not applicable
(a)Total Area of Green Belt	0.13											
(b)Percentage of Total Project Area	34.67											
(c)No. of Plants to be Planted	1049											
(d)Funds Allocated for Plantation	2503000											
(e)Uploaded Green Belt plan	<a href="#">Copy of Green Belt Plan</a>											
34	CRZ Specific Details : Not Applicable	Proposed project falls in CRZ IV as per ICRZ notification 2011										
35	<p>Sector Specific Details For INFRA-2 1</p> <p><b>Details of Building Construction:</b></p> <table border="0"> <tr> <td>(a)Maximum Height of the Building (Meters)</td> <td>  7</td> </tr> <tr> <td>(b)Total No. of Flats to be Build</td> <td>  0</td> </tr> <tr> <td>(c)No. of Buildings</td> <td>  2</td> </tr> <tr> <td>(d)Total plot area (sqm)</td> <td>  3750</td> </tr> <tr> <td>(e)Total built up area (sqm)</td> <td>  741.25</td> </tr> </table>	(a)Maximum Height of the Building (Meters)	7	(b)Total No. of Flats to be Build	0	(c)No. of Buildings	2	(d)Total plot area (sqm)	3750	(e)Total built up area (sqm)	741.25	Not applicable
(a)Maximum Height of the Building (Meters)	7											
(b)Total No. of Flats to be Build	0											
(c)No. of Buildings	2											
(d)Total plot area (sqm)	3750											
(e)Total built up area (sqm)	741.25											
	<p>3 Rain Water Harvesting:</p> <table border="0"> <tr> <td>(a)No. of Storage</td> <td>  1</td> </tr> <tr> <td>(b)Capacity</td> <td>  20</td> </tr> <tr> <td>(c)No. of Recharge Pits</td> <td>  0</td> </tr> <tr> <td>(d)Capacity</td> <td>  0</td> </tr> </table>	(a)No. of Storage	1	(b)Capacity	20	(c)No. of Recharge Pits	0	(d)Capacity	0	Not applicable		
(a)No. of Storage	1											
(b)Capacity	20											
(c)No. of Recharge Pits	0											
(d)Capacity	0											
	<p>4 Parking:</p> <table border="0"> <tr> <td>(a)Details of 4 Wheeler/ 2 Wheeler Parking</td> <td>  86 m2</td> </tr> </table>	(a)Details of 4 Wheeler/ 2 Wheeler Parking	86 m2	Not applicable								
(a)Details of 4 Wheeler/ 2 Wheeler Parking	86 m2											
	<p>5 Energy Saving Measures:</p> <table border="0"> <tr> <td>(a)Source/Mode</td> <td>  Solar Power Harvesting</td> </tr> <tr> <td>(b)Percentage</td> <td>  42</td> </tr> <tr> <td>(c)Quantity</td> <td>  60</td> </tr> </table>	(a)Source/Mode	Solar Power Harvesting	(b)Percentage	42	(c)Quantity	60	Not applicable				
(a)Source/Mode	Solar Power Harvesting											
(b)Percentage	42											
(c)Quantity	60											

Yours Sincerely,  
For Andaman and  
Nicobar Administration

  
Authorized Signatory