

**Draft EIA Report
April, 2025**

ENVIRONMENTAL IMPACT ASSESSMENT

FOR

DEVELOPMENT OF NEW GREENFIELD AIRPORT

AT

Doloo, Silchar, Cachar district, Assam

BY

AIRPORTS AUTHORITY OF INDIA

Baseline Monitoring Period- 1st October to 31st December, 2023

Schedule- 7(a), Category- A

Project Cost- Rs. 1400.0 Crores

Plot Area- 997.4 acres



**MONITORING DONE
BY
M/S VARDAN
ENVIROLAB LLP
(NABL ACCREDITION
TC-6299)**

ENVIRONMENT CONSULTANT



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Document No.: 2023_VI_033**

QGLOBAL



**QCI/NABET
ACCREDITION
NUMBER
NABET/EIA/2326/RA
0284**

Ref. No. AAI/SIL/Dolu Airport/ 349

Date: 28.04.2025

To,
The Member Secretary,
Pollution Control Board Assam
Bamunimaidam, Guwahati-21, Assam.

Subject: Submission of Draft EIA/EMP report for Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India-**Reg. Public Hearing**

Reference: ToR File No. 21-273/2024-IA.III dated 02.09.2024

Sir,

With reference to the subject cited above, the undersigned informs that the proposed project of "Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India" has been granted a TOR by MoEF&CC vide File no. 21-273/2024-IA.III dated 02.09.2024

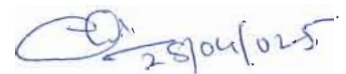
As per terms of approved TOR letter by MoEF&CC; we are hereby submitting the copies of Draft EIA /EMP report for the conduct Public Hearing process as per EIA notification dated 14th September, 2006 for the proposed project of "Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India."

Accordingly, we have prepared the Draft EIA/EMP Report incorporating all the ToR points and are submitting the following documents:

1. 10 hard copies and 10 soft copies of draft EIA Report
2. 10 hard copies and 10 soft copies of Summary EIA Report (English/Assamese)

In the view of above, you are therefore requested to fix a schedule for conducting public hearing at the earliest in view of above.

Yours Truly
For Airports Authority of India



Authorized Signatory

Name: M. Chinglensana Singh

Designation: APD

विमान पत्तन निदेशक
Airport Director
भारतीय विमान पत्तन प्राधिकरण, शिलचर.
Airports Authority of India, Silchar

Encl: As stated above

Ref. No. AAI/SIL/Dolu Airport/ 350

Date: 28.04.2025

UNDERTAKING

I, Authorized Signatory of proposed project of "Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India", hereby solemnly affirm an undertaking stated herein:

1. That, the project is not a violation as per provision S.O. 804 dated 14.03.2017 and SOP dated 07.07.2021.
2. That, the prescribed TOR has been complied with respect to the EIA/EMP studies. The contents given in the EIA/EMP report are factually correct with full knowledge of undersigned as per Ministry's O.M. No. J-11013/41/2006-IA.II(I) dated 04.08.2009 and J-11013/41/2006-IA.II(I) dated 05.10.2011.

For Airports Authority of India



Authorized Signatory

Name: M. Chinglensana Singh

Designation: APD

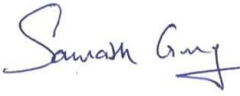

विमान पत्तन निदेशक
Airport Director
भारतीय विमान पत्तन प्राधिकरण, शिलचर
Airports Authority of India, Silchar

REVIEW AND REVISION HISTORY

Document no. 2023_VI_033

History of revisions of the present report:

History of the Revisions

Rev.	Date	Description	Review-1	Approval
Rev.00	April 2025	Draft EIA Report	Mr. Saurabh Garg	Mr. R.S. Yadav
-	-	-		

This Report has been prepared by Vardan EnviroNet LLP on behalf of and for the use of the **Airports Authority of India** with due consideration and skill as per our general terms and conditions of business and terms of agreement with **Airports Authority of India**.



Declaration by Experts contributing to the Proposed Project of Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India.

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

EIA coordinator:

Name: Mr. Saurabh Garg



Signature:

Date – 02.05.2025



Period of involvement: October, 2023 to till date

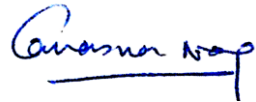
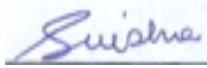





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FUNCTIONAL AREA EXPERTS (FAEs) INVOLVED EIA REPORT PREPARATION

FAE	Name of the expert/s	Involvement	Signature
AP	Mr. K.M. Khare	Period of Involvement- October to December, 2023 <ul style="list-style-type: none">➤ Identifying the sources of emissions and mitigation measures.➤ Site-specific micro meteorology monitoring.➤ Ambient Air Quality (AAQ) monitoring➤ Impact predictions and mitigations.➤ Impact identification	
WP	Mr. Shubham Tyagi	Period of Involvement- October to December, 2023 <ul style="list-style-type: none">➤ Selection of sampling locations➤ Ground water quality monitoring and assessment, impacts on water environment and	

		<p>mitigations.</p> <ul style="list-style-type: none"> ➤ Identification, characterization of effluent and treatments there of ➤ Water balance and conservation measures 	
SHW	Mr. Anasua Nag	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Identification of hazardous, solid waste generation, and their disposal and mitigation measure. ➤ Suggesting proper Recycling and disposal techniques 	
SE	Ms. Shilpa Mishra	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Determination of demographic profile including socio economy & livelihood ➤ Assessing the changes in socio economic pattern 	
EB	Dr. Sunil Prasad Bhatt	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Biological environment status in respect of terrestrial fauna and aquatic eco system ➤ Impact on ecological environment 	
HG	Mr. R. S Yadav	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Ground water resource assessment ➤ Impact on ground water potential and mitigation measures for avoiding ground water contamination. 	
SC	Mr. Sameer Deshpande FAA: Adarsh Bhardwaj	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Monitoring, analysis, and characterization of soil ➤ Assessment of impact on soil quality and mitigation measure. 	 
AQ	Ms. Surbhi Makwana	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Processing of site specific micro-meteorological data. ➤ Collection and use of data for 	

		<p>modelling.</p> <ul style="list-style-type: none"> ➤ Air dispersion modelling for prediction of GLCS due to PM10, SO2 and NOx. 	
NV	Mr. K.M. Khare	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Analysis of ambient noise quality data ➤ Impact due to plant noise and abatement measures 	
LU	Mr. Mamta Pandey	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Analysis of data related to land use pattern ➤ Land use map development. ➤ Impact on land environment in respect to land form change 	
RH	Mr. Jayeshbhai Y. Makwana	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Identification of hazardous prone areas ➤ Environment risk evaluation ➤ On-site and Off-site emergency planning 	
GEO	Mr. R. S Yadav	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Topography and geological aspects. ➤ Developing geological maps. 	

PERSONNELS INVOLVED IN EIA REPORT PREPARATION

S. No.	Name of Employee	Involvement – Actual Work Performed	Experience
1.	Ms. Aanchal Sharma	Assisted EIA Co-ordinator in compilation & preparation of draft EIA/EMP report.	4 years & 6 months
2.	Ms. Meenu	Assisted EIA Co-ordinator in Lab data Compilation for draft EIA/EMP report.	8 years & 6 months

Declaration by Head of the ACO / authorized person

I, Anshul Yadav hereby, confirm that all the relevant experts have provided inputs in preparation of the Draft EIA report of **Airports Authority of India** and EIA Coordinator (EC) is fully aware of the content. The consultant organization shall be fully accountable for any mis-leading information. It is also certified that Draft EIA Report has been analysed by the system for plagiarism check using Plagiarism Checker X in accordance with good scientific practice. No unethical practices have been carried out and external data/ text have not been used without proper acknowledgement, while preparing this Draft EIA report.

Certificate of Plagiarism check	
Title of EIA Report:	Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India
Name of Accredited Organisation:	Vardan Environet LLP
Unique Identification Number:	2023_VI_033
Name of EIA Co-ordinator:	Mr. Saurabh Garg
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Date and Sign of EIA Co-ordinator:

Name- Mr. Saurabh Garg



Signature

Date - 02.05.2025

Date and Sign of Head of ACO / authorized person:

Name: - Mr. Anshul Yadav (General Manager)



Signature:

Date - 02.05.2025

Name of the EIA consultant organization: Vardan Environet LLP

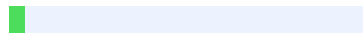
NABET Certificate No. & Issue Date: NABET/EIA/2326/RA 0284 Valid upto: 04.05.2026.



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ABBREVIATIONS

AAQM	Ambient Air Quality Monitoring
APCD	Air Pollution Control Devices
cm	Centimetre
CPCB	Central Pollution Control Board
dB	Decibel
DG	Diesel based Generator
E	East
ECC	Emergency Control Centre
EIA	Environmental Impact Assessment
EMC	Environmental Management Cell
EMP	Environmental Management Plan
EPA	Environmental Protection Agencies
ESE	East of South East
STP	Sewage Treatment Plant
FCC	False Colour Composite
GIS	Geographical Information System
GG	Gas based Generator
GLC	Ground Level Concentration
GPS	Global Positioning System
IMD	Indian Meteorological Department
IRS	Indian Remote Sensing Satellite
ISCST	Industrial Source Complex, Short Terms
ISO	International Organization of Standardization
ISS	Indian Standard Specification
KLD	Kilo Litre Per Day
Km	Kilometre
KVA	Kilo Volt Ampere
KW	Kilo Watt
Ltd.	Limited
m	Meter
M bgl	Meter Below Ground Level
mg	Milligram
MoEF&CC	Ministry of Environment, Forest, and Climate Change
mRL	Mean Reference Level
MSMEs	Micro, Small and Medium Enterprises
N	North
NE	North-East
NH	National Highway
NNE	North of North-East

NNW	North of North-West
NO ₂	Nitrogen Dioxides
NW	North-West
OHSAS	Occupational Health & Safety Assessment
SPCB	State Pollution Control Board
PPE	Personal Protective Equipment
PPM	Parts Per Million
Pvt.	Private
QC	Quality Council
QCI	Quality Council of India
QRA	Quantitative Risk Assessment
R&R	Rehabilitation & Resettlement
RSPM	Respirable Suspended Particulate Matter
SE	South- East
SEIAA	State Level Environmental Assessment Authority
SO ₂	Sulphur-Di-Oxide
SOI	Survey of India
SPM	Suspended Particulate Matter
SSE	South of South-East
SSW	South of South-West
TAC	Traffic Advisory Committee
TDS	Total Dissolve Solid
ToR	Terms of Reference
TPH	Tones Per Hour
TS	Total Solid
TSDF	Treatment, Storage and Disposal Facility
USEPA	United State Environmental Protection Agencies
PCB	Pollution Control Board
µg/m ³	Micro gram per meter cube
w.e.f.	With Effective From
w.r.t.	With Reference To
ZLD	Zero Liquid Discharge

LIST OF ANNEXURES

S. No.	Annexure	Document
1.	Annexure 1	TOR Letter
2.	Annexure 2	Baseline Report
3.	Annexure 3	CGWA Application
4.	Annexure 4	Contour Plan
5.	Annexure 5	Land Documents
6.	Annexure 6	NABET Certificate
7.	Annexure 7	NABL Certificate



TOR COMPLIANCE

S. No.	ToR Point	Action to be taken	Chapter & Heading
Standard Terms of reference			
SPECIFIC CONDITIONS			
1.1	Comparative report of site suitability related to Environmental aspect.	Comparative study of site suitability related to Environmental as well as other aspects has been given in Chapter-5 under section-5.2.2.	Chapter 5 (Section 5.2.2)
1.2	A sensitivity analysis of the site shall be carried out as per the MoEF&CC criteria and form part of the EIA report.	Sites and design process should be critically examined to maintain the positive environmental impact, socio-economic benefits & profitability and minimise the temporary adverse impact. Normally, the extent of displacement of people, the loss of agricultural land, relocation of flora & fauna and irreversible loss of natural resources permanently, are the deciding factors in selection/rejection of site. The sensitivity analysis of the site has been carried out as per the MoEF&CC criteria	Chapter 5 (Section 5.2)
1.3	Impact of the proposed project on Bird Movement in particular and wildlife in general in the region.	Impact of the proposed project on Bird Movement and wildlife has been detailed in the region in Chapter 7.	Chapter-7 (Sec-7.4.1.2)
1.4	Impact of the proposed project on adjacent water bodies and possible mitigation measures.	Impact of the proposed project on adjacent water bodies during construction as well as operational phase along with its possible mitigation measures are covered in Chapter-4.	Chapter-4 (Sec-4.4.2)
1.5	Feasibility study on the use of Natural gas in power generation sets in place of diesel for mitigation of air pollution.	The availability and distribution of natural gas hinders its feasibility over the use of diesel especially in remote locations. Also, the volatility of natural gases are higher than diesels which may have safety concerns associated with gas leaks. However, not only these are the only factors making natural gases non-feasible for power generation sets in place of diesel in such a remote location for mitigation of air pollution since there are not much difference in emissions from natural gases and diesels. The feasibility	Chapter-7 (Sec-7.3)



		study on the use of natural gas in power generation sets in place of diesel for mitigation of air pollution is covered in Chapter 7.	
1.6	Importance and benefits of the project.	Importance and benefits of the project has been covered in Chapter-1.	Chapter-1 (Sec-1.3.4)
1.7	Layout maps of proposed project indicating runway, terminal building, parking, greenbelt area, utilities etc.	Layout maps of proposed project indicating runway, terminal building, parking, greenbelt area, utilities etc has been given in Chapte-2.	Chapter-2 (Sec-2.3)
1.8	The details of excavations, its impacts, and the impact of transport of excavated material. A detailed management plan shall be suggested.	The excavated material will be used for filling purpose for leveling the site; hence there won't be transportation of the excavated materials. A detailed management plan has been briefed under the head of environmental management plan in Chapter-10.	Chapter-10 (sec-10.4)
1.9	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.	Traffic Study has been covered in Chapter-4.	Chapter-4 (sec-4.6)
1.10	The impacts of demolition and the activities related thereto shall be examined and a management plan shall be prepared to conform to the C&D Waste Management Rules.	The impacts of C&D activities related thereto have been prepared to conform to the C&D Waste Management Rules and have been detailed in Chapter-4.	Chapter-4 (Sect-4.4.6)

1.11	An onsite disaster management plan shall be prepared to account for risks and accidents. This onsite plan shall be dovetailed with the disaster management plan for the district.	An onsite disaster management plan has been prepared to account for risks and accidents and has been covered in Chapter-7.	Chapter-7 (sec-7.5)
1.12	A note on appropriate process and materials to be used to encourage reduction in carbon footprint. 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.	A note on appropriate process and materials to be used to encourage reduction in carbon footprint has been elaborated in chapter-10.	Chapter -4 (sec-4.9)
1.13	Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract).	Requirement of water, power, with source of supply, status of approval, water balance diagram, man-power requirement (regular and contract) has been covered in Chapter 2 (Project Description)	Chapter-2 (sec-2.7)
1.14	Details of emissions, effluents, solid waste (including de-plane waste) and hazardous waste generation and their management. Air quality modelling and noise modeling shall be carried out for the emissions from the various types of aircrafts.	Details are covered as under: Waste water generation under head 2.8.1. Solid water generation under head 2.8.2. Air emmissions under head 4.5.	Chapter-2 (sec- 2.8.1) Chapter-2 (sec- 2.8.2) Chapter-4 (sec- 4.5)
1.15	Details shall be provided regarding the solar generation proposed and the extent of substitution, along with compliance to the ECBC rules. Cost of project and time of	Solar panel of capacity 500 kWp has been proposed to be installed at the roof top which is approx. 20% of total power requirement (2400 kW). Cost of project is projected to be 1400 cr. and time of	Chapter-2 (sec-2.7.3) Chapter-1 (sec- 1.3)



	completion.	completion will be approx. 24-36 months after obtaining the required permissions and NOC's.	
1.16	A tabular chart with index for point wise compliance of above TORs.	A tabular chart with index for point-wise compliance of TORs has been prepared.	-
1.17	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.	No litigation/court cases filed/pending w.r.t. the project or related activities as on date. However, an appeal to Supreme Court arises from an order dated 25 January 2024 of the Eastern Zone Bench of the National Green Tribunal which was taken up by Supreme Court on 22 April 2024. The final judgement by Supreme Court was passed vide SC order dated 06.05.2024. Pending applications, if any, stand disposed thereof. The details of the litigation have been covered under Chapter-1.	Chapter-1 (sec- 1.6)
1.18	Cost of project and time of completion.	Cost of project is projected to be 1400 cr. and time of completion will be approx. 24-36 months after obtaining the required permissions and NOC's.	Chapter-2 (sec- 2.7.6)
STANDARD CONDITIONS			
1. Project Details			
1.1	Importance and benefits of the project.	Importance and benefits of the project has been covered in Chapter-1.	Chapter-1 (Sec-1.3.4)
1.2	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.	Three sites were identified by State Government of Assam namely Doloo T.E., Khoreel T.E. and Silcoorie T.E. Accordingly, a team of officials from AAI along with the officials from State Government of Assam carried out study of the sites. Analysis of alternative sites covering all the factors with reasons have been covered in Chapter-5 (Analysis of Alternatives)	Chapter-5 (Sec-5.2)
1.3	Examine and submit details of levels, quantity required for filling, source of filling material	The excavated material will be used for filling purpose for leveling the site; hence there will not be transportation of	Chapter-7 (sec-7.4 & 7.5)



	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.	the excavated materials. The details of a comprehensive Risk Assessment and Disaster Management Plan including emergency evacuation during natural and man-made disaster have been covered in Chapter-7 under head 7.4 & 7.5 respectively.	
1.4	Details of man-power requirement (regular and contract).	During Construction: 10 (permanent) + 350 (temporary) During Operation: 40 (permanent)	
1.5	The cost of the Project (capital cost and recurring cost) as well as the cost towards implementation of EMP should be clearly spelt out.	Cost of project is projected to be 1400 cr. Capital cost and recurring cost has been covered in chapter-2. Cost towards implementation of EMP has been covered in Chapter-10.	Chapter-1 (sec- 2.7.6) Chapter-10 (sec- 10.5)
1.6	Submit Layout plans of proposed project indicating runway, terminal building, parking, greenbelt area, utilities etc.	Plans showing general location, specific location, project boundary and project site layout have been given in chapter-2.	Chapter-2 (sec- 2.3)
2. Road and Traffic			
2.1	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.	A detailed traffic and transportation study should be made for existing and projected passenger and cargo traffic has been covered in Chapter-4.	Chapter-3 (sec- 4.6)
2.2	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	Traffic Study has been covered in Chapter-4.	Chapter-4 (sec-4.6)

	and Transport Departments shall also include the consent of all the concerned implementing agencies.		
3. Land Environment			
3.1	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.	Details of the land use break-up for the proposed project and the details of land use around 10 km radius of the project site delineating 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 has been covered under head 3.8 in chapter-3.	Chapter-3 (sec-3.8)
3.2	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.	A total land area of 997.4 acres has been earmarked for the development of the Doloo greenfield Airport. 826.60 acres of land has been acquired by the state government. Additional 170.8 acres of land acquisition is in process by State Government.	Chapter - 1 (sec-1.2)
3.3	The details of excavations, its impacts and the impact of transport of excavated material. A detailed management plan shall be included in compliance with C&D Waste Management Rule, 2016.	The excavated material will be used for filling purpose for leveling the site; hence there won't be transportation of the excavated materials. A detailed management plan has been briefed under the head of environmental management plan in Chapter-10.	Chapter-10 (sec-10.3)
4. Drainage			
4.1	Submit a copy of the contour plan with slopes, drainage pattern of the site and surrounding area, any obstruction of the same by the	A copy of the contour plan with slopes, drainage pattern of the site and surrounding area, any obstruction of the same by the airport has been attached as Annexure-4 .	Annexure-4.



	airport.		
5. Water Environment			
5.1	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. Submit CRZ map in case the proposed site falls in CRZ region.	The baseline analysis results of the water bodies within the corridor of impacts have been given in Chapter- 3 and the likely impacts on them due to the project and its mitigation measures has been given in Chapter-4. However, the project site doesn't falls under the CRZ region.	Chapter- 3 (sec-3.9) Chapter-4 (sec-4.7.2)
6. Land acquisition and R&R			
6.1	Submit the present land use and permission required for any conversion such as forest, agriculture etc.	A total land area of 997.4 acres has been earmarked for the development of the Doloo greenfield Airport. 826.60 acres of land has been acquired by the state government. Additional 170.8 acres of land acquisition is in process by State Government.	-
6.2	Submit details regarding R&R involved in the project.	R&R details has been incorporated in Chapter-3.	Chapter- 3 (sec-3.12.10)
6.3	Submit details of environmentally sensitive places, land acquisition status, rehabilitation of communities/ villages and present status of such activities.	An Environment Sensitive Places Map has been given in Chapter-3. A total land area of 997.4 acres has been earmarked for the development of the Doloo greenfield Airport. 826.60 acres of land has been acquired by the state government. Additional 170.8 acres of land acquisition is in process by State Government. R&R details has been incorporated in Chapter-3.	Chapter- 3 (sec-3.2 & sec-3.12.10)
6.4	Examine baseline environmental quality along with projected incremental load due to the proposed project/activities.	Anticipated environmental impact along with projected incremental load due to the proposed project and the mitigation measures has been covered in Chapter-4.	Chapter-4 (sec-4.4)
6. Water Management			
7.1	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 details of water requirement, use of treated waste water with a water balance char, source of water vis-à-vis waste water to be generated along with treatment facilities proposed has been covered in Chapter-2.	Chapter- 2 (sec-2.7.2 & 2.8.1)

7.2	Rain water harvesting proposals should be made with due safeguards for ground water quality. Maximize recycling of water and utilization of rain water.	Rain water harvesting proposed will be made with due safeguards for ground water quality. Maximum recycling of water and utilization of rain water will be done. The details of rainwater harvesting have been covered in Chapter-4.	Chapter-4 (sec-4.8)
7. Waste Management			
8.1	Examine details of Solid waste generation (including de-plane waste and hazardous waste) treatment and its disposal.	The details of Solid waste generation (including de-plane waste and hazardous waste) treatment and its disposal have been covered under chapter 2.	Chapter-2 (sec-2.8.2)
8.2	The impacts of demolition and the activities related thereto shall be examined and a management plan shall be prepared to conform to the C&D Waste Management Rules.	The impacts of demolition and the activities related thereto have been examined and a management plan has been prepared to conform to the C&D Waste Management Rules have been covered in Chapter-4.	Chapter- 4 (sec-4.4.6)
8. Energy Management			
9.1	Requirement of power, with source of supply, status of approval.	The total power requirement of the Civil Airport is 3000 kVA or 2400 kW which will be sourced from State Electricity Board.	Chapter- 2 (sec-2.7.3)
9.2	Details shall be provided regarding the solar generation proposed and the extent of substitution, along with compliance to the ECBC rules.	Solar power has been proposed to be installed at the roof top of capacity 500 kWp i.e., ~20% of total power requirement.	Chapter- 2 (sec-2.7.3)
9.3	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	A note on appropriate process and materials to be used to encourage reduction in carbon foot print as recommended but not limited to the Energy Conservation Building Code (ECBC) 2017 of the Bureau of Energy Efficiency, Government of India has been covered in Chapter-4.	Chapter- 4 (sec-4.9)

	air circulation devices.		
9. Environmental Monitoring and Management			
10.1	Examine separately the details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters.	The details for construction and operation phases both for Environmental Management Plan and Environmental Monitoring Plan with cost and parameters have been covered in Chapter-10.	Chapter- 10 (sec-10.3 & 10.5)
10.2	Examine baseline environmental quality along with projected incremental load due to the proposed project/activities.	Baseline environmental quality has been covered in Chapter-3 and anticipated environmental impact along with projected incremental load due to the proposed project and the mitigation measures has been covered in Chapter-4.	Chapter-3 & 4
10.3	The air quality monitoring should be carried out as per the notification issued on 16th November, 2009.	The air quality monitoring has been carried out as per the notification issued on 16th November, 2009. The methods adopted for ambient air quality monitoring has been given in Chapter-3.	Chapter- 3 (sec-3.4)
10.4	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.	The draft EIA/EMP report has been prepared in accordance with the above additional TOR and has been submitted to the Ministry in accordance with the Notification.	-
10.5	Air quality modelling and noise modelling shall be carried out for the emissions from the various types of aircrafts.	Air quality modelling has been covered in Chapter-4.	Chapter- 4 (sec-4.5)
10.6	Possible carbon footprint contribution from each activities and mitigation measures proposed shall be included as part of Environment Management Plan.	The impacts and mitigation measures proposed has been included as part of Environment Management Plan and covered in Chapter-4. The possible carbon footprint contribution and its appropriate process to be adopted to encourage reduction have been covered chapter-4.	Chapter- 4 (sec-4.7) Chapter- 4 (sec-4.9)
10. Disaster Management Plan			
11.1	Submit details of a comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster.	A comprehensive Disaster Management Plan including emergency evacuation during natural and man-made disaster has been covered in Chapter-7.	Chapter- 7 (sec-7.5)

11. Socio-Economic Environment			
12.1	Examine the impact of proposed project on the nearest settlements.	The positive as well as negative impact of proposed project on the nearest settlements has been covered in Chapter-3.	Chapter-3(sec-3.12) Chapter-4 (sec-4.7.8)
12.2	Submit details of corporate social responsibilities (CSR).	The details of corporate social responsibilities (CSR) have been covered in Chapter-8.	Chapter-8(sec-8.4)
12.3	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.	Noted.	-
12. Forest			
13.1	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.	This is under process with the state government and the details will be submitted with final EIA/EMP report.	-
13.2	Submit status of permission to be obtained from concerned local authorities for the proposed tree cutting/ pruning/ transplantation.	This is under process with the state government and the details will be submitted with final EIA/EMP report.	-

13.3	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.	Layout plan is incorporated in Chapter-2.	Chapter-2 (sec-2.3)
13. Court Cases			
14.1	Details of litigation pending against the project, if any, with direction/order passed by any Court of Law against the Project should be given.	No litigation/court cases are pending w.r.t. the project or related activities as on date. However, an appeal arises from an order dated 25 January 2024 of the Eastern Zone Bench of the National Green Tribunal. A brief detail of the appeal has been given in Chapter-1.	Chapter-1 (sec-1.6)

EXECUTIVE SUMMARY

1.1 INTRODUCTION

The EIA report has been prepared as per TOR (Terms of Reference) grant in addition to “Generic Structure of EIA/EMP/RA Report” required by the Ministry of Environment & Forest, Government of India as per the general condition stipulated in the EIA notification dated 14.09.2006.

1.2 PROJECT DESCRIPTION

Airports Authority of India has proposed to develop a new Greenfield Airport at Doloo, Silchar. The current airport at Silchar belongs to IAF and AAI operates a civil enclave from 70.66 acres of land. Operators like Indigo, Air India & Spicejet are presently operating 80 flight movements in a week. It is suitable for the operation of A-320 type of aircraft. The Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave.

Table 1: Project Details

1 Nature and size of the Project			
Name of the project	Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India		
Category of the Project	As per EIA Notification dated 14th Sept., 2006 as amended from time to time; the project falls in Category A, Activity 7(a).		
2 Location Details			
Village /Town/Plot No.	Village-Doloo		
Tehsil	Silchar Sadar		
District	Cachar		
State	Assam		
Latitude and Longitude	Points	Latitude	Longitude
	Core	24°55'56.85"N	92°48'52.40"E
Toposheet No.	G46016, G46012, G46U13 & G46U9		
3 Area Details			
Total Project Area	997.4 Acres		
4 Environmental Setting Details (with approximate aerial distance & direction from plant site)			
Nearest Settlement	Mulidahar Grant village adjacent towards SW		

		direction.
	Nearest Highway	NH-27 parallelly adjacent towards South direction. SH-38 at 8.3 km distance towards SW direction.
	Nearest Railway station	Moinarband Railway Station 8.3 km in South direction.
	Nearest Airport	Silchar Airport at 14 kms towards East direction.
	National Parks, Wildlife Sanctuaries, Biosphere Reserves, Tiger/ Elephant Reserves, Wildlife Corridors etc. within 10 km radius	Barail Wildlife Sanctuary at 3.3 Kms towards North direction.
	Nearby Water Bodies	Dalu River adjacent towards East direction.
	Defence Installations	None within 10 km radius from Centre of plot
	Seismic Zone	Zone V
5	Cost Details	
	Total Cost of the Project	1400.0 Crores
	Budget for EMP (construction+ Operation)	Capital Cost of Rs. 30 Cr.
6	Basic Requirements for the project	
	Fresh Water (m ³ /day)	203 KLD (Source: Ground Water)
	Manpower	During Construction: 10 (permanent) + 350 (temporary) During Operation: 40 (permanent)
	Electricity Requirement	3000 kVA or 2400 kW Source: State Electricity Board
	Power Backup	DG Sets - 4 x 1,250 kVA (3W+1S) Solar Power - 500 kWP (20.83%)
	Working Days	365 days

Project Proponent:

Table 2: Project Proponent Details

Name	Mr. M.C. Singh
Designation	APD, Silchar Airport
Registered Address	Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi 110003
Project Address	Doloo, Silchar, Cachar district, Assam
Mobile No.	9435700587
Mail Id	apdsilchar@aai.aero

Process Description and Technology:

AAI has to develop New Greenfield Airport for Code-4C at Doloo, Silchar, Assam. Total land of 997.4 acre has been earmarked for the development of Proposed Airport.

Existing Facilities

Existing Airport is located at Kumbhirgram, about 22 km from Silchar. The current airport at Silchar belongs to IAF and AAI operates a civil enclave from 70.66 acres of land. Operators like Indigo, Air India & Spicejet are presently operating 80 flight movements in a week. It is suitable for the operation of A-320 type of aircraft.

Proposed Facilities

The Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave. Airport Authority of India has proposed to develop a new Greenfield Airport at Doloo, Silchar as the existing Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave.

The proposed site for development of the Greenfield airport for Code-4C is located at 28 km away from the Current Civil Enclave. A total land area of 997.4 acres has been earmarked for the development of the proposed Airport.

1.3 DESCRIPTION OF THE ENVIRONMENT**Table 3: Summary of Baseline Monitoring Study**

S. No	Parameters	Baseline Status
1.	Ambient Air Quality	
i.	PM10	27.0 ug/m ³ to 47.0 ug/m ³
ii.	PM2.5	11.0 ug/m ³ to 25.8 ug/m ³
iii.	SO ₂	4.2 ug/m ³ to 15.2 ug/m ³
iv.	NO ₂	9.4 ug/m ³ to 23.06 ug/m ³
v.	CO	0.42 mg/m ³ and 0.93 mg/m ³
Values are well within the stipulated standard of CPCB.		
2.	Noise Level Monitoring	
i.	Day Time (6:00 a.m. to 10:00 p.m.)	47.24 Leq dB to 53.75 Leq dB
ii.	Night Time (10:00 p.m. to 6:00 a.m.)	38.12 Leq dB to 42.8 Leq dB
The observed noise levels were found slightly higher than the stipulated standards of CPCB.		
3.	Soil Quality and Characteristics	
i.	pH	7.15 to 7.59
ii.	Organic Matter	0.58% to 0.94%

iii.	Nitrogen	162.79 Kg/ha. to 195.15 Kg/ha.
iv.	Phosphorus	17.12 Kg/ha. to 29.15 Kg/ha.
v.	Potassium	140.00 Kg/ha. to 163.15 Kg/ha.
4.	Ground Water	
i.	pH	7.51 to 7.88
ii.	Total Hardness	148 mg/l to 157 mg/l
iii.	Total Dissolved Solids	213 mg/l to 222 mg/l.
5.	Surface Water	
i.	pH	7.44 to 7.78
ii	Total Hardness	216.0 mg/l to 288.0 mg/l
iii	Total Dissolved Solids	397 mg/l to 679 mg/l
iv	BOD	20 to 38(mg/l)
v	COD	62 to 82 (mg/l)

The concentrations were found to be within permissible limits (Compared with IS 10500:2012)

1.4 ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

Table 4: Environmental Impact and Mitigation Measures

S.No.	Particulars	Mitigation measures to be adopted
1	Air Environment	<ul style="list-style-type: none"> • ICAO emission standards will be maintained at the airport • Efforts will be done to reduce the use of fuel to save money and reduce emission • Single engine taxiing will be adopted at the airport • Engine will be shut down during idling • Airport will be designed to reduce the taxiing length of aircraft • Proper signage will be displayed at the airside for movement of vehicles and aircraft • Low Sulphur Diesel will be used in DG set • Regular Vehicle pollution check will be done for vehicle used in airside • Proper traffic management plan will be prepared to ensure no traffic congestion at internal road and NH-27. • Stack height to the DG set as per CPCB guideline will be provided • Wide access pathways and sufficient nos. of exit & entry shall be provided to minimize the congestion • All measures will be adopted to reduce fugitive emission during handling and refueling of fuel.
2.	Water Environment	<ul style="list-style-type: none"> • Proper oil & grease interceptors have been installed at wastewater outlet from the fuel depots, hotels/restaurants, and

		<p>flight catering. The wastewater will be passed through oil and grease interceptors and then routed to STP. Sludge will be removed regularly and after appropriate treatment it will be used as manure.</p> <ul style="list-style-type: none"> • Proper drainage will be provided to mitigate the impacts which can be due to run-off of the storm water.
3.	Hazardous Waste Environment	<ul style="list-style-type: none"> • Used oil will be send to authorized recycler identified by SPCB. • Sludge from STP can be used in-house in green belt plantation. • Discarded Containers/ Empty Barrels will be sent to vendors/ SPCB approved scrap dealer.
4.	Noise Environment	<ul style="list-style-type: none"> • Personal protective equipment-like ear plugs and ear muffs will be provided to employees working in the noise prone areas. • Time to time oiling and servicing and Maintenance of machineries will be done. • Acoustic enclosure for heavy machines/ equipment/ DG sets would be used. • The Noise free machines of latest technology will be installed • A high standard of maintenance and proper lubricants will be practiced for plant machinery and equipment, which helps to avert potential noise problems.
5.	Occupational Health & Safety	<ul style="list-style-type: none"> • All safety signs will be placed at proper location. • First aid kits will be made available at every department. • Pre-employment medical check-up and periodical medical check-up shall be undertaken to know the occupational health hazards at the early stage. • Work permit system has been introduced to avoid the entry or unauthorized working to avoid the incidences which can lead to the accident if proper care is not taken. • A well-developed fire fighting system is already Implemented at the airport premises. • Apart from all engineering control measures, if required necessary PPEs shall be provided as last protection measures to the employees. • Good housekeeping also plays important role in avoiding the undesirable incidences / accidents, hence good housekeeping practices will be employed throughout the Airport premises

1.5 ANALYSIS OF ALTERNATIVES

A team of officials from AAI consisting of Shri Varun Lau, JGM(Arch), Shri Manjit Singh DGM (ATM)-(PLG), Shri Soumen Poddar, AGM(ATM), Shri Sunil Kumar SM(Ops), RHQ NER and Shri Rajpal Lavasia Manager Engg. (Civil)CHQ-NER along with the officials from State



Government of Assam carried out study at sites identified by State Government namely Doloo T.E., Khoreel T.E. and Silcoorie T.E. from 20.01.2020 to 22.01.2020. As per site analysis based on parameters like connectivity, physical features, and planning aspects, Doloo T.E. site can be considered for development of Greenfield Airport at Silchar compared to Khoreel T.E. and Silcoorie T.E. site.

1.6 ENVIRONMENTAL MONITORING PROGRAM

Monitoring of environmental samples will be done as per the guidelines provided by MoEF&CC/ CPCB. The method followed will be recommended / standard method approved / recommended by MoEF&CC /CPCB/SPCB.

Table 5: Environmental Monitoring Program

S. No.	Environmental Components	Monitoring Points/Locations
1.	Ambient Air	8 locations (upwind, downwind & crosswind directions) within 10 km radius around the project site.
2.	Water	Ground water samples were collected from 6 different locations and Surface Water quality from 7 locations (including upstream & Downstream) within the study area.
3.	Noise	8 locations within 10 km radius around the project site.
4.	Greenbelt/Vegetation Cover	Greenbelt area around the project boundary & lawn area.
5.	Soil	6 locations within 10 km radius around the project site.

1.7 ADDITIONAL STUDIES

This report is prepared based on the one non-monsoon season (three months) baseline monitoring data during 1st October to 31st December 2023, Post-monsoon season, by field study. Data from the secondary sources are used for comparison between present environmental conditions and our laboratory results. The data includes meteorological conditions, ambient air quality, noise, water quality and soil quality. Site survey has been conducted for studying the flora and fauna, socio- economic conditions land use etc. Additional information is also collected from several agencies and departments, both under State and Central Governments pertaining to above. The collected data have been analysed in detail for identifying, predicting, and evaluating the environmental impacts of the proposed project. The anticipated impacts on environment are assessed and suitable environmental management plan has been suggested.

1.8 PROJECT BENEFITS

Direct and indirect employment opportunities will be generated which will result in the growth and development of the surrounding areas.

Special emphasis on financial and social benefits will be given to the local people including the tribal population, if any, in the area. Development of social amenities will be in the form of medical facilities, education, and the creation of self-help groups.

1.9 ENVIRONMENT MANAGEMENT PLAN

M/s Airports Authority of India has committed to implement all the pollution control measures to protect the surrounding environment. The project can improve the regional, state, and national economy. Industrial growth is an indication of socio-economic development. The implementation of this project will improve the physical and social infrastructure of the surrounding area.

The total capital investment on environmental control measures is envisaged to be about 30.0 crores (approx. 4.3 crores during construction phase & Rs 25.7 Crores during operation phase) which is about 2% out of a total proposed project cost i.e., **Rs 1400.0 Crores**. Details are given in table below:

Table 6: EMP Cost Details

S. No.	Environment Component	Basis of Cost Estimation	Capital Cost (In Cr.)	Recurring Cost (In Cr.)
Construction Phase				
1	Air	Tarpaulin sheets & covers	0.02	0.005
		Site barricading	1.5	0
		Anti-smog gun (rent)	0.5	0.01
2	Water	Treated water	1.0	0.02
		Tanker water	0.5	0.01
		Bio-toilet (30-35 nos.)	0.02	0.005
		Temporary garland drains and sedimentation basin	0.1	0.005
3	Noise	Acoustic Enclosures	0.15	0.01
4	Occupational Health & Safety	Industrial PPE Kits	0.2	0.01
		Safety board/flex	0.01	0.001
5	Solid Waste Management	Dustbins (for domestic & recyclable wastes)	0.01	0.002
		Sealed containers (for hazardous waste)	0.01	0.002
		Solid waste management & disposal (including C&D wastes)	0.15	0.05
6	Environment Monitoring	Quarterly monitoring of Air, Water, Noise, Soil	0	0.07
7	Escalation Cost	Miscellaneous	0.13	0.02
SUB-TOTAL			4.3	0.22

Operation Phase				
1	Air	CAAQMS	0.4	0.005
		Industrial Vacuum cleaner	0.1	0.005
		Internal road sweeping machine	0.1	0.005
		Water sprinkling system	0.1	0.005
2	Water	Water saving fixtures & devices	0.5	0.05
		RWH tank	3.0	0.01
		STP (400 KLD)	0.2	0.01
3	Noise	Acoustic Enclosures	1.0	0.01
		Sound proof doors & windows (medium to high performance)	1.0	0.01
		Lubricating materials	0	0.0025
4	Occupational Health & Safety	PPE Kits	0.1	0.005
		First Aid kit	0.05	0.005
		Fire hydrant system	1.0	0.1
		Fire extinguishers	0.05	0.01
		Safety board/signs, windsocks & others	0.02	0.005
		Health Check up	0.2	0.05
5	Solid Waste Management	Dustbins (for domestic wastes)	0.01	0.005
		Sealed containers (for hazardous waste)	0.01	0.005
		Solid waste management & disposal	0.5	0.02
6	Solar power	Solar Pannels	1.0	0.02
7	Landscape	Lawn development	0.1	0.01
8	Environment Monitoring	Quarterly monitoring of Air, Water, Noise, Soil	0.01	0.1
9	EMC	Environment Management Cell	0.5	0.05
10	CER	Corporate Environment Responsibility/ Addressing Public Hearing Issues	15.0	0
11	Escalation Cost	Miscellaneous	0.75	0.02
SUB-TOTAL			25.7	0.5175
GRAND TOTAL			30.0	0.7375

CHAPTER 1: INTRODUCTION

1.1 PURPOSE OF THE PROJECT

Development of New Greenfield Airport has been planned to be proposed at Silchar, city, southern Assam state, North-eastern India. It is situated on the Surma (Barak) River near the Bangladesh border. The name originated from two words: Shil (“rocks”) and Char (“fields”).

The area of Silchar metro is 257.5 Sq.km. It has an average elevation of 25M. It has a tropical monsoon climate. Silchar is home to the main campus of Assam University and NIT. Present day Silchar is a trade and processing center for tea, rice, and other agricultural products. There is limited industry, principally papermaking and tea-box manufacturing. ONGC has its base located at Srikona, near Silchar.

Existing Airport is located at Kumbhirgram, about 22 km from Silchar. In December 1985, Air India operated the first all-woman crew flight in the world from Kolkata to Silchar which was commanded by Captain Saudamini Deshmukh on a Fokker Friendship F-27 aircraft.

The current airport at Silchar belongs to IAF and AAI operates a civil enclave from 70.66 acres of land. Operators like Indigo, Air India & Spicejet are presently operating 80 flight movements in a week. It is suitable for the operation of A-320 type of aircraft.

The Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave. On receiving a request from State Govt. of Assam, a multi-disciplinary team had conducted a prefeasibility study of Doloo site, 28 kms away from current Civil Enclave and was found feasible for Construction of Greenfield Airport for Code-4C. Now the State Govt. has acquired land for the development of this green-field Airport and is in the process of handing over the land to AAI. The profile of land indicated by the State Govt. did not match the one suggested by AAI in the Master Plan Proposal. To develop the Airport for A-321 type Aircraft around 171 acres of additional land was essentially required. This critical issue was highlighted by HMCA vide letter dated 16/06/2022 to Chief Minister of Assam. In the letter, he also informed that AAI in collaboration with state Government will undertake this project.

The State Govt. vide letter dated 4th August, 2022 has assured that the required additional land will be subsequently arranged for and other necessary action may be taken up for development of Greenfield Airport at Silchar.

Hence, the following scope of work is prepared for obtaining in-principal approval from the Competent Authority for the preparation of estimates to obtain AA & ES to take up the development works through PMC.

1.2 IDENTIFICATION OF THE PROJECT AND PROJECT PROPONENT

1.2.1 Project Details

The State Govt. of Assam envisaged development of New Greenfield Airport in Silchar region of Assam as the terminal building at the existing airport at Kumbhirgram, about 22 km from Silchar city, is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave.

On receiving a request from State Govt. of Assam, a multi-disciplinary team had conducted a prefeasibility study of Doloo site, 28 kms away from current Civil Enclave and was found feasible for Construction of Greenfield Airport for Code-4C. Now the State Govt. has acquired land for the development of this Greenfield Airport and is in the process of handing over the land to AAI. The profile of land indicated by the State Govt. did not match the one suggested by AAI in the Master Plan Proposal. To develop the Airport for A-321 type Aircraft around 171 acres of additional land was essentially required. This critical issue was highlighted by HMCA vide letter dated 16/06/2022 to Chief Minister of Assam. In the letter, he also informed that AAI in collaboration with state Government will undertake this project.

A total land area of 997.4 acres has been earmarked for the development of the Doloo greenfield Airport. 826.60 acres of land has been acquired by the state government. Additional 170.8 acres of land acquisition is in process by State Government.

The proposed project falls under Category-A of Schedule 7(a) vide EIA Notification 2006 as amended till date involving preparation of Environment Impact Assessment study and Environmental Management Plan. However general condition is not applicable to this project. This project is independent and is not linked with other projects which may attracts directly or indirectly any provisions of schedule of EIA Notification 2006 amended to date.

Screening Category:

As per EIA Notification dated 14th Sept., 2006 and amended from time to time, the proposed project falls under **Activity 7(a)** under “All New projects of Airports including airstrips, which are for commercial use”. As the project is development of new airport hence, the project shall be treated as **Category “A”** and will be appraised at EAC, MoEF&CC.

1.2.2 Identification of Project Proponent

Table 1-1: Project Proponent Details

Name	Mr. M.C. Singh
Designation	APD, Silchar Airport
Registered Address	Rajiv Gandhi Bhawan, Safdarjung Airport, New Delhi 110003
Project Address	Doloo, Silchar, Cachar district, Assam
Mobile No.	9435700587
Mail Id	apdsilchar@aai.aero

1.3 BRIEF DESCRIPTION OF THE PROJECT

1.3.1 Nature, Size, Location of The Project

The proposed project site (Greenfield Airport) is located at Doloo, Silchar, Cachar district, Assam. The proposed site is 28 kms away from existing civil enclave which is at Kumbhirgram, about 22 km from Silchar city.

A total land area of 997.4 acres has been earmarked for the development of the Doloo greenfield Airport. 826.60 acres of land has been acquired by the state government. Additional 170.8 acres of land acquisition is in process by State Government.

The proposed project falls under Category-A of Schedule 7(a) vide EIA Notification 2006 as amended till date involving preparation of Environment Impact Assessment study and Environmental Management Plan. This project is independent and is not linked with other projects which may attracts directly or indirectly any provisions of schedule of EIA Notification 2006 amended to date

The Brief description about the nature, size and location of the project is given in **Table 1.2.**

Table 1-2: Project Detail and Environment Setting

1	Nature and size of the Project	
	Name of the project	Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India
	Category of the Project	As per EIA Notification dated 14th Sept., 2006 as amended from time to time; the project falls in Category A, Activity 7(a).
2	Location Details	
	Village /Town/Plot No.	Village-Doloo
	Tehsil	Silchar Sadar
	District	Cachar

	State	Assam		
	Latitude and Longitude	Points	Latitude	Longitude
		Core	24°55'56.85"N	92°48'52.40"E
	Toposheet No.	G46016, G46012, G46U13 & G46U9		
3	Area Details			
	Total Project Area	997.4 Acres		
4	Environmental Setting Details (with approximate aerial distance & direction from plant site)			
	Nearest Settlement	Mulidahar Grant village adjacent towards SW direction.		
	Nearest Highway	NH-27 parallelly adjacent towards South direction. SH-38 at 8.3 km distance towards SW direction.		
	Nearest Railway station	Moinarband Railway Station 8.3 km in South direction.		
	Nearest Airport	Silchar Airport at 14 kms towards East direction.		
	National Parks, Wildlife Sanctuaries, Biosphere Reserves, Tiger/ Elephant Reserves, Wildlife Corridors etc. within 10 km radius	Barail Wildlife Sanctuary at 3.3 Kms towards North direction.		
	Nearby Water Bodies	Dalu River & Dalu Lake adjacent towards East direction.		
	Defence Installations	None within 10 km radius from Centre of plot		
	Seismic Zone	Zone V		
5	Cost Details			
	Total Cost of the Project	1400.0 Crores		
	Budget for EMP (construction+ Operation)	Capital Cost of Rs. 30 Cr.		
6	Basic Requirements for the project			
	Fresh Water (m ³ /day)	203 KLD (Source: Ground Water)		
	Manpower	During Construction: 10 (permanent) + 350 (temporary) During Operation: 40 (permanent)		
	Electricity Requirement	3000 kVA or 2400 kW Source: State Electricity Board		
	Power Backup	DG Sets - 4 x 1,250 kVA (3W+1S) Solar Power - 500 kWP (20.83%)		
	Working Days	365 days		

All corner-coordinates of plant area are superimposed on Toposheet (OSM No.) of Survey of India and same has been furnished here in the **Figure 1.1**.

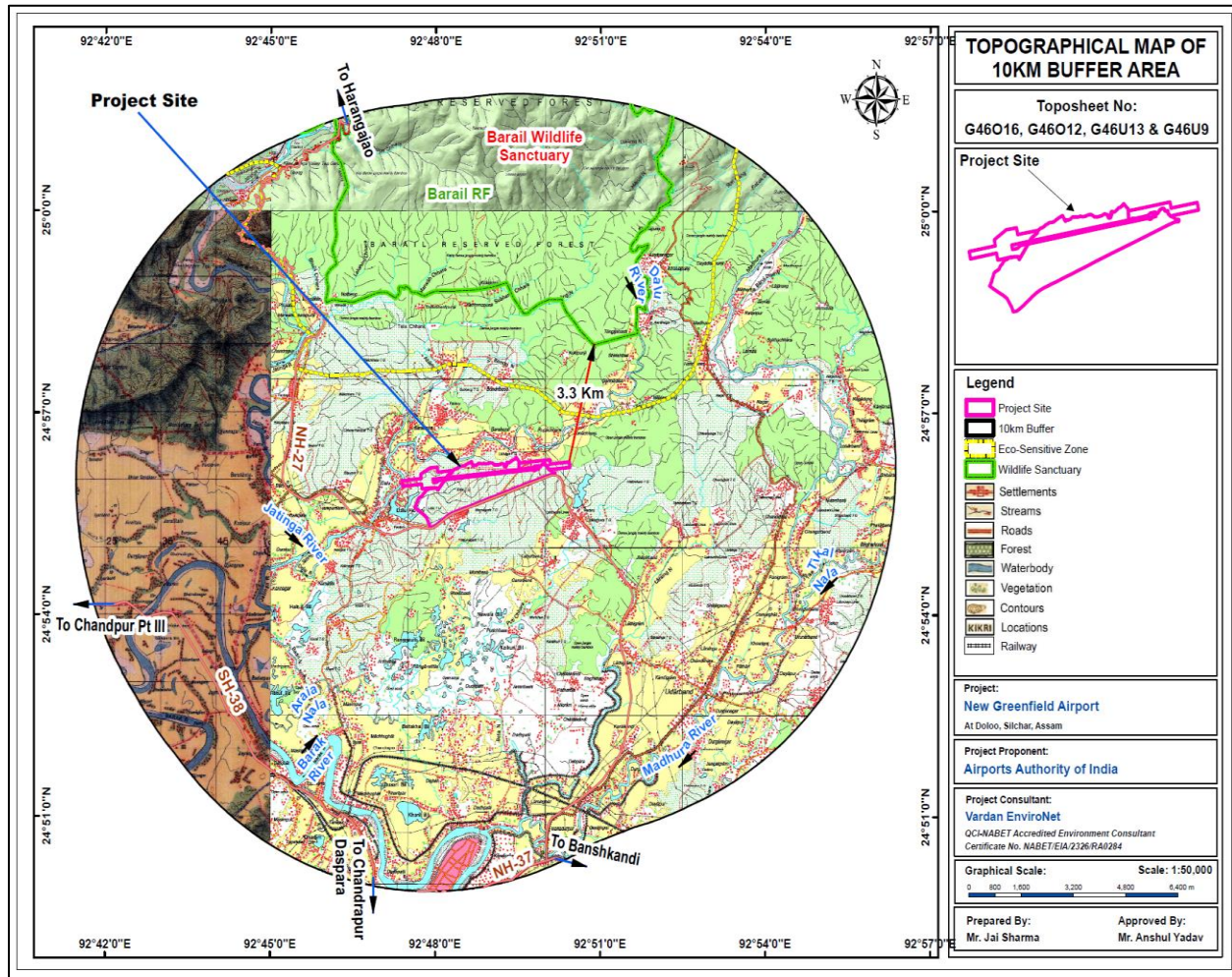


Figure 1-1: Study Area Map – 10 Km Radius around the Project Site

1.3.2 Importance to the Country and Region

It is increasingly recognized that aviation, far from being a mere mode of transportation for an elite group, is crucial for sustainable development of trade and tourism. In this context, it is vital that airport infrastructure grows in anticipation of the escalating needs of the air transport industry. As this is a capital-intensive sector, there is an obvious need for perspective planning with a vision for the next twenty years and to muster the combined resources of the public and private sectors, both domestic and foreign.

As per an ICAO (International Civil Aviation Organization) study - "Economic benefits of civil aviation: ripples of prosperity", the output and employment multipliers of aviation are 3.25 and 6.10 respectively. This implies that every 100 Rupees spent on air transport contributes to 325 Rupees worth of benefits, and every 100 direct jobs in air transport result in 610 jobs in the economy. In fact, the study attributes over 4.5% of the global Gross Domestic Product (GDP) to civil air transport.

The establishment of new airport is required as the existing terminal building at the current Silchar airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave and to cater the increasing traffic. New airport has been proposed which will significantly enhance the capacity of the Airport in handling traffic, which will further boost tourism, economy and generate employment opportunities. The decision comes in the wake of the policy of the government to promote the Indian Aviation sector in a significant manner, so as to ensure a multiplier effect on the economy. The Government aims to provide an ecosystem for harmonized growth of various aviation subsectors.

1.3.3 National Civil Aviation Policy 2016 (NCAP 2016)

Vision: To create an eco-system to make flying affordable for the masses and to enable 30 crore domestic ticketing by 2022 and 50 crores by 2027, and international ticketing to increase to 20 crores by 2027. Similarly, cargo volumes should increase to 10 million tons by 2027.

Mission: Provide safe, secure, affordable, and sustainable air travel for passengers and air transportation of cargo with access to various parts of India and the world.

Objectives:

- Establish an integrated eco-system which will lead to significant growth of civil aviation sector, which in turn would promote tourism, increase employment and lead to a balanced regional growth.
- Ensure safety, security, and sustainability of aviation sector using technology and effective monitoring.

- Enhance regional connectivity through fiscal support and infrastructure development.
- Enhance ease of doing business through deregulation, simplified procedures, and e-governance.
- Promote the entire aviation sector chain in a harmonized manner covering cargo, MRO, general aviation, aerospace manufacturing and skill development.

As the Indian economy grows, consumption-led growth in populated metros is expected to spill over to hinterland areas. This is also expected to be on account of factors of production (land, labor, etc.) becoming costlier in the densely populated metro cities. In this scenario, air connectivity can provide required impetus to the economic growth of regional centers (towns/cities). One of the key objectives of NCAP 2016 is to “establish an integrated eco-system which will lead to significant growth of civil aviation sector, which in turn would promote tourism, increase employment and lead to a balanced regional growth”.

NCAP 2016 also seeks to sustain and nurture a competitive market environment in the civil aviation sector. While it would be best for growth in the sector and establishment of regional air connectivity to materialize through open market mechanisms in terms of airlines assessing demand on various routes, developing networks through deployment of appropriate capacities & technologies, infrastructure developing in sync with demand, etc. it was felt that facilitating/stimulating regional air connectivity would be desirable from a public policy perspective and may need financial support, at least in the initial period, to trigger participation of players. It is in this context that NCAP 2016 provides for a Regional Air Connectivity Scheme (RCS or the Scheme).

1.3.4 Benefits of Proposed Project

The proposed project will have the following benefits:

- Airport is a key to the development and revenue generation both directly or indirectly. It expects boost of industrialization, multi-modal-connectivity, and infrastructure development in the hinterland.
- The development of the proposed airport will induce economic and social benefits to the people in the project influence zone. Economic development will be not only in the direct influence area, but also for the surroundings and would generate employment opportunities.
- The employment opportunities will grow steadily resulting in more demand of educated, skilled and un-skilled people thereby increasing the standard of education and living in the city.
- The commercial development such as retail outlets, food-courts, multiplexes, and market

zone shall lift the socio-economic status of the area.

- The aviation industry itself is a source of considerable economic activity, creating jobs that directly serve passengers at airlines, airports, and air navigation services providers. These include check-in, baggage handling, onsite retail, cargo, and catering facilities. These could be a push for people in the project influence area to scale up their primary education enrolment for women and children, to cater to the requirement of new works and employment opportunities that will be created by the airport as well as its allied services like the hotel industry, transport, tourism, etc.

1.4 SCOPE OF THE STUDY & METHODOLOGY FOR ENVIRONMENTAL IMPACT ASSESSMENT

The Ministry of Environment, Forests & Climate Change, Govt. of India, through EIA Notification No. S.O.1533 (E) dated 14th September 2006 and subsequent amendments under the Environment Protection Act 1986 have placed Airports Projects at Sl. No. 7(a) in the list of projects requiring prior environmental clearance. Further, as it's a Greenfield project, it falls under category 'A' of the schedule and shall require prior environmental clearance from the MoEF&CC, New Delhi.

The Environmental Clearance process for the project will comprise of three stages. These stages in sequential order are given below: -

1. Scoping
2. Public Hearing
3. Appraisal

This report is prepared based on the one non monsoon season (three months) baseline monitoring data during 1st October to 31st December 2022, Post-monsoon season, by field study. Data from the secondary sources are used for comparison between present environmental conditions and our laboratory results. The data includes meteorological conditions, ambient air quality, noise, water quality and soil quality. Site survey has been conducted for studying the flora and fauna, socio- economic conditions land use etc. Additional information is also collected from several agencies and departments, both under State and Central Governments pertaining to above. The collected data have been analysed in detail for identifying, predicting, and evaluating the environmental impacts of the proposed project. The anticipated impacts on environment are assessed and suitable environmental management plan has been suggested.

➤ **STRUCTURE OF EIA REPORT**

Chapter 1 – Introduction

The chapter provides description of project background, site and surroundings, objectives, scope and organization of the study and format of this report.

Chapter 2 – Project Description

This chapter deals with all the details pertaining to the proposed project. These include technical details of the process; products & the raw material details along with the utilities in proposed plant.

Chapter 3 – Description of the Environment

This chapter deals with the methodology and findings of field studies undertaken with respect to ambient air, meteorology, water, soils, noise levels, ecology to define the various existing environmental status in the project area. Once the affected environmental parameters are identified, a monitoring network is set up for each environmental parameter to establish its background quality. For Air Environment, ambient air quality monitoring stations were set up at key points to establish the representative background levels of criteria for air pollutants like Suspended Particulate Matter (SPM), Respirable Dust (RD) and Carbon Monoxide (CO). The data for other environmental components such as Noise, Water, Land, Socio-economic were also collected in the study area. The detailed description on the above is covered in the relevant chapter of this report. Baseline data in terms of above environmental parameters had been collected by M/s. Vardan Envirolab, Gurugram, NABL Accredited Lab, and Certificate No. TC-6299. Population statistics of villages in the study area was collected from census data available from the National Informatics Centre. Similarly, the baseline status of flora and fauna had been collected by Field Area Expert (Ecology & Biodiversity). Land Use/ Land Cover study was also done.

Chapter 4 – Anticipated Environmental Impacts and Mitigation Measures

In this part of the report the sources of emissions (Gaseous, Liquid, Solid, Noise) due to the proposed activities are identified and their emission load and characteristics are estimated. Predictions were then carried out to know the quantitative/qualitative effect on various environmental parameters. Parts of the predictions are qualitative in nature also, especially in cases where such predictive techniques are not available. These predictions are subsequently superimposed on the background quality of various environmental components and their individual and synergistic impact is evaluated using the "Cause and Effect" relationship matrix. The resultant matrix attempts to give an objective assessment to help the Assessment Agency in the decision-making process.

Chapter 5 - Analysis of Alternatives

This chapter's deal with the consideration of alternative of sites and technologies so that best technology and least impacted site can be selected.

Chapter 6 - Environment Monitoring Programme

This chapter described with the planning for Environmental Monitoring considering all environmental component during construction and operation of the project.

Chapter 7 - Additional Studies

This chapter includes risk assessment, studies conducted, proposing Onsite and off-site emergency management plan, disaster management plan for the proposed project.

Chapter 8 - Project Benefits

This chapter deals with improvements in the physical infrastructure, social infrastructure, employment potential and other tangible benefits due to proposed project activity.

Chapter 9 - Environmental cost benefit analysis

Environmental Cost benefit analysis is included in ***the EIA/EMP Report.***

Chapter 10- Environment Management Plan

To mitigate or minimize the negative impacts of the proposed project, an effective EMP is called for. Therefore, this chapter deals with the planning and implementation of various pollution abatement strategies including the proposed monitoring/surveillance network.

Chapter 11 - Summary and Conclusion

This will constitute the summary of EIA Report.

Chapter 12 - Disclosure of Consultant

This will include the names of the consultants engaged in preparation of EIA and nature of consultancy rendered.

1.5 APPLICABILITY OF EIA NOTIFICATION, 2006/ FOREST (CONSERVATION) ACT, 1980/ WILDLIFE (PROTECTION) ACT, 1972/ CRZ NOTIFICATION, 2011

As per EIA Notification dated 14th Sept., 2006 and amended from time to time, the proposed project falls as Category "A" under Activity 7(a) under "All New projects of Airports including airstrips, which are for commercial use" and will be appraised at EAC, MoEF&CC.

1.6 STATUS OF LITIGATIONS/ COURT ORDERS: LAND & PROPONENT

No litigation/court cases filed/pending w.r.t. the project or related activities as on date. However, an appeal arises from an order dated 25 January 2024 of the Eastern Zone Bench

of the National Green Tribunal. In view of the matter, the order dated 06 May 2024 allow the appeals and set aside the impugned order of the National Green Tribunal dated 25 January 2024.

1.7 APPLICABILITY OF GENERAL CONDITIONS AS PER EIA NOTIFICATION, 2006

The proposed project falls as Category “A” under Activity 7(a) under “All New projects of Airports including airstrips, which are for commercial use” and will be appraised at EAC, MoEF&CC.

1.8 SUMMARY OF ENVIRONMENTAL LEGISLATION FOR PROPOSED PROJECT

Legislation	Responsible Ministries/ Bodies	Objective of Legislation	Action Plan
The Environment (Protection) Acts 1986/ Rules 1986. The Environmental Impact Assessment (EIA) Notification, 2006	MoEF&CC, CPCB, SPCB	Protection and Improvement of the Environment	<ol style="list-style-type: none"> 1. Prevent discharge or emission of environment pollutants more than the prescribed standards 2. Submit 'Environmental Statement' every year. 3. Obtain prior "Environmental Clearance" from MoEF&CC in case of New Project or for Modernization or Expansion.
The Water (Prevention & Control of Pollution) Acts 1974/ Rules 1975	CPCB, SPCB	The prevention, control, and abatement of air pollution	<ol style="list-style-type: none"> 1. Not to discharge any effluent, not conforming to standards, prescribed by CPCB into any stream, well, sewers or land 2. Obtain 'Consent to Establish' prior to construction 3. Obtain 'Consent to Operate' prior to operation of system which is likely to discharge effluent. 4. Apply for renewal of the 'Consent to Operate' before the expiry. 5. Comply with conditions as prescribed under consents.
The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982	CPCB, SPCB	The prevention and control of water pollution and maintaining or restoring the wholesomeness of water	<ol style="list-style-type: none"> 1. Not to discharge air pollutant(s) more than standards, prescribed by the State PCB 2. Obtain 'Consent to Establish' prior to construction. 3. Obtain 'Consent to Operate' prior to operation of system which is likely to discharge any particulate matter, and emissions. 4. Apply for renewal of the 'Consent to Operate' before the expiry. 5. Comply with conditions as prescribed under consents.
Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	MoEFCC, CPCB, SPCB	Management & Handling of hazardous wastes in line with the Basel convention	<ol style="list-style-type: none"> 1. It is the responsibility of the occupier to identify the hazardous wastes in their units and ensure proper handling and disposal. 2. Obtain authorization from PCB and comply with the conditions. 3. Maintain records of Hazardous Waste generated in Form-3 and submit yearly return for generation, treatment, recycling, disposal

			<p>etc., to SPCB</p> <ol style="list-style-type: none"> Used Oil to be send / sold to the registered recycler, re-processor, registered authorized facility Shall be transported in accordance with the rule. Site storage is allowed for 90 days only
Factories Act, 1948 (as amended till 1987)	Ministry of Labor, DGFASLI and Directorate of Industrial Safety and Health/ Factories Inspectorate	Control of workplace environment, and providing for good health and safety of workers	<ol style="list-style-type: none"> Obtain and renew factory license and obtain permission for the site from State Government or the Chief Inspector of Factories in case of new or extension of any Factory. Ensure health, safety, and welfare of all workers while they are at work in the Factory as far as reasonably practicable. Ensure effective and adequate ventilation of work place and adequate measures to be taken to protect workers particularly in the processes involving excessive temperature. Ensure effective and adequate ventilation of work place and adequate measures to be taken to protect workers particularly in the processes involving excessive temperature.
The Central Motor Vehicle Rules, 1989	Ministry of Shipping, Road and Transport Highways	To consolidate and amend the law relating to motor vehicles including to regulate the transportation of dangerous goods with a view to prevent loss of life or damage to the environment	<ol style="list-style-type: none"> Ensure compliance to safety provisions in the transport vehicle carrying dangerous and hazardous substances inside works Display of emergency information panels at front, back and both side of vehicle Every transporter to ensure safe transportation of dangerous/ hazardous goods. Earthing chain for grounding, any prevalent static charge. All motor vehicle entering the works shall have properly maintained brakes, lights, signal system for brakes, blinkers and registration number displayed, and valid Pollution under Control Certificate
The Solid Waste Management Rules,	CPCB, SPCB	To manage/ utilize the generated solid	<ol style="list-style-type: none"> Segregate waste in to three streams, Wet (Biodegradable), Dry (Plastic, Paper, metal, wood, etc.) and domestic hazardous wastes

2016		waste without damaging the environment and surroundings	(diapers, napkins, empty containers of cleaning agents, mosquito repellents, etc.) and handover segregated wastes to authorized rag-pickers or waste collectors or local bodies.
Batteries (Management and Handling) Rules, 2001.	SPCB, CPCB and MoEF&CC	To control the hazardous waste generation (lead waste) from used lead acid batteries	<ol style="list-style-type: none"> 1. It is the responsibility of the generator to ensure, used batteries are not disposed of in any manner other than depositing with dealer, manufacturer, importer, re-conditioner registered recycler or at designated collection center. 2. Submit half yearly return for disposal of used batteries to State PCB by 30th June & 31st December, every year 3. In case of auction, ensure batteries are auctioned to the registered recycler only 4. File half yearly return for the auction 5. Maintain record for such auction
E-Waste (Management) Rules, 2016	SPCB, CPCB and MoEF&CC	To recycle/manage the electronic waste from the industry	<ol style="list-style-type: none"> 1. Shall make provisions for collection of e-waste generated from 'end of life' of their products and shall ensure that such e-wastes are channelized to registered dismantler or recycler, In line with the principle of 'Extended Producer Responsibility.' 2. Set-up of collection centers or take back systems either individually or collectively. 3. Finance and organize a system to meet costs involved in the environmentally sound management of e-waste generated from the 'end of life' of its own products. 4. Create Awareness
Noise Pollution (Regulation and Control) Rules, 2000 and its amendments	CPCB, SPCB, MoEF&CC	To maintain the noise levels with respect to the place/equipment/ industry	<ol style="list-style-type: none"> 1. Noise Quality Monitoring & submission of reports on weekly/monthly basis. 2. Providing Ear plugs and Muffs to the workers working in noise prone areas.

CHAPTER 2: PROJECT DESCRIPTION

2.1 TYPE OF THE PROJECT

The present proposal is for Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India.

The proposed project falls in Category “A” of Schedule 7(a) vide EIA Notification 2006 and amended till date involving preparation of Environment Impact Assessment study and Environmental Management Plan. This project is independent and is not linked with other projects which may attracts directly or indirectly any provisions of schedule of EIA Notification 2006 amended till date.

2.2 NEED FOR THE PROJECT

The establishment of new Airport is required as the existing Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave and to cater the increasing traffic. New Airport has been proposed which will significantly enhance the capacity of the Airport in handling traffic, which will further boost tourism, economy and generate employment opportunities. The decision comes in the wake of the policy of the government to promote the Indian Aviation sector in a significant manner, to ensure a multiplier effect on the economy. The Government aims to provide an ecosystem for harmonized growth of various aviation subsectors.

2.3 LOCATION OF PROJECT (MAPS SHOWING GENERAL LOCATION, SPECIFIC LOCATIONS, PROJECT BOUNDARY AND PROJECT SITE LAYOUT)

The present proposal is for Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India.

The proposed project falls in Category “A” of Schedule 7(a) vide EIA Notification, 2006 amended till date involving preparation of Environment Impact Assessment study and Environment Management Plan.

The geographical location of the proposed project lies from the coordinates mentioned below:

Table 2-1: Coordinates of Project Site

POINT	LATITUDE	LONGITUDE	POINT	LATITUDE	LONGITUDE
1	24°55'17.73"N	92°47'54.43"E	54	24°56'14.85"N	92°48'56.95"E
2	24°55'21.04"N	92°47'53.33"E	55	24°56'14.79"N	92°48'57.58"E
3	24°55'26.82"N	92°47'50.24"E	56	24°56'15.35"N	92°48'59.01"E
4	24°55'29.48"N	92°47'46.77"E	57	24°56'15.44"N	92°49'1.34"E
5	24°55'35.88"N	92°47'37.33"E	58	24°56'14.80"N	92°49'2.91"E
6	24°55'36.53"N	92°47'38.02"E	59	24°56'13.64"N	92°49'4.14"E
7	24°55'36.73"N	92°47'38.07"E	60	24°56'13.70"N	92°49'5.30"E
8	24°55'37.68"N	92°47'38.52"E	61	24°56'13.56"N	92°49'6.16"E
9	24°55'38.13"N	92°47'39.13"E	62	24°56'13.95"N	92°49'10.43"E
10	24°55'38.96"N	92°47'39.42"E	63	24°56'14.85"N	92°49'11.60"E
11	24°55'40.37"N	92°47'39.86"E	64	24°56'14.98"N	92°49'12.59"E
12	24°55'41.48"N	92°47'40.55"E	65	24°56'14.46"N	92°49'14.19"E
13	24°55'43.83"N	92°47'41.60"E	66	24°56'13.86"N	92°49'14.67"E
14	24°55'44.41"N	92°47'42.18"E	67	24°56'14.18"N	92°49'17.97"E
15	24°55'45.57"N	92°47'44.85"E	68	24°56'15.16"N	92°49'18.18"E
16	24°55'46.48"N	92°47'46.11"E	69	24°56'15.73"N	92°49'17.60"E
17	24°55'47.57"N	92°47'46.72"E	70	24°56'16.00"N	92°49'17.89"E
18	24°55'48.07"N	92°47'47.08"E	71	24°56'16.18"N	92°49'18.51"E
19	24°55'48.69"N	92°47'48.09"E	72	24°56'15.61"N	92°49'19.54"E
20	24°55'49.44"N	92°47'48.91"E	73	24°56'15.95"N	92°49'20.96"E
21	24°55'49.95"N	92°47'49.13"E	74	24°56'17.95"N	92°49'23.83"E
22	24°55'51.50"N	92°47'50.66"E	75	24°56'18.33"N	92°49'25.58"E
23	24°55'51.62"N	92°47'51.12"E	76	24°56'18.82"N	92°49'25.88"E
24	24°55'51.77"N	92°47'52.51"E	77	24°56'18.99"N	92°49'26.56"E
25	24°55'52.73"N	92°47'54.23"E	78	24°56'19.79"N	92°49'27.29"E
26	24°55'52.87"N	92°47'54.73"E	79	24°56'20.35"N	92°49'28.09"E
27	24°55'52.87"N	92°47'56.07"E	80	24°56'19.21"N	92°49'29.10"E
28	24°55'53.14"N	92°47'56.03"E	81	24°56'17.88"N	92°49'30.02"E
29	24°55'52.13"N	92°47'45.38"E	82	24°56'16.65"N	92°49'31.26"E
30	24°55'56.45"N	92°47'44.87"E	83	24°56'15.43"N	92°49'31.23"E
31	24°55'54.51"N	92°47'24.03"E	84	24°56'18.32"N	92°50'4.59"E
32	24°55'59.37"N	92°47'23.47"E	85	24°56'14.54"N	92°50'5.24"E
33	24°56'1.18"N	92°47'44.26"E	86	24°56'16.18"N	92°50'25.98"E
34	24°56'5.38"N	92°47'43.98"E	87	24°56'11.61"N	92°50'26.56"E
35	24°56'10.86"N	92°47'54.02"E	88	24°56'9.47"N	92°50'5.71"E
36	24°56'11.56"N	92°48'2.12"E	89	24°56'8.74"N	92°50'5.83"E

37	24°56'7.09"N	92°48'2.66"E	90	24°56'8.02"N	92°50'7.10"E
38	24°56'8.57"N	92°48'19.03"E	91	24°56'7.38"N	92°50'7.63"E
39	24°56'9.77"N	92°48'21.01"E	92	24°56'6.74"N	92°50'8.84"E
40	24°56'10.75"N	92°48'24.15"E	93	24°56'6.87"N	92°50'10.38"E
41	24°56'11.37"N	92°48'24.85"E	94	24°56'6.14"N	92°50'10.90"E
42	24°56'12.50"N	92°48'27.86"E	95	24°56'5.21"N	92°50'10.20"E
43	24°56'12.88"N	92°48'28.54"E	96	24°56'5.26"N	92°50'7.63"E
44	24°56'12.94"N	92°48'31.71"E	97	24°56'5.05"N	92°50'6.13"E
45	24°56'16.53"N	92°48'39.11"E	98	24°55'32.11"N	92°48'22.55"E
46	24°56'12.65"N	92°48'41.12"E	99	24°55'30.55"N	92°48'18.18"E
47	24°56'13.61"N	92°48'41.76"E	100	24°55'28.65"N	92°48'14.01"E
48	24°56'13.28"N	92°48'43.54"E	101	24°55'22.51"N	92°48'4.56"E
49	24°56'13.69"N	92°48'45.03"E	102	24°55'19.65"N	92°48'0.26"E
50	24°56'15.07"N	92°48'46.82"E	103	24°55'17.94"N	92°47'56.78"E
51	24°56'14.79"N	92°48'52.49"E			
52	24°56'15.07"N	92°48'53.10"E			
53	24°56'14.56"N	92°48'55.06"E			

The Location Map, Google Earth Map, Plant Layout and Site Photographs are shown below as **Fig. 2.1, Fig. 2.2, Fig. 2.3, and Fig. 2.4.**

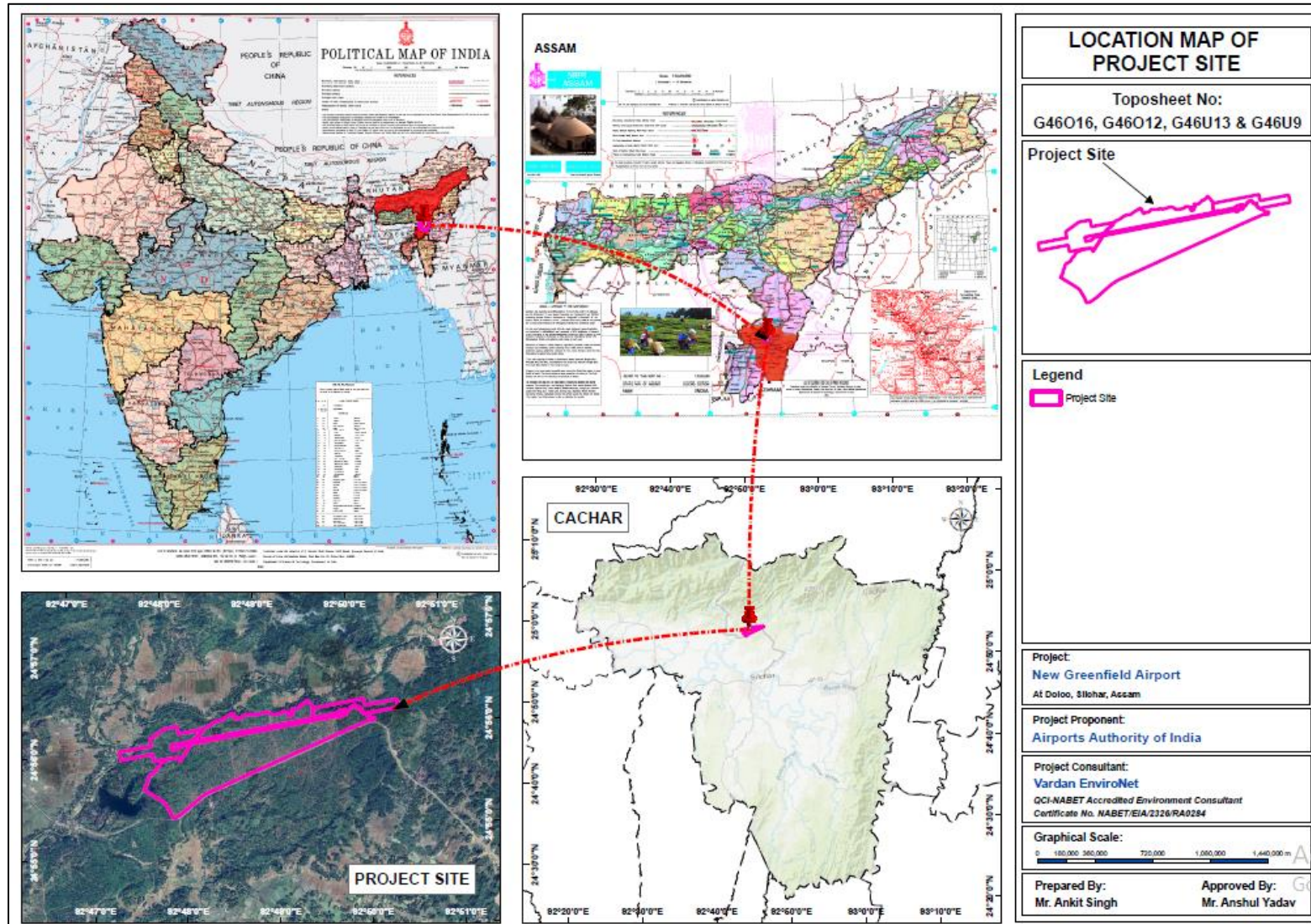


Figure 2-1: Location Map of the Project Site



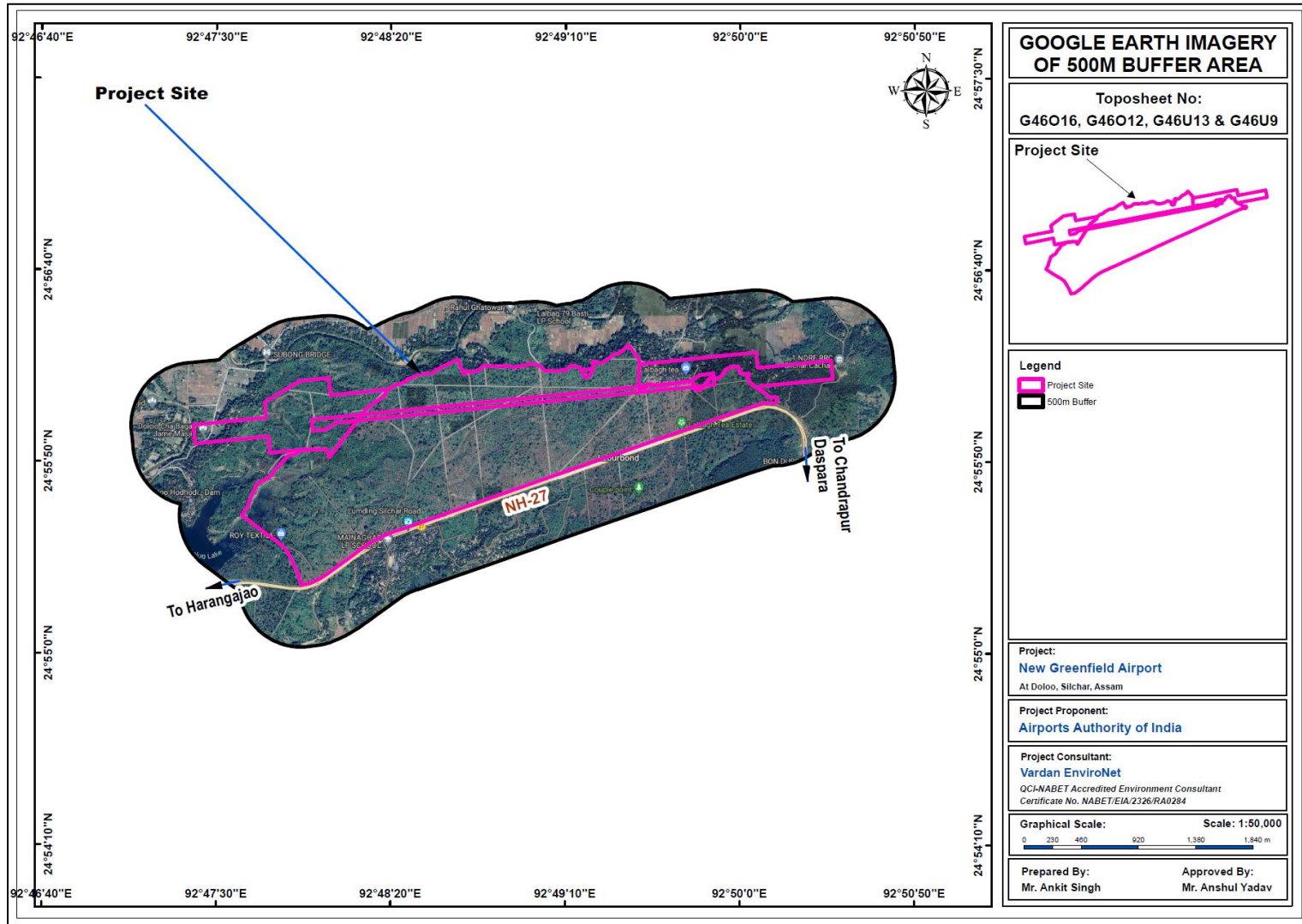


Figure 2-2: Google Earth Map of Project Area



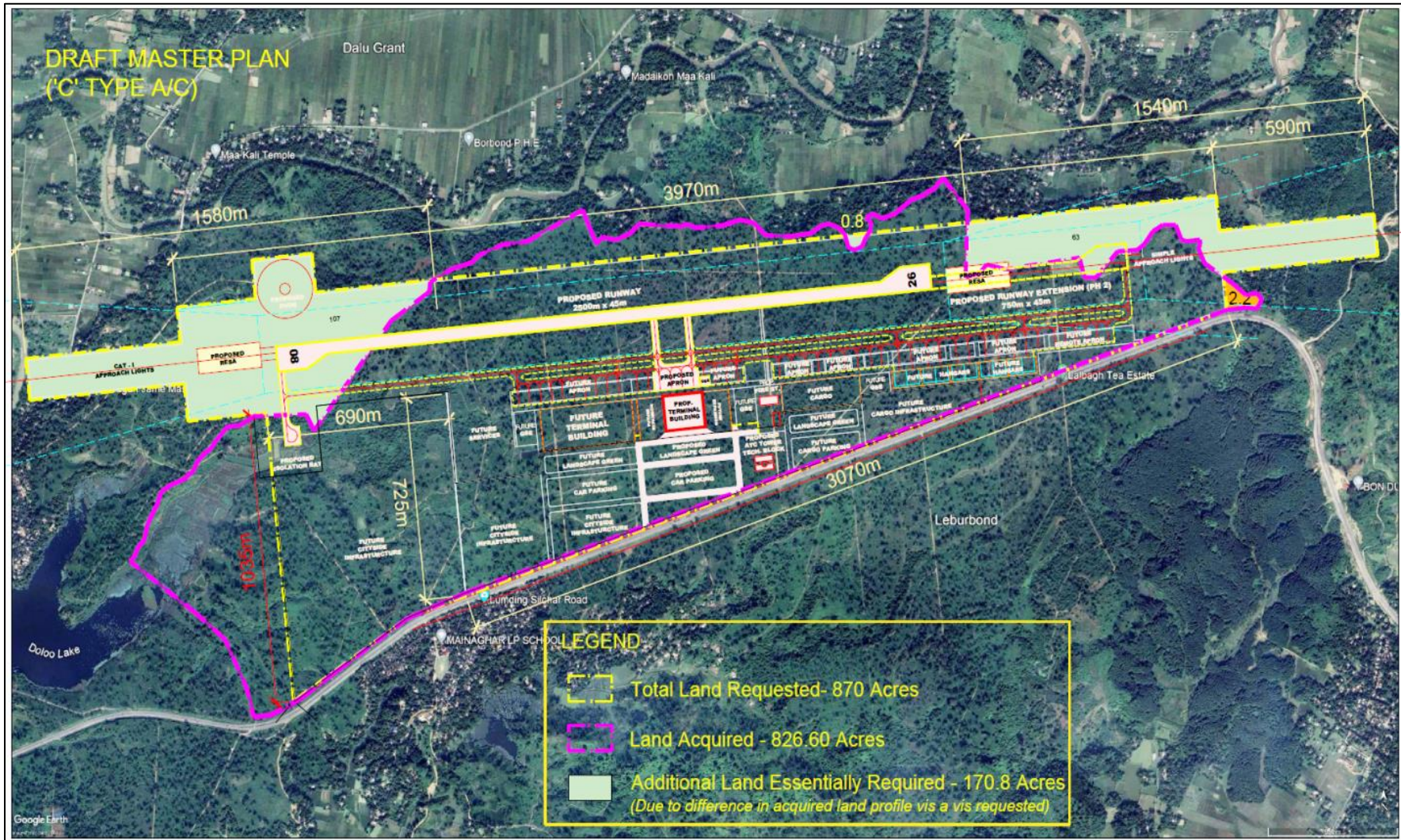


Figure 2-3: Plant Layout



Figure 2-4: Site Photographs

2.4 SIZE OR MAGNITUDE OF OPERATION

The proposed project site located at Doloo site which is 28 kms away from Existing Civil Enclave involves the development of New Greenfield Airport with acquiring of 997.4 acres of land and falls under Category-A of schedule 7(a) Airports as per EIA Notification,2006 and its ammendment till date.

A total land area of 997.4 acres has been earmarked for the development of the Doloo greenfield Airport. 826.60 acres of land has been acquired by the state government. Additional 170.8 acres of land acquisition is in process by State Government.

The total area of project is estimated to be 4,036,335 m² (997.4 acres). The detailed Area Statement is provided below in Table 2.2.

Table 2-2: Area Statement

S. No.	Particulars	Ground Coverage (m ²)
1.	Runway	1,12,500
2.	RESA	43,200
3.	Apron	15,300
4.	Link Taxi	8,000
5.	Isolation Bay area & link taxi	14,569
6.	Terminal Building	15,000
7.	ATC Tower	11,550
8.	Other building (Sub-station, Emergency Medical Room, Transit accommodation, Fire Station & Admin Block)	18,000
9.	Greenbelt/Landscape area	1,00,000
10.	Vehicles Parking Area	17,500
11.	Other allied Infrastructure Facilities	---
12.	Road and Pavement area	40,000
13.	Open Area for future development	Not Planned yet
Total		4,036,335 m² (997.4 acres)

2.5 PROPOSED SCHEDULE FOR APPROVAL AND IMPLEMENTATION

The proposed project will be commenced within 24-36 months after obtaining nvironment clearance and other statutory permissions.

2.6 PROCESS DESCRIPTION AND TECHNOLOGY

AAI has to develop New Greenfield Airport for Code-4C at Doloo, Silchar, Assam. Total land of 997.4 acre has been earmarked for the development of Proposed Airport.

2.6.1 Existing Facilities

Existing Airport is located at Kumbhirgram, about 22 km from Silchar. The current airport at Silchar belongs to IAF and AAI operates a civil enclave from 70.66 acres of land. Operators like Indigo, Air India & Spicejet are presently operating 80 flight movements in a week. It is suitable for the operation of A-320 type of aircraft.

2.6.2 Proposed Facilities

The Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave. Airport Authority of India has proposed to develop a new Greenfield Airport at Doloo, Silchar as the existing Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave.

The proposed site for development of the Greenfield airport for Code-4C is located at 28 km away from the Current Civil Enclave. A total land area of 997.4 acres has been earmarked for the development of the proposed Airport.

2.6.3 Scope of Project work

1. Ground Development/Improvement (Approx. 997.4 Acres)

- i. Demarcation of total land Approx. 997.4 Acres earmarked for development of Airport as per Master plan.
- ii. Carry out the Topographical Survey (with latest instruments and sound surveying practice) of total area (997.4 Acres approx.) on a grid of 15m x 15m including contouring and submission of Contour Plans (contour map with 0.5m interval), preparation of Drainage plan, re-routing of natural drainage/water bodies, if any on basis of Site survey, Flood levels, Hydrological Survey, and site data.
- iii. To finalize the finished level of graded ground to match with DGCA/CAR/ICAO/AAI requirement for slope in both directions, also to maintain drainage system considering flooding pattern of adjacent water bodies etc.
- iv. Revised OLS charts to be issued after fixing of ground level. OLS to be re-assessed for runway finalization.

2. Construction of New Runway (08/26)

Civil Works:

- i. Construction of new Runway of dimension 2500m x 45m (subject to transfer of remaining land by State Govt.) suitable for Code 'C' aircraft of specified dimensions



- ii. Provision of Pavement against blast erosion 60m x 60m at both Runway ends with shoulder strength.
- iii. Provision of shoulder of 7.5 m width for the entire length of Runway.
- iv. Critical aircraft for designing pavement strength and geometrics to be considered as A-320/B-737.
- v. Filling / grading of 280m Basic Strip as per DGCA CAR.
- vi. The soil at a depth of 15 cm below the finished strip surface should be prepared to have a bearing strength of California Bearing Ratio (CBR) value of 15 to 20.
- vii. Provision of Runway markings as per updated version of DGCA CAR, Annex-14 and Aerodrome Design Manual Part-IV (Visual Aids)
- viii. Site development with provision of drainage system connecting to nearby drainage system at appropriate location and provision of culvert if necessary.
- ix. Technical Evaluation & declaration of pavement strength after the completion of work and prior to commissioning.
- x. Static tanks at both sides of runway along the emergency exit road from runway end to crash gate.
- xi. Location of drainage system- Drainage system to be developed should be as per CAR guidelines i.e. if within 105 m from RWY center line then covered drains capable of bearing the weight of aircraft, if drains b/w 105m to 140m from RWY 13 centerline then covered drains and if beyond 140 m from RWY centreline then open drains may be constructed which will be subject to regular wildlife management.
- xii. Provision of Runway End Safety Area (RESA) of dimensions 240m x 90m at both ends of Runway as per circular issued by Member (Plg.) with specification. Filling to be maintained in the approach area to maintain natural slope.
- xiii. The Slopes on Runway, Runway Shoulder, Runway strip & RESA shall be as specified in DGCA CAR 4/B/1.
- xiv. Critical Aircraft Turn Pads should be provided at both ends of the runway.

Electrical works:

- xv. Provision of Airfield Ground lighting (AGL) system comprising of Runway edge lighting system, Runway end light system, Threshold lighting system, Threshold wing bar light, runway distance to Go Marker, Intermediate holding position light, ALCMS (Airfield Lighting Control & Monitoring System), Illuminated DIGMS (Digitally Illuminated

Glowing Metallic Signboard), illuminated signage, PAPIs.

- xvi. Cat-I approach lighting system at Runway-08 and Simple Approach Lights for Runway-26 (subject to land made available by State Govt.)
 - xvii. AGL Substations i/c CCR halls (to be part of civil work), Sub Station Equipment, DG sets and associated system i/c air conditioning for CCR halls etc; Power Monitoring and Control System, Power supply (main and stand by) to NAVAIDS, MET & ancillary buildings, etc. inside operational area.
 - xviii. Provision of Illuminated Wind directidirection indicator(s) and Landing direction indicator should be made as per DGCA CAR.
- 3. Construction of Apron for parking of 04 nos. Code-C Aircrafts in power in push back configuration along with link taxi track & associated GSE area. Area of Apron=15300 Sqm (approx.) with 2 nos. link taxi having area of 8000 Sqm. (approx.)**

Civil Works:

- i. Construction of Apron for parking of 04 nos. Code-C Aircrafts in power in push back configuration along with link taxi track & associated GSE area. Area of Apron = 15300 Sqm (approx.) along with fillets.
- ii. Construction of 2 nos. 23m wide link taxiway connecting with proposed apron with fillets.
- iii. Construction of 1 no. GSE area of dimension 35m X 35m.
- iv. 7.5m wide shoulder to be provided all along the edge of the apron and link taxi tracks to the apron.
- v. Provision of fillets at intersections and connections of Runway, taxiway and apron.
- vi. Critical aircraft to be considered for strength and geometrics are A-320/B-737.
- vii. The Slope to be provided on Apron and link taxi as specified in DGCA CAR.
- viii. Taxiway strip of width 52m i. e. symmetrically for a distance of 26m on either side of the centre line shall be made obstruction free considering the operations of Code C type of aircraft at a later date.
- ix. Technical evaluation and declaration of pavement strength after completion of work and prior to commissioning.
- x. Provision of drainage system for the apron connecting to the main storm water drains with required culverts if necessary, OWS etc.

- xi. Provision of Taxiway & Apron marking, holding point marking mandatory instruction marking wherever required as per Annex-14, Aerodrome design Manual Part-IV (Visual Aids) and DGCA CAR.
- xii. To prevent the boundary, wall/ objects on perimeter road, against jet blast of Code C aircraft pushed back on apron, necessary SOP to be developed.

Electrical Works:

- xiii. Provision of Apron and Taxiway edge lighting system.
- xiv. Provision of Apron flood lighting System.
- xv. Provision of Perimeter lighting system.
- xvi. Provision of runway guard lights.
- xvii. Provision of stop bar lighting system.
- xviii. Illuminated signage of taxiway

4. Area of Isolation Bay is 9900 Sqm. with Link Taxi of dimension 202m x 23m

Civil Works:

- i. Construction of Isolation Bay of area 9900 Sqm. for parking of Code C type of aircraft with strength for A-320/B737.
- ii. Slope to be provided on isolation bay and link taxi as specified in DGCA CAR.
- iii. Construction of 1 no. 23m wide link taxi track connecting with isolation bay.
- iv. 7.5m shoulder to be provided all along the edge of the isolation bay and link taxi track to the isolation bay.
- v. Technical evaluation and declaration of pavement strength after completion of work and prior to commissioning.
- vi. Provision of drainage system for the apron connecting to the main storm water drains with required culverts if necessary.
- vii. Provision of markings, mandatory instruction marking wherever required as per Annex-14, Aerodrome design Manual Part-IV (Visual Aids) and DGCA CAR.

Electrical Works:

- viii. Provision of Isolation Bay edge lights and Taxiway edge lighting System, stop bar light.
- ix. Provision of Isolation Bay flood lighting System.

x. Illuminated signage for taxiway

5. Construction of New Domestic Passenger Terminal building with peak hour capacity of 1000 passengers, having an area of 20,000 Sqm (excluding basement) with airside corridor for new contact stands and city side approach road & canopy for passenger facilitation.

Civil Works:

- a) Construction of centrally air-conditioned one and a half level new domestic terminal building with all modern facilities and amenities as per the layout plan enclosed. The New Terminal Building having an area of 20,000 sqm (excluding basement) with a capacity to handle 1000 passengers at a time with the recommended area specifications and to match the level of service "Optimum" as per IATA recommendations. The building should comply with energy-efficient planning and green building concepts considering India's future net zero targets and should be provided with aesthetically appealing & soothing interior decoration matching the modern structure. Space planning should ensure that no dead Space/ Area is created in the building.
- b) Departure area, Arrival area, Security Hold area and Concourse area are to be provided with adequate nos. of toilets of gents, ladies and differently-abled persons (Divyangjan) along with drinking water facility. Suitable number of ramps and other amenities to be provided for entry and exit of differently -abled persons (Divyangjan) in Departure and Arrival area. Additional fixtures in the toilet to be provided for arrival passengers arriving together at one time or during peak hour.
- c) Tactile pathway by using SS Studs & strips to be provided as per planning circular 1/2017 dated 17.10.17.
- d) The design of Terminal building to include Media planning, Retail area planning, F& B plan, etc. Overall planning of Building to capture local architectural features and it to be part of design features of Terminal. The design should include the required arrangement for its regular maintenance to make it in-built part of execution. Solar power generation viz. solar lighting, solar roofing system, etc. shall be provided. Maintenance friendly roofing, false ceiling & building facade system including provision of regular cleaning with maintenance hoists, hooks, etc. including cat walk / rope suspended platform / gondola etc. to be provided on both inside and outside of terminal building.
- e) Terminal Building Master Planning and Designing should be based on an analysis of passenger growth and their profiling on various parameters like age, gender, spending at airports, e-booking, usage for drop facilities or using a private vehicle, special groups

like Army personnel, tourists, artisans labour etc. so that their specific needs inside the terminal building and city side can be planned and provided.

- f) A unique aesthetic depicting local art and culture should be developed in all constructions to be done in the Terminal Building and within the airport premises. The entire scheme shall have a common look & feel.
- g) New Terminal Building should depict the work of local artisans depicting local culture. The Air side of the Terminal Building should also depict the uniqueness of that area through its art and culture.
- h) The building should be Carbon Neutral (for operational level emissions) and GRIHA 5 compliant. Green energy plan for Terminal Building rooftop and other areas to be prepared. Power consumption and power requirement are to be monitored continuously.
- i) Appointment of Commercial Planning Expert, Art & Culture Expert or any other Experts so that Master Plan and Building Plan can be prepared in an integrated manner.
- j) The quality of material to be used in construction should be the same throughout e.g. the granite flooring should be uniform across the building (one quarry one finish)

Departure Area:

- a) The Terminal Building with provision for Departure concourse, having requisite nos. of check-in counters with Baggage Screening system, Baggage Conveyor Belts, queueing space, Segregation Railing, Back-up Offices for Airlines, Facilitation Counters, Weighing Machines, Counters, Automated Baggage Drop system, lost and found item room and a housekeeping room adjacent to Terminal manager office etc.
- b) Self-check-in Kiosk to be planned.
- c) Security Offices.

Security Hold Area:

- a) Security Hold Area and bus lounge area with adequate seating arrangements, isolated smoking area, child care room and wash rooms etc.
- b) Security check/ passenger frisking area in security hold with adequate space for required number of DFMDs, X-ray machines, frisking platforms, Inspection Tables for manual checking of hand baggage and adequate space / room for security staff, etc.
- c) Security Hold to be planned on first floor to facilitate holding near the gates provided

with 4 Nos. aerobridges and at ground floor for remote gates.

- d) Retail Area Creation of Retail Islands/ Shops, area for vehicle display without affecting the passenger movement.
- e) Food & Beverage Area.
- f) Office Space for regulatory agencies

Arrival Area / Baggage Claim Area:

- a) Baggage Claim area with 2 numbers conveyor belts of adequate size to be provided.
- b) Adequate space should be provided for required number of offices, Bank, space for storing of baggage trolleys, space for storage of mishandled baggage for airlines, segregation railing and associated passenger amenities.
- c) Offices Space for regulatory agencies.
- d) Medical room.

Other requirements for Terminal Building:

- a) Provision for Snack Bar counter, Travel Requisite, Pharmaceutical shops, Airlines offices & ticket selling counters, ATM/Bank counters etc.; Meet and Greet area, First Aid room, Facilitation counters, caretaker room with store, Airport Terminal Manager office, Conference Room and other facilities, infrastructure for advertisements and Art work at suitable locations.
- b) Adequate space for airline offices, CISF, AAI, Airlines, Regulatory agencies is to be planned and provided.
- c) Construction of car park with all amenities for requisite nos. of cars and parking for VIP cars & buses, designated parking space for PwRM and separate car / scooter park area for AAI, and airlines staff at appropriate location.
- d) Provision of water supply system as per norms and as per site conditions.
- e) Loader room along with toilet inside proposed Terminal Building.
- f) Hydro-pneumatic water supply system for proposed Terminal Building.
- g) City side horticulture-landscaping including both side footpath of the Terminal Building entry & exit roads.
- h) VIP/ CIP lounge inside the proposed Terminal Building.
- i) Horticulture-landscaping, drainage system, water supply, Rain Water Harvesting etc.

- j) Driver's rest room, canteen and toilet facility on the city side.
- k) Sub-stations, A/C plant room, Fire & water pump Room and related service facilities. provision to be made for backup Generators, UPS for essential services, etc.
- l) Provision of acoustics for effective functioning of PA system.
- m) Providing city side compound wall depicting local architecture and with impressive entrance gates.
- n) A space of 200 sq. feet may be created where local Self-Help Groups (SHGs) can display and sell their products.
- o) The provision of the rooms in central location of the building at Ground Floor with air conditioners and adequate no. of power points of 15 Amp and 3 phase power supply for UPS as mentioned below:
 - i. Equipment Room:
 - Minimum size: 5mtr x 7mtr
 - Purpose: Housing Batteries & UPS for CCTV, Servers/ Recorder / Switches / Racks. FIDS & PA Racks and other equipment.
 - ii. UPS & Battery Room:
 - Minimum size: 3mtr x 3mtr
 - Purpose: Housing Batteries & UPS for CCTV, FIDS, PA system and other equipment.
 - iii. CCTV Monitoring Room:
 - Minimum size: 5mtr x 4mtr
 - Purpose: Housing CCTV video wall / monitors, PCs etc. and Monitoring / Surveillance of airport by security personnel through CCTV cameras.
 - iv. Workshop/ Maintenance Room:
 - Minimum size: 5mtr x 4mtr
 - Purpose: For repair and keeping spares of the equipment under this Dte. And maintenance and watch of all these sophisticated systems.

Electrical Works:

- a) Energy efficient Internal and external electrification for Terminal Building Complex, associated buildings, Car park and roads i/c boom barriers etc. Lighting shall be of LED

based.

- b) Main sub-station
- c) Provision of main power supply, Substation Equipment, Standby DG Sets/ UPS for Secondary Power supply to Passenger Terminal Building and associated ancillary buildings, including service connection.
- d) Energy efficient central air-conditioning system as required.
- e) Provision of BHS with Departure Check-in X-ray inspection system, Arrival, Baggage Claim and associated other equipment i/c control rooms, equipment/ panel rooms etc. as required.
- f) Fire alarm and detection system, firefighting hydrant, Sprinkler system, gas suppression system (for server room, UPS room & critical electrical and electronic rooms) with Fire Control Room/ Panel and linking the same with Fire Station.
- g) Provision of automatic sliding doors at exit & entry points of Terminal Building.
- h) Escalators & Elevators/ Travellators of adequate capacity with matching staircase.
- i) Provision of passengers Boarding Bridges (PBB) i/c AVDGS as per the apron requirement.
- j) Provision of adequate number of LED Signage of world class standard, inside and outside the terminal building, car park area & City side approach road and air side area for guidance of passengers and visitors as per latest concept by signage consultant.
- k) Compliance with GRIHA norms viz. generation of power from renewable energy.
- l) Provision of pumps, compressors and associated electrical system for water supply, STP, water treatment systems.
- m) Provision of Air-curtains, Water cooler, RO, hand driers etc.
- n) Building Management System
- o) Provision of Wi-fi enabled services integrating building power and water consumption with zone-wise consumption display etc.
- p) Provision of facia lighting system
- q) Lighting system for special occasions to be planned and integrated with the overall planning so that lighting on occasions like Independence Day, Republic Day and AAI Day etc. can be done without any additional work and cost.
- r) Provision of lightning protection system with earth pits

- s) Provision of public address system and car calling system.
- t) For setup of Server Room, following Engg. works are required to executed:
 - i. SITC of Modular UPS with half an hour battery backup
 - ii. SITC of Precision Air Cooling System
 - iii. SITC of Fire Alarm & Gas-based Fire Suppression System
 - iv. SITC of Anti Rodent System
 - v. SITC of Water Leakage Detection
 - vi. Dedicated Earthing & Dual Power Sources

Airports Systems:

- a) 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.
- b) Provision of Flight Information Display system (FIDS) with adequate number of Display Devices in departure, arrival, and security hold area for passenger facilitation.
- c) Provision of adequate number of X-ray machines for scanning Cargo, in line Registered Baggage (RB) and Hand Baggage (HB), including provision of required number of ETDs, DFMDs and HHMDs, as per BCAS norms.
- d) Provision of adequate no. of VHF FM sets (Walkie-Talkie, Base Stations, and Mobile stations).
- e) Provision of Baggage self-drop
- f) Provision of Full Body Scanner
- g) Provision of Automatic Tray Retrieval System
- h) Provision of Electronic display system for advertisements etc.

IT Systems:

- a) Provision of Passive Cabling to provide data points for all IP Based installations at Airport such as CCTV, FIDS, voice, desktop for AAI staff /Stakeholders etc. Only Data Points shall also be provisioned for Biometric Access Control System.
- b) Provision of Active Components such as Router, firewall, Core cum distribution switch,

edge switches etc. with accessories as per requirement.

- c) Provision of Optical Fibre Cable with all accessories like Racks, Cable trays, conduits raceways etc.
- d) Integrated Data Centre equipped with UPS supply with change-over at ALCR/DLCR rooms, Access Control and CCTV. Data Centre shall also have Precision AC, WLD, Anti Rodent, Fire Alarm, Gas Based Fire Suppression, Dedicated Earthing, Dual Power Supply etc. provisioned by Engg. Dept.
- e) SITC of EPABX System as per requirement.

6. Construction of ATC Tower cum Technical Block with a preferred height of 35m or more depending on NOC

The Space provision, General Guidelines and General Recommendations for various CNS, ATM & MET Departments shall be made as per approved committee report enclosed. While applying for height NOC for ATC Tower cum Technical Block, CNS equipment antenna of 5 meters must be considered.

Civil Works:

- a) Leveling and grading of the site including development of drainage system etc.
- b) Construction of boundary wall around the ATC Tower cum Technical Block area for safety and security of operational staff and equipment's with one / two security posts.
- c) Construction of approach road to the site from outside area.
- d) Construction of peripheral road of minimum width 6m within ATS complex Boundary.
- e) Ground level Car park/ surface car park to accommodate min. requisite. four wheelers and requisite nos. two wheelers.
- f) Horticulture-landscaping, drainage system, water supply, rain water harvesting etc.
- g) Sub-station, VRF Air-conditioning System and related service facilities. Provision should be made for power backup /generators for essential services.
- h) Making provision for adequate number of DSCN Antenna base as per the specification and requirement of CNS dept.
- i) The Approach Control Centre should have sound proofing material for convenience of officers in the respective units.
- j) The foundation of ATC Tower cum Technical Block should be designed in such a way that in future one additional floor, if required, can be added vertically without changing

the structural design of the same building.

- k) Steel stair case for fire exit at ATC Tower as per BCAS requirement.
- l) Procurement and installation of furniture & panels.
- m) The false floor to ceiling clear height should be not less than 4 meters and the depth of false floor should be not less the 450 mm. The space requirement for CNS should be as per the type of operation to be carried out so that accordingly the space is available for installation of various CNS/ATM systems.

Electrical/ Mechanical Works:

- a) Energy efficient Internal and external electrification for ATC Tower cum Technical Block, associated buildings, Car Park and roads.
- b) Provision of main power supply, Substation Equipment, DG Sets for Secondary Power supply to ATC Block and associated ancillary buildings.
- c) Provision of adequate number of Signage of standard specification and quality, inside and outside the ATC Tower cum Technical Block, entry & exit of the area for guidance of staff and visitors.
- d) Energy efficient air-conditioning system as required.
- e) Provision of fire detection & alarm system, provision for fire hydrants and water sprinklers system as per standards along with fire extinguishers. Fire gas suppression system for data center / server rooms, Provision of BMS.
- f) GLF items like remote control desk, runway control cable.
- g) Procurement, installation and commissioning of requisite nos. elevators of adequate, capacity in the ATC Tower cum Technical Block.
- h) Provision of Solar power/heater for internal water requirement.
- i) Provision for water coolers and drinking water facilities.
- j) Compliance with GRIHA norms viz. generation of power from renewable energy.
- k) Miscellaneous items like Beacon, Crash Siren, Aviation Obstacle Lights & Lightning protection systems with earth pits etc.

Miscellaneous Works:

- a) Procurement and installations of Access Control Doors.
- b) All Electronics, BMS and IT works as required.
- c) Making provision for DSCN Antenna as per the specification and requirement of CNS



Dept.

- d) Provision of Passive Cabling to provide data points for all desktop/application for AAI staff. Only Data Points shall also be provisioned for Biometric Access Control System.
- e) Provision of Distribution and Access Switches with accessories as per requirement.
- f) Provision of Optical Fibre Cable between terminal and ATC Block and within ATC block if required with all accessories like Racks, Cable trays, conduits raceways etc.
- g) The EPABX hybrid type for ATS Tower may consider as a separate system.
- h) The CCTV and access control may be as per the CNS Circulars.
- i) The fire control system shall be as per the CNS Circulars.
- j) The CNS equipment earth shall be independent from all the other earths.
- k) There shall be three different physical networks of IT data, telephone & CCTV access control.
- l) The requirement of UPS shall be as per the CNS power policy.

7. Construction of Fire Station (Category-VI) & Emergency Medical Centre

The requirements of fire station of category -VI shall be in accordance with Fire Manual 2015 & Emergency Medical Centre.

Civil Works:

- a) Leveling and grading of the site including development of drainage system etc.
- b) Construction of approach road to the site from outside area and head to Runway.
- c) Construction of boundary wall around the Fire Station & Approach Road for safety and security of operational staff and equipment's with one / two security posts.

Electrical/ Mechanical/IT works:

- a) Energy efficient Internal and external electrification for Fire Station, associated buildings, Car Park and roads.
- b) Provision of power supply system
- c) Provision of Fire alarm & detection system
- d) Provision of Signage, Water supply, Water cooler, RO etc.
- e) Provision of suitable Air-conditioning.
- f) Provision of Fire Hydrant system.

- g) Provision of Fire Bell.
- h) SITC of integrated LAN, WLAN & WAN by providing Passive and Active Networking Components.
- i) Provision of lightning protection system with earth pits.

8. M. T. /E &M Workshop, Area = 1000 Sqm.

Civil works:

Construction of M.T./E & M workshop of an area of 1000 Sqm. (approx.)

Electrical works:

Provision of power supply, internal & external EI, FADS, FF system, Air-conditioning system, water cooler, RO system, Provision of lightning protection system with earth pits as required.

IT works:

SITC of integrated LAN, WLAN & WAN by providing Passive and Active Networking Components.

9. DVOR building (Area), localizer hut (area) (Frangible), glide path hut (area) (Frangible) i/c power supply (main & standby), Air conditioning, lighting, Auto dial FADS, Fire Fighting etc.

10. Provision of Visual Navigational Aids:

- a) Precision Approach Path Indicator (PAPI) at both ends of the runway.
- b) Ground Lighting system.
- c) Simple Approach Lighting system on Runway 26
- d) Cat-I Approach Lighting system on Runway 08
- e) Wind sock
- f) Landing T

11. CNS Infrastructure

- i. Procurement and Installation of Doppler very High Frequency Omni Range (DVOR) with building and 3.5m wide approach road.
- ii. Procurement and Installation of Distance Measuring Equipment (DME)
- iii. Procurement and Installation of Instrument Landing system (ILS)-CAT-I with frangible



huts and 3.5m approach road.

- iv. The final location of DVOR shall be after visiting the site.
- v. The tentative sites for ILS shall be finalized i.e. for LLZ & GP after getting the data for the most usable runway by the ATM Dte.

12. Miscellaneous work:

- i. Provision of CUTE / CUPPS and CUSS & BRS system in Terminal Building.
- ii. ARP with 3.5m approach road.
- iii. Provision of Explosive disposal area/ cooling off area and Fire training pit as per standard drawing i/c lighting.
- iv. Designed capacity of Underground & Overhead tanks for fire and other requirement.
- v. High intensity Retro-reflective overhead signages at entrance of the Airport and facia signages of Terminal Building, technical block, substation etc.
- vi. Provision of MET-observatory for Metrological Dept. in the operational area.
- vii. RCC service tunnel/ tranche connecting from proposed NTB to substation/CCR Building.
- viii. Provision of signal area.
- ix. Provision of Bore wells for water supply requirement.
- x. Administrative Block and transit accommodation for AAI Officials.
- xi. Provision of property boundary wall and operational boundary wall (as per site condition) i/c lighting.
- xii. Provision for Bollard, Tyre killer and BP Morcha as per standard.
- xiii. Provision Perimeter Road of 4.8 m width with 1.2 m shoulder on both side to facilitate quick movement of emergency vehicles/CFT and shall be capable of supporting Crash Fire Tender of 36.0 tonnes as per T.I. no. 77 dated 27-04-2022.
- xiv. Watch tower as per site requirement next to perimeter road operational boundary wall i/c lighting.
- xv. Cutting and filling of ground to maintain the desired level.
- xvi. Wall to wall grading for remaining portion of operational area of Airport.

- xvii. Plot identified in the master-plan for CISF & Kote (for arms and ammunition) room of an area of 5.0 acres (approx.) requirement will be finalized in the later date.
- xviii. Provision for solid waste management system in order to comply with solid waste management rule 2016.
- xix. All dimensions are based on Auto CAD Drawing and are subject to minor modifications as per survey and site conditions.
- xx. Height Clearance for NOC for the proposed Terminal Building, ATC Tower cum Technical Block and associated infrastructure i/c Beacon and CNS Antennas etc.
- xxi. As per DGCA CAR Section 4/B/I, Para 1.5.3 (applicable from 03rd Nov 2022) Aerodrome stakeholders, particularly aircraft operators, shall be consulted in order to facilitate the master planning process using a consultative and collaborative approach.
- xxii. Solar power plant of minimum @5% of the connected load need to be provided as per NBC guidelines 2016 i.e. minimum requirement is 100KWp. However, 500KWp solar power plant may be proposed for consideration in the draft SOW.
- xxiii. Stand by arrangement of some Capacity Over Head water tanks for Terminal Building.
- xxiv. Approach roads for PAPI, DVOR, DME, GP, LLZ, wind sock, signal area, Monitor Antenna, OHT & UGT, Cooling pit & Fire pit, MET observatory etc.
- xxv. Videography film - before & after development of new Greenfield Airport.
- xxvi. Both side foot path of entry & exit approach roads from main Airport Entrance to Terminal Building.
- xxvii. Provision of office furniture in NTB, Sub-Station, MT, MI & Child care Rooms, LLZ, DVOR, GP building offices and sofas with local touch in VIP/CIP room.
- xxviii. Provision of three-seater chairs, baggage trolleys, CFT, Ambulance along with medical equipment to be procured by the Technical Dte.
- xxix. Sewerage system.
- xxx. Steel gates for main entrance of Airport, operation area (both side of Terminal building) & emergency gates at both end of the Runway.

All the works are to be carried out as per DGCA CAR I ICAO I FAA documents and BCAS Norms. Any other work left out of the above and necessary to complete the project. All system shall be complying with relevant international standard IS/NBC and sound engineering practices.

2.7 REQUIREMENT OF RAW MATERIALS, WATER, ENERGY/POWER, MANPOWER, OTHERS AND THEIR SOURCE

2.7.1 Raw Material Requirement

Airport being a service industry doesn't process any raw material or deal in production of products. The proposed project is development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam, which requires general construction materials viz. steel, cement, RMC, sand, aggregates, etc. These materials will be procured from nearby markets as per requirements and transportation facilities will be provided by construction contractor.

2.7.2 Water Requirement

The total water requirement for the proposed development of Greenfield Airport will be 491 KLD out of which 203 KLD will be fresh water required for Domestic usage which will be sourced from ground water and 286 KLD water will be used for flushing, greenbelt development/landscaping and DG Cooling, Cleaning, Fire-Fighting etc. which will be treated water.

Table 2-3: Water Consumption Detail

S. No.	Description	Occupancy	Rate of water demand (lpcd)		Total Water Requirement		
			Fresh	Flushing	Fresh	Flushing	Total
A. Domestic Water							
1.	Passenger	4700	@40 lpcd	@30 lpcd	188	141	329
2.	Staff	500	@25 lpcd	@20 lpcd	12.5	10	22.5
3.	Visitors	466	@ 5 lpcd	@10 lpcd	2.3	4.7	7.0
	Sub-total				202.8 or 203KLD	155.7 or 156 KLD	358.5 or 359KLD
Total Domestic Water = 359 KLD							
B.	Horticulture	1,00,000.0 m ²	1.15 lt/m ² /day		115 KLD		
C	DG Cooling, Cleaning, Fire-Fighting etc.	--	--		15 KLD		
Grand Total (A+B+C) = 489 KLD							

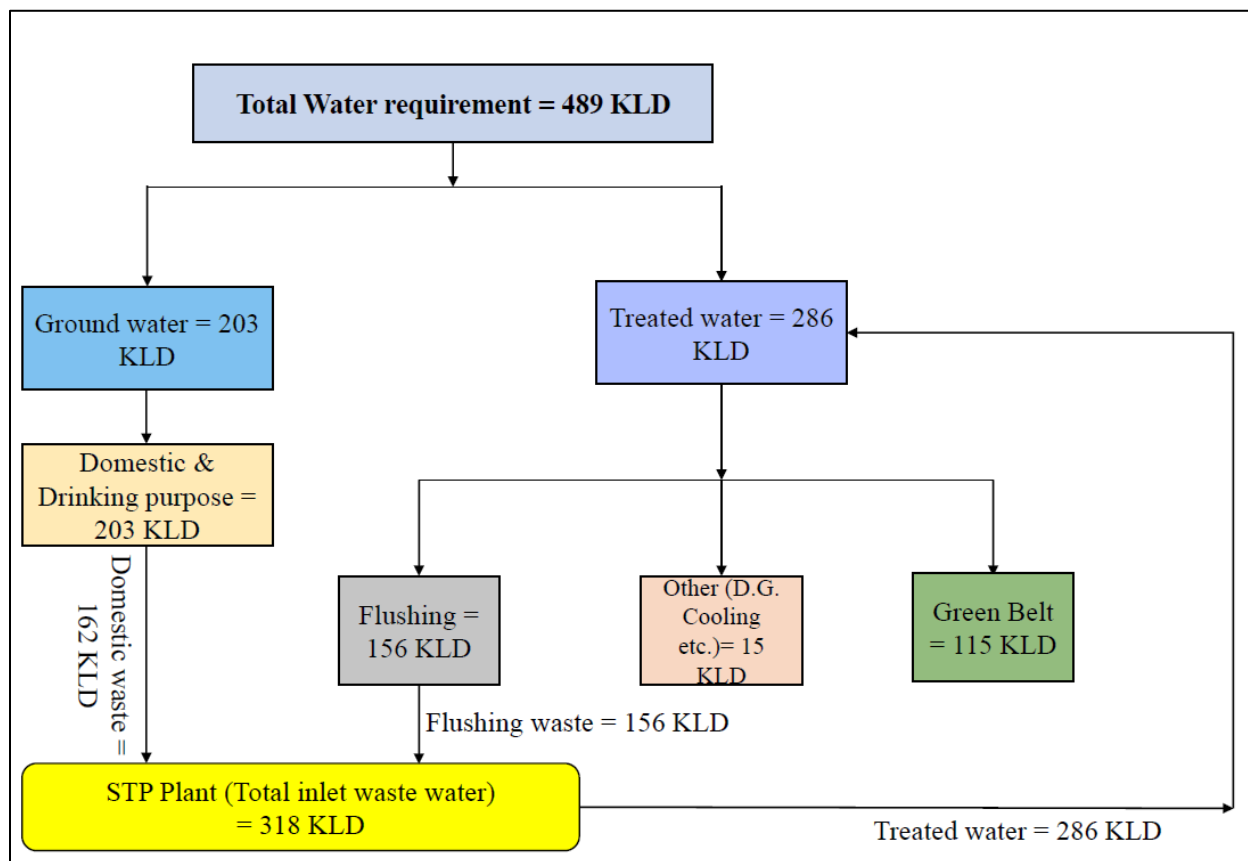


Figure 2-5: Water Balance Diagram

2.7.3 Power Requirement

The total power requirement of the Civil Airport is 3000 kVA or 2400 kW which will be sourced from State Electricity Board.

For power back-up supply 4 nos (3W +1S) of DG sets will be provided with capacity of 1250 kVA each.

Solar power has been proposed to be installed at the roof top of capacity 500 kWp i.e., ~21% of total power requirement.

2.7.4 Manpower Requirement

The manpower requirement during operation phase will be approx. 40 and preference shall be given to locals based on their education and skills. Some temporary man power will be hired from local areas during construction phase approx. 10 (permanent) + 350 (temporary).

2.7.5 Land Requirement

The proposed project will be set up in an area of 997.4 acres (40,36,335 Sq.m.). The total land use breakup of the proposed project is given in table below.

Table 2-4: Land Requirement

S. No.	Proposed Land-use	Area in Sq.m.
1.	Roof Top Area of buildings/sheds	33000
2.	Road/ Paved area	207869
3.	Open land	3695466
4.	Green Belt area	100000
Total Land		4036335

2.7.6 Cost Details

The total estimated cost for the proposed project is Rs. 1400.0 Crores. Details of the same are mentioned below:

Table 2-5: Project Cost Breakup

S. No.	Particular	Cost (In Cr.)
1.	Building & Civil Work	740
2.	Mechanical & Electrical work	150
3.	AICMC Cost	74.92
4.	Miscellaneous & Contingency	405.08
5.	EMP	30.0
TOTAL		1400

2.8 WASTE MANAGEMENT

2.8.1 Waste Water Management

Mainly the effluent generation at the Airport consists of Domestic sewage which will be treated with the help of proposed STP having capacity of 400 KLD. The treated water will be used for the flushing, gardening etc.

Table 2-6: Wastewater Calculations

Domestic Water Requirement	355 KLD
• Fresh	203 KLD
• Flushing	156 KLD
Wastewater generated [@80% fresh + 100% flushing + 100% lavatory waste]	162 + 156 = 318 KLD
Treated Waste Water generated (90% of treated waste water)	286 KLD
STP Capacity (at approx. 1.25 times of waste waster generated)	400 KL

Details of Sewage Treatment Plant:

Sewage generated from the airport is being treated in a well-designed Sewage Treatment Plant (STP). Moving Bed Biofilm Reactor (MBBR) type sewage treatment plant of capacity 400 KLD has been installed for treating the domestic sewage. After meeting stipulated standards, treated sewage will be utilized for flushing and irrigation of greenery and landscaping.

The sewage from the airport is being collected by gravity into the collection tank / equalization tank of Sewage Treatment Plant (STP) via perforated screens to prevent the large particles into system. In equalization tank, pH and temperature of incoming sewage will be equalized. The sewage from equalization tank will be pumped to Moving Bed Biofilm Reactor (MBBR) reactor for biological treatment, where required quantity of air in presence of MBBR system will be supplied to meet the oxygen requirements by mean of blower and fine bubbles air diffusers.

After MBBR reactor, sewage will flow by gravity to settler (tube type) where sludge is settled at the bottom due to gravity. This settled sludge is being recycled through sludge pump to MBBR reactor to meet the mixed liquor suspended solids (MLSS) requirement; excess sludge is discharged through filter press for final disposal. Final discharge of wastewater from settler is collected in chlorine contact tank, where some chlorine will be dosed for disinfections of treated wastewater. Then, treated sewage will be pumped for tertiary treatment through Pressure Sand Filter followed by Activated Carbon Filter and it will be passed through Ultraviolet (UV) disinfection system.

Treated sewage meet the norms prescribed by MoEFCC / CPCB / SPCB and is being utilized for flushing and for irrigation of greenery & landscaping purpose. Treated wastewater is not discharged outside the boundary of the airport.

MBBR Technology

Moving bed biofilm reactor technology is based on the principle of attached growth process. Raw sewage will be collected under gravity into the equalization tank after allowing to pass through the bar screen. Screens will be provided in screen chambers, and it will be manually cleaned by going down to a platform. The bar screen, by removing coarse solids from the sewage help in protecting the raw sewage pump.

Fully submersible centrifugal non clog sewage handling pump will be provided in the collection cum equalization tank to pump the collected wastewater to the next MBBR tanks. Automatic level controller will be provided in the tank to turn the pump off at the low water level in the tank and to start the pump when water level is high automatically. Air will be introduced in this tank to prevent any potential foul smell problem & to provide the mixing

of wastewater to avoid the sedimentation of solids in this tank. Air Grid used for aeration purpose shall be non-clog.

The sewage collected in equalization tank is pumped the moving bed bioreactor. There shall be two nos. of bioreactors in series for the efficient working and removal of BODs for the required retention time. The process inside the moving bed bioreactors consists of adding small cylindrical-shaped polyethylene/polypropylene carrier elements in aerated basins to support biofilm growth. The small cylinders are provided with a cross inside the cylinder and longitudinal fins on the outside. The biofilm carriers are maintained in the reactor by the use of a perforated plate with appropriate slot at the tank outlet. Air agitation or mixers are applied in a manner to continuously circulate the packing. The packing may fill 25 to 50 percent of the tank volume. Specific surface area of the packing is about 450-500m²/m³ of bulk packing volume. The wastewater from first bioreactor flows by gravity through the perforated plate/mesh to the next bioreactor kept in series. Inside the bioreactors, aerobic bacteria grow in an attached growth from around the moving plastic media inside the reactors. The bacteria have to reduce BOD & COD of wastewater in the presence of oxygen provided through the air grids located at the bottom of the reactors. The Process does not require any return activated sludge flow or backwashing.

From the bioreactors, the effluent passes by gravity into the clarifier (Tube Settling Tank). Clarifier will be a hopper bottom sedimentation tank provided with appropriate size PVC tube deck media. The suspended solids will settle at the bottom of the tank & clear supernatant will overflow to filter feed tank through outlet launder. The collected sludge at bottom shall be transferred through pumps to sludge holding tank. The clear supernatant after clarifier will be collected in to filter feed tank. This tank will act as housing tank for filter feed pumps. The clarified & dis-infected water will be then fed to filtration unit.

Filtration unit consisting of Dual Media sand filter, activated carbon filter and ultra-filtration system (optional) will remove the residual impurities such as odor/color, suspended solids, BOD/COD. The treated water after the filtration unit will be collected in Irrigation cum Flushing water storage tank from where it is transferred to flushing water tank at terrace & Irrigation System.

Excess sludge from the bottom of the settling tank will be removed and transferred to sludge holding tank. Air grid shall be provided in this tank to avoid conversion into anaerobic conditions, thickening of sludge and keep sludge in homogenous condition. The digested & thickened sludge shall be further thickened through Sludge Dewatering System (Filter press with screw pump) and disposed-off periodically through closed tanker or can be reused as manure.

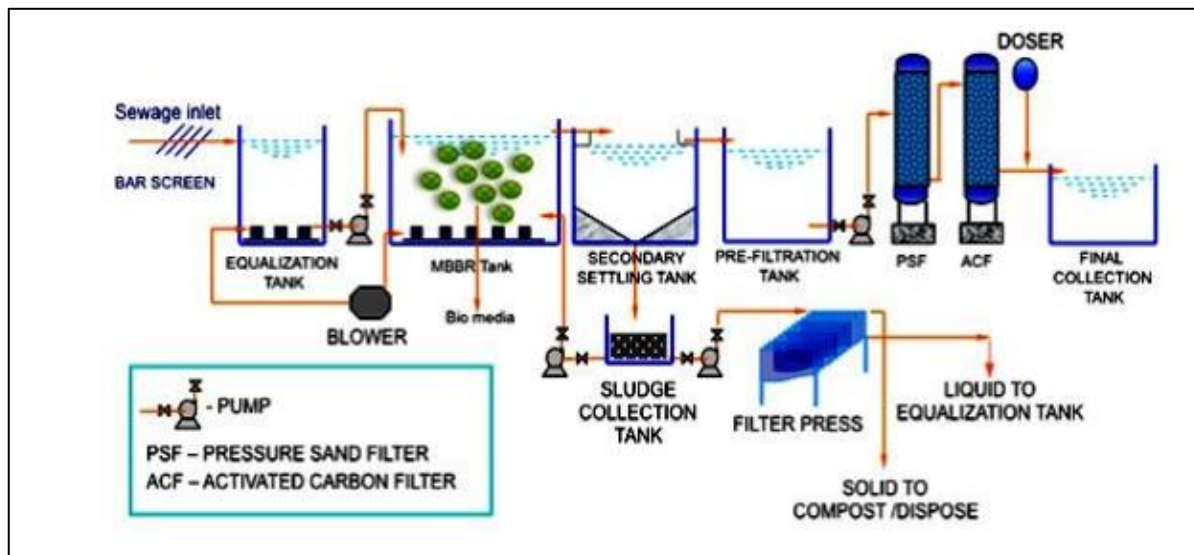


Figure 2-6: Schematic Diagrams for STP Based on MBBR Technology

2.8.2 Solid and Hazardous Waste Management

Solid waste generated from the proposed airport mainly comprises of waste and garbage waste. Further, small quantities of sludge from STP and other waste will be generated. Collection and handling of domestic solid waste would be done in line with the provisions of the Municipal Solid Waste Rules 2000 (as amended).

During the operation phase, the solid waste generated from the project shall be approx. @ 150g per person per day for the visitor, 200g per person per day for the staff members and aircraft waste @ 8.0 kg per aircraft per day. Therefore, 1095 Kg/day of Municipal Solid waste is estimated to be generated from Airport on the basis of population projection estimated till year 2036-37. Total 15 workers will be involved in the project. Considering 200 gm/Person/Day of waste; it is estimated that approximately 3.0 Kg/day of domestic solid waste will be generated. Dustbins have been provided for separated collection of wet and dry waste.

Table 2-7: Solid Waste Management

S. No.	Particulars	No. of passenger/ staffs/Aircraft	Solid waste (kg/day)	Mode of Disposal
1.	Passengers (150g /person/day)	4659	698.85	Will be given to Municipality for proper disposal of the waste.
2.	Staff (200g / person/day)	500	100	
3.	Aircraft or de-plane waste (8 kg per Aircraft)	37	296	
Total			1094.85 say 1095	

Solid waste generated from the proposed airport mainly comprises of waste and garbage waste. Further, small quantities of sludge from STP and other waste will be generated. Collection and handling of domestic solid waste would be done in line with the provisions of the Municipal Solid Waste Rules 2000 (as amended).

Following arrangements will be made at the site in accordance with Solid Waste Management Rules, 2016:

❖ **Collection and Segregation of waste**

1. A local approved vendor will be hired to provide separate-colored bins for dry recyclable and bio-degradable waste.
2. Litter bins will also be provided in common areas like corridors, etc.

❖ **Treatment of waste**

• **Bio-Degradable waste**

1. Bio-degradable waste will be subjected to composting through Organic Waste Converter and the compost will be used as manure.
2. STP sludge is proposed to be used in horticulture.
3. Horticultural Waste is proposed to be composted and used for gardening.

• **Recyclable waste**

1. Grass Recycling – The cropped grass will be spread on green area. It will act as manure after decomposition.
2. Recyclable waste like paper, plastic, metal etc. will be disposed through local approved recyclers.

❖ **Disposal**

Recyclable and non-recyclable waste will be disposed through an authorized service provider/vendor. Solid Waste Management scheme for Operation Phase is depicted in the following figure:

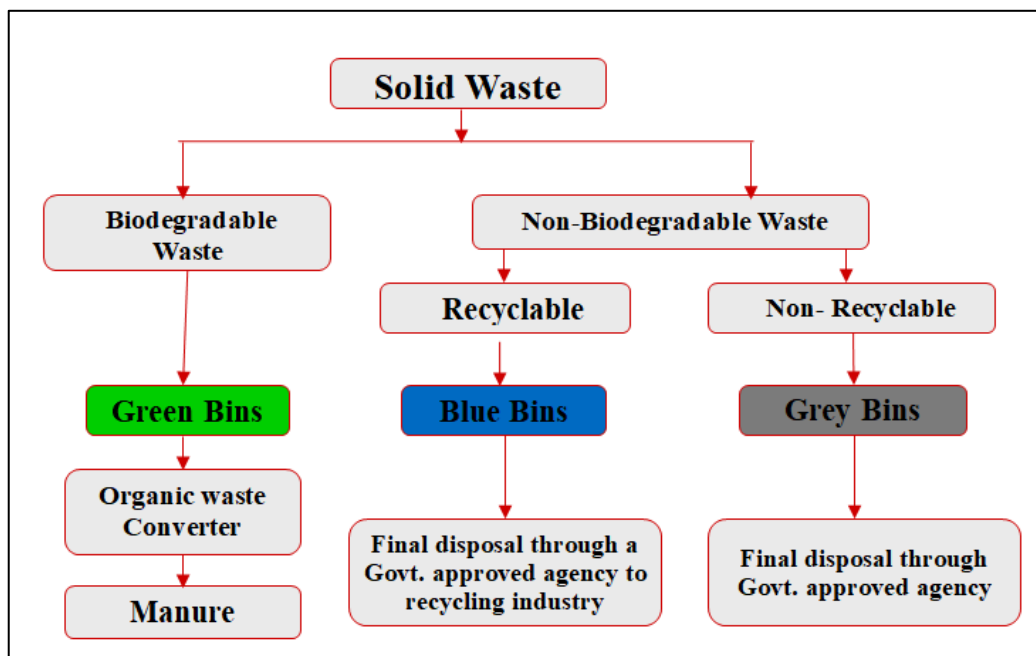


Figure 2-7: Solid Waste Management Scheme (Operation Phase)

Hazardous waste: Used oil from machineries/G.G. Set will be carefully stored in HDPE drums in isolated covered facility. The used oil will be sold to vendors authorized by Central Pollution Control Board/ State pollution control Board for the treatment of the same. Suitable care will be taken so that spills / leaks of used oil from storage could be avoided. All hazardous waste shall be strictly disposed of as per Hazardous and Other Waste (Management & Trans-boundary Movement) Rule, 2016.

2.9 DESCRIPTION OF MITIGATION MEASURE INCORPORATED IN TO THE PROJECT TO MEET ENVIRONMENTAL STANDARD, ENVIRONMENTAL OPERATING CONDITIONS OR OTHER EIA REQUIREMENTS

Details of emission effluent, hazardous waste generation and their management give below:

Table 2-8: Details of Emission Effluent, Hazardous Waste Generation, and their Management

Sources	Control/ Treatment
Sewage Generation	STP will be installed to Process generated effluent.
Used oil, STP Sludge, and Empty barrels/containers	Used oil and Empty barrels/containers will be sold to vendors authorized by Assam State Pollution Control Board. STP sludge will be used in green belt plantation.

Following mitigation measures will be adopted for the proposed project to minimize the impact of project on the surrounding environment:

Table 2-9: Mitigation Measures Adopted for the Proposed Project

S. No.	Particulars	Mitigation measures to be adopted
1	Air Environment	<ul style="list-style-type: none"> To control the air emissions from DG Set, stack height of 6.0 m shall be provided Adequate measures for control of fugitive dust emissions will be taken.
2.	Water Environment	<ul style="list-style-type: none"> Domestic waste water will be sent to STP for treatment and further will be used in lawn development. Rain water harvesting will be proposed.
3.	Noise Environment	<ul style="list-style-type: none"> Personal protective equipment-like ear plugs and ear muffs will be provided to employees working in the noise prone areas. Time to time oiling and servicing and Maintenance of machineries will be done. Acoustic enclosure for heavy machines/ equipment/ DG sets would be used. The Noise free machines of latest technology will be installed A high standard of maintenance and proper lubricants will be practiced for machinery and equipment, which helps to avert potential noise problems.
4.	Hazardous Waste Environment	<ul style="list-style-type: none"> Used oil will be send to authorized recycler identified by SPCB. Sludge from STP can be used in-house in green belt plantation. Discarded Containers/ Empty Barrels will be sent to vendors/ SPCB approved scrap dealer.
5.	Odour management	<ul style="list-style-type: none"> The remedial measures will be taken such as better housekeeping by regular steaming of all the equipment.

CHAPTER 3: DESCRIPTION OF ENVIRONMENT

3.1 INTRODUCTION

This chapter illustrates the description of the existing environmental status of the study area with reference to the major environmental attributes. The existing environmental setting is considered to establish the baseline conditions which are described with respect to physical environment, air environment, water environment, noise environment, traffic pattern and density, land environment, biological environment, and socio-economic environment.

The monitoring of environmental parameters has been conducted within the core zone and buffer zone (10 km radial distance) from project site in accordance with the guidelines issued by the Ministry of Environment, Forests and Climate Change, CPCB, and SPCB during the study period (October to December 2023).

Baseline Environmental status in and around new green-field Airport at Doloo, depicts the existing quality of Air, Noise, Water, Soil, Ecology & Biodiversity and Socio-economic Environment. Based on the baseline data, environmental impact assessment is carried out and Environmental Management Plan is prepared.

This baseline environmental study reveals information on existing environmental scenario.

- Delineation of project site and study area.
- Delineation of the environmental components and methodology
- Delineation of study period.
- Delineation of the location of the site and description of its surroundings based on secondary data.

After delineation of the above for the present case the following studies were conducted:

- Baseline data generation/establishment of baseline for different environmental components.
- Traffic density at the inter-phase of project site and study area.

3.2 STUDY AREA & PERIOD

3.2.1 Study Area

Studies of various environmental parameters have been done within 10 km radius area of the proposed project site. The impact identification always commences with the collection of baseline data such as Ambient Air Quality, Micro-Meteorology, Ground and Surface Water Quality, Noise levels, Soil Quality, Land Use pattern, Biological Environment and Socio-economic aspects, Solid and Hazardous waste, Geology and Hydrology within the study zone of 10 km radius.

3.2.2 Study Period

The baseline environmental study has been done for the period of October 2023 to December 2023 by M/s Vardan Envirolab, Gurugram, NABL Accredited Lab, and Certificate No. TC-6299.

3.2.3 Components and Methodology

The baseline information on Micro-Meteorology, Ambient Air Quality, Water Quality, Noise Levels, Soil Quality and Floristic descriptions are largely drawn from the data generated by M/s Vardan Enviro Lab, Gurgaon (NABL Accredited Lab). Micrometeorological data at site was recorded using automatic weather station. Long term meteorological data recorded at IMD Station Meerut; UP was sourced for correlation. The studies involved conducting field studies and analyzing various parameters that might be affected due to the industry and conducting socio-economic survey among the people. For reconnaissance survey the sampling locations were identified based on:

- Existing topography and meteorological conditions
- Locations of water intake and waste disposal points
- Location of human habitation and other sensitive areas present in the vicinity of the proposed project site
- Representative areas for baseline conditions
- Accessibility for sampling

The scoping and the extent of data generation were formulated based on interdisciplinary team discussions, and professional judgment keeping in view of ToR assigned by MoEF&CC. The baseline studies started with reconnaissance survey and the site visits in the study area for fixing the monitoring locations for collection of the primary data.

3.3 ESTABLISHMENT OF BASELINE FOR VALUED ENVIRONMENTAL COMPONENTS

The scope of the study is as per TOR issued by MoEF&CC vide letter F. No. 21-273/2024-IA.III dated 02.09.2024 attached as **Annexure-1**.

3.3.1 Meteorological Data

Micro-meteorological data of the project site during the air quality survey period is an indispensable part of air pollution study. Assessment of the micro and macro meteorology is important from the standpoint of understanding of the nature and extent of air pollution in the study area.

(a) Secondary Data

Historical data on meteorological parameters also plays an important role in identifying the general meteorological status of the region. The data generated in the field is compared with the historical data in order to identify changes, which may have taken place during the course of time.

The latest and updated secondary data is procured from the IMD for observing parameters like Temperature, Relative Humidity, Rainfall, Wind Speed and Wind direction in the Cachar district of Assam.

b) Primary Data



The micrometeorological data recorded during survey period is very useful for proper interpretation of the baseline information as well as for input, to predictive models for air quality impacts.

For collection of Primary data an Automatic Weather Station was installed at the site for three months (1st October to 31st December, 2023) and it recorded hourly observation for the parameters like Maximum and Minimum Temperatures (°C), Relative Humidity (%), Wind Speed (m/s), Wind Direction and Rainfall (mm). The hourly-recorded observations (wind velocity and wind directions) during 12 weeks study period are used in computing percentage frequencies and are depicted in the form of “Wind Rose” (Fig 3.1). The summarized meteorological data is provided in Table No. 3.1.

Table 3-1: Meteorological Data

Months	Temp (°C)		Avg Relative Humidity (%)	Average wind speed (m/s)
	Max	Min		
October 2023	30.0	21.0	84	1.22
November 2023	28	18	78	1.42
December 2023	25	15	76	1.33

Comparison of Primary Meteorological data with IMD data:

The meteorological data recorded on site is compared with the available IMD data. The average maximum and minimum temperature obtained during the monitoring period was found to be 27.66°C and 18°C respectively and follows the similar trends as observed in secondary data. For the study period, obtained predominant wind direction (i.e South-west) was same as secondary data.

3.4 AMBIENT QUALITY

Ambient air quality monitoring is done to determine the general background concentration levels. The prime objective of the ambient air quality study is to assess the existing air quality of study area and to establish the existing ambient air quality within the study area and its conformity to NAAQS.

3.4.1 Sampling Locations

The due consideration during the selection of sampling locations was given to the likely affected zones during construction and operation of the airport. The location of human habitation and other sensitive areas within the study area were considered in selection of ambient air quality monitoring locations. Eight (8) numbers of monitoring stations were set up to assess the existing air quality of the study area. One station was located inside the proposed project site (core zone) and the seven others, outside (buffer zone) the proposed project site. The locations of the monitoring stations were based on the frequent wind directions to site the stations as close as feasible to the anticipated maximum pollutant deposition areas, moreover, duly considering human habitation and

proximity to sensitive zones within the study area. Logistic considerations as ready accessibility, security, availability of reliable power supply etc. were examined while finalizing the monitoring locations. The Ambient Air Quality Monitoring locations have been presented in **Fig 3.2**.

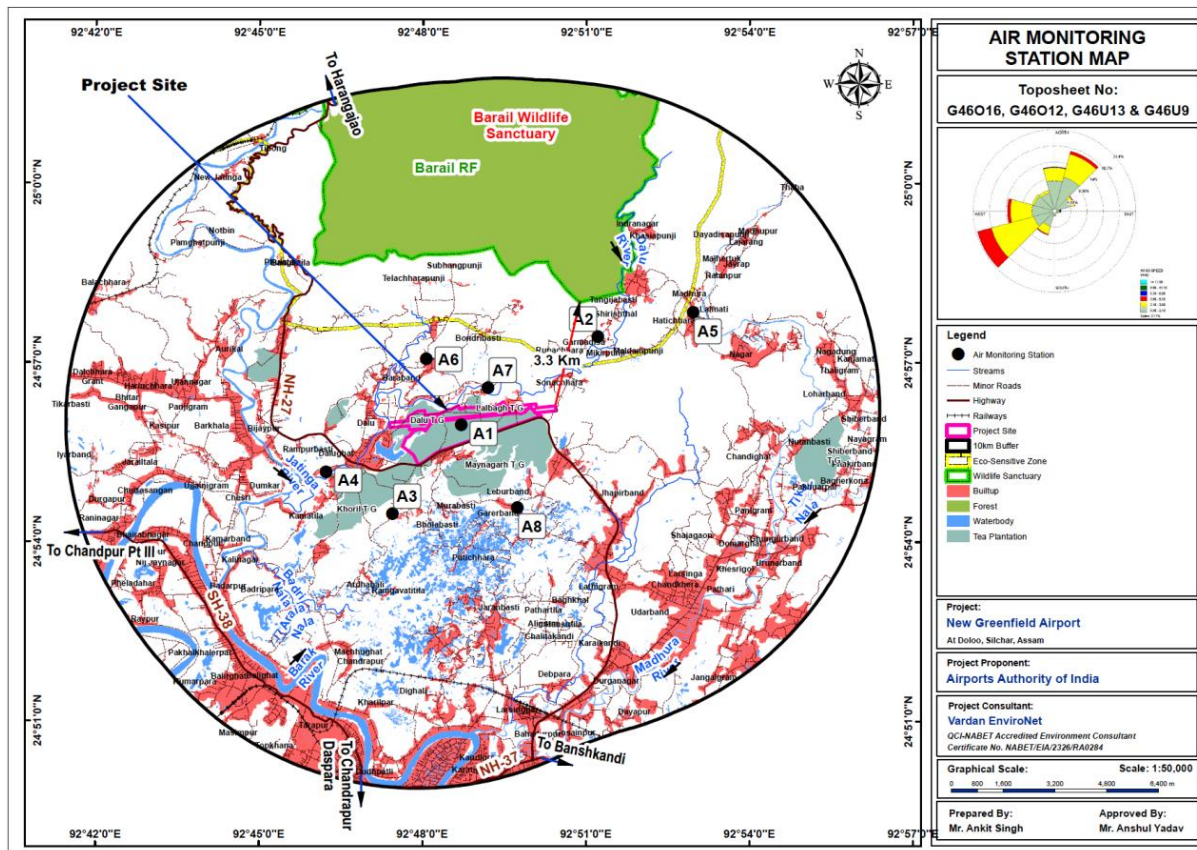


Figure 3-1: Air Monitoring Sampling Station

Table 3-2: Ambient Air Quality Monitoring Locations

Station	Location	Distance	Direction	Latitude	Longitude
A1	Project Site	0	-	24°55'57.38"N	92°48'42.44"E
A2	Madhurapur Grant	5.02	ENE	24°57'26.22"N	92°51'12.85"E
A3	Dudhpatil Pt.1	2.07	SW	24°54'28.21"N	92°47'26.54"E
A4	Boro Rampur	2.54	WSW	24°55'10.37"N	92°46'13.48"E
A5	Chandighat Grant	6.2	ENE	24°57'50.23"N	92°52'57.66"E
A6	Subong	2.12	NNW	24°57'3.76"N	92°48'3.76"E
A7	Dalu Grant	1.43	NNE	24°56'34.86"N	92°49'11.73"E
A8	Borodudhpatil Grant	3.09	SSE	24°54'34.57"N	92°49'44.13"E

3.4.2 Methodology Adopted for the Study

As per the scope of work, 8 ambient air quality monitoring stations were monitored for specific air pollutants during the study period. All the instruments (samplers) were installed between 1 to 4 m above ground level which was free from obstructions. The sampling and analysis of the required parameters were carried out as per IS: 5182

methodology entitled “Methods of Measurement of Air Pollution” and AWMA entitled “Methods of air sampling and analysis”. Following are the parameters monitored during the study period.

1. Particulate Matter (PM₁₀ and PM_{2.5})
2. Sulphur dioxide (SO₂)
3. Nitrogen dioxide (NO₂)
4. Carbon Monoxide (CO)

Table 3-3: Procedures for Determining Various Air Quality Parameters

S. No	Parameters	Methods	Technical Protocol
1	Sulphur Dioxide (SO ₂)	West & Gaeke	IS:5182(P2)
2	Nitrogen Dioxide (NO ₂)	Jacob & Hochheiser	IS:5182(P6)
3	Particulate Matter (PM ₁₀)	Gravimetric	IS:5182(P15)
4	Particulate Matter (PM _{2.5})	Gravimetric	-
5	Carbon monoxide (CO)	NDIR	IS:5182(P10)
6	Hydro Carbon (HC)	Gas Chromatography	IS:5182 (P17)
7	VOC	EPA method 24	-

Table 3-4: Procedures for Determining Various Air Quality Parameters

Parameters	Testing Procedure
PM ₁₀ & PM _{2.5}	Gravimetric Method by using Respirable Dust Sampler” (RDS) and Repairable fine Particulate Matter 9 (PM _{2.5}) sampler.
NO ₂	Absorption in diluted NaOH and then estimated calorimetrically with sulphanilamide and N (I-Naphthyl) Ethylene diamine Di-hydrochloride and Hydrogen Peroxide (IS: 5182 1975, Part-VI).
SO ₂	Absorption in Sodium Tetra Chloro-mercurate followed by Colorimetric estimation using P-Rosaniline hydrochloride and Formaldehyde (IS: 5182 Part - II, 2001).
CO	Each constituent gas in a sample will absorb some infra-red at a particular frequency. By shining an infra-red beam through a sample cell (containing CO), and measuring the amount of infra-red absorbed by the sample at the necessary wavelength, a NDIR detector is able to measure the volumetric concentration of CO in the sample.
VOC	ASTM D2369 test standards & EPA Method 24.

3.4.3 Data Analysis

The Ambient Air Quality survey has been carried out at 8 locations within 10 km radius around the project site. Measurement of Particulate matter (PM₁₀ & PM_{2.5}), SO₂, NO₂ and CO levels helps to understand the existing environmental scenario. The monitoring for PM₁₀, PM_{2.5}, SO₂, NO₂ was carried 24-hourly twice a week and for CO, VOC, and HC, it was 8-hourly twice a week. The results of PM₁₀, PM_{2.5}, SO₂, NO₂ are expressed in µg/m³ whereas the results of CO are expressed in mg/m³. The detailed air quality

reports are given in **Annexure-2**. The results of all the locations were further computed for statistical parameters like Minimum, Maximum Concentrations and Arithmetic Mean (AM). The results are shown in Table 3.5. The graphical representations of the results are depicted in **Fig No. 3.3**.

Table 3-5: Ambient Air Quality Monitoring Results

Parameters	PM ₁₀ ($\mu\text{g}/\text{m}^3$)	PM _{2.5} ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)	CO (mg/m^3)	VOC ($\mu\text{g}/\text{m}^3$)	HC (ppm)
AAQM Norms	100	60	80	80	4 (for 8 hours)	5	0.2
Project Site (AQ1)							
Max	45.1	24.3	22.5	13.5	0.83	ND	ND
Min	32.7	17.1	14.3	8.3	0.69	ND	ND
Mean	38.85	20.55	18.28	11.05	0.76	ND	ND
98 Percentile	44.65	24.3	22.35	13.45	0.83	ND	ND
Madhurapur Grant (AQ2)							
Max	39.3	18.5	17.1	6.6	0.50	ND	ND
Min	27.0	11.0	9.4	4.2	0.42	ND	ND
Mean	34.58	14.93	13.615	5.196	0.46	ND	ND
98 Percentile	39.25	18.25	16.95	6.45	0.5	ND	ND
Dudhpatil Pt.1 (AQ3)							
Max	39.5	20.7	18.4	8.3	0.56	ND	ND
Min	27.4	12.1	10.3	5.0	0.46	ND	ND
Mean	34.40	17.09	13.78	6.87	0.50	ND	ND
98 Percentile	39.3	20.7	18.4	8.3	0.56	ND	ND
Boro Rampur (AQ4)							
Max	43.5	23.0	20.5	12.5	0.78	ND	ND
Min	32.9	15.1	12.9	7.4	0.60	ND	ND
Mean	38.23	20.12	16.74	9.80	0.71	ND	ND
98 Percentile	43.45	22.95	20.2	12.4	0.78	ND	ND
Chandighat Grant (AQ5)							
Max	47.0	25.8	23.6	15.2	0.93	ND	ND
Min	36.2	18.0	15.2	9.4	0.76	ND	ND
Mean	42.32	22.03	19.74	12.63	0.84	ND	ND
98 Percentile	46.9	25.75	23.3	15.15	0.93	ND	ND
Subong (AQ6)							
Max	46.7	23.6	22.8	14.2	0.89	ND	ND
Min	34.2	17.5	15.0	9.0	0.72	ND	ND
Mean	39.99	20.65	18.23	11.12	0.81	ND	ND

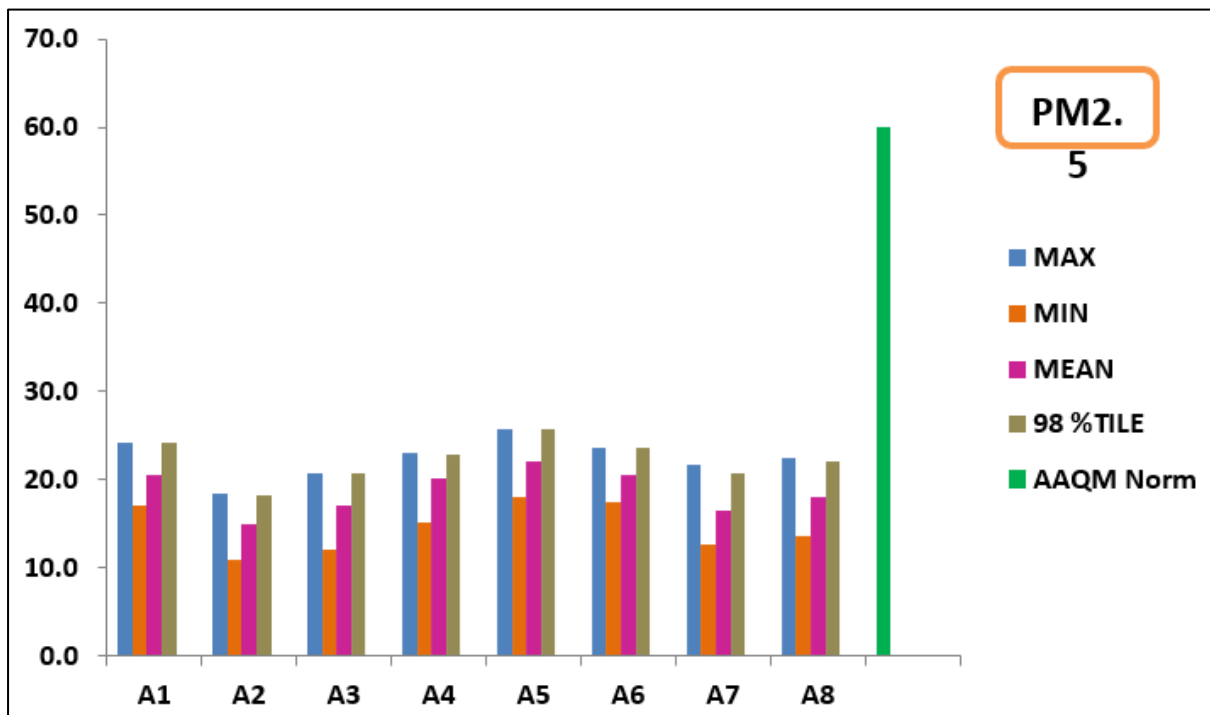
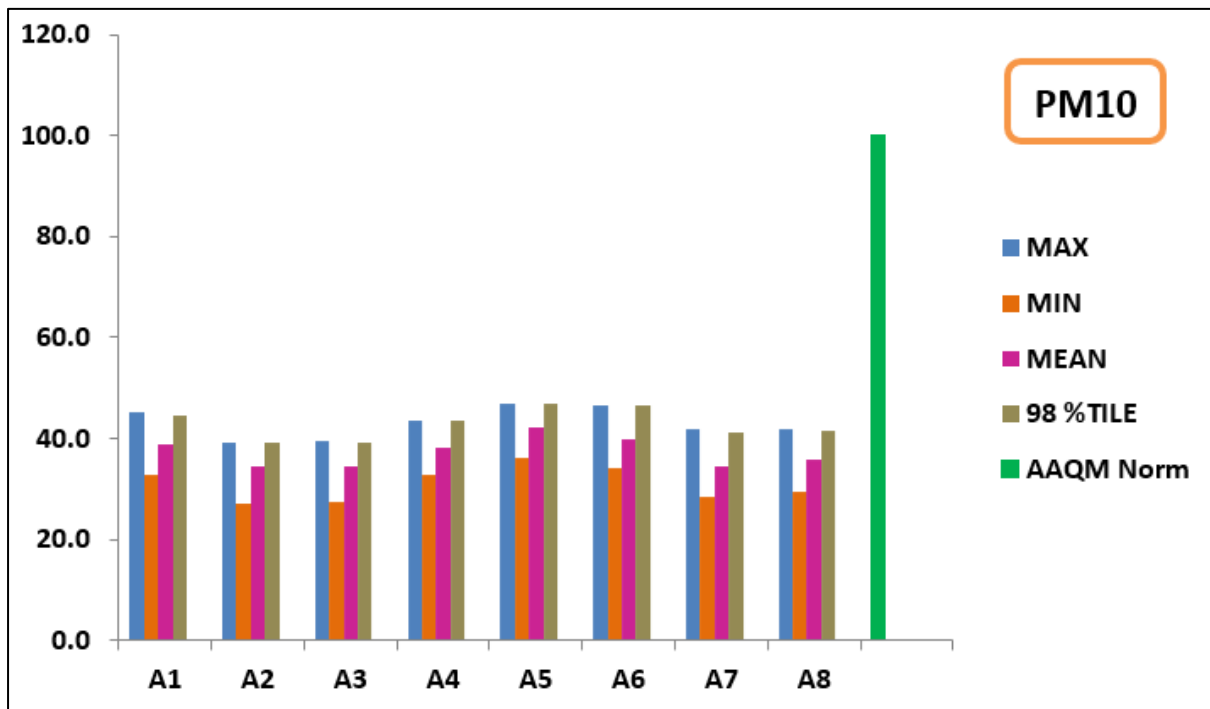
98 Percentile	46.65	23.6	22.2	14.1	0.89	ND	ND
Dalu Grant (AQ7)							
Max	41.7	21.7	19.5	9.1	0.63	ND	ND
Min	28.6	12.7	11.6	5.8	0.49	ND	ND
Mean	34.59	16.62	15.05	7.7	0.57	ND	ND
98 Percentile	41.35	20.7	19.35	9.05	0.63	ND	ND
Borodudhpatil Grant (AQ8)							
Max	41.8	22.4	20.7	11.1	0.71	ND	ND
Min	29.4	13.6	12.1	6.9	0.55	ND	ND
Mean	35.95	18.03	15.89	8.76	0.63	ND	ND
98 Percentile	41.4	22.05	20.45	10.8	0.71	ND	ND

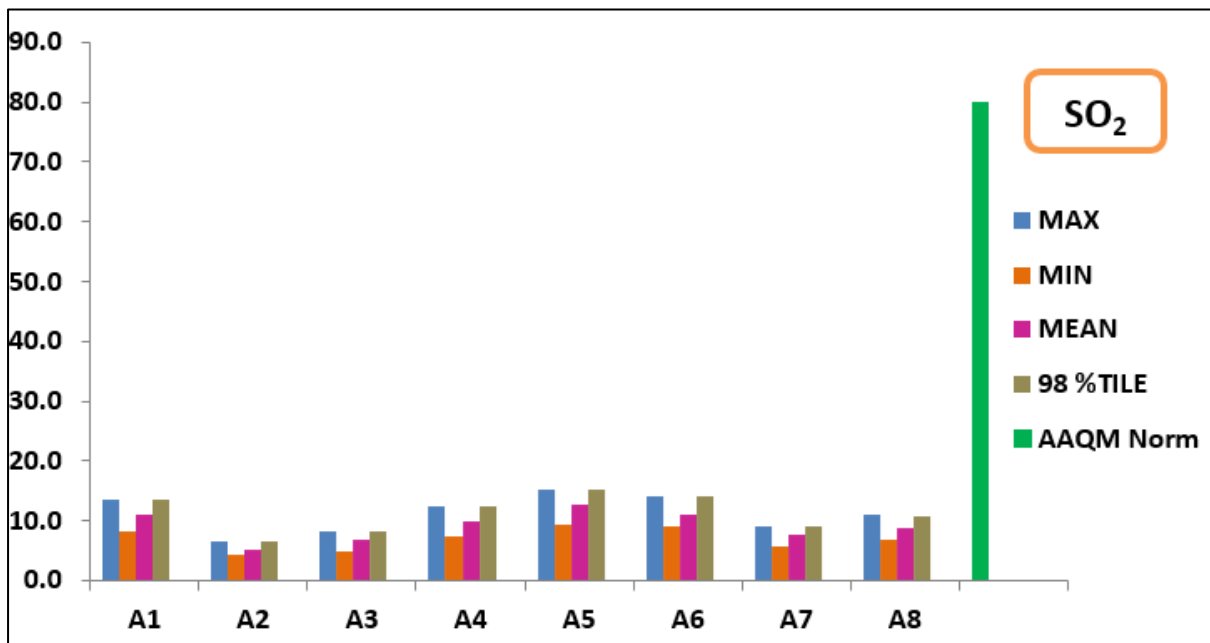
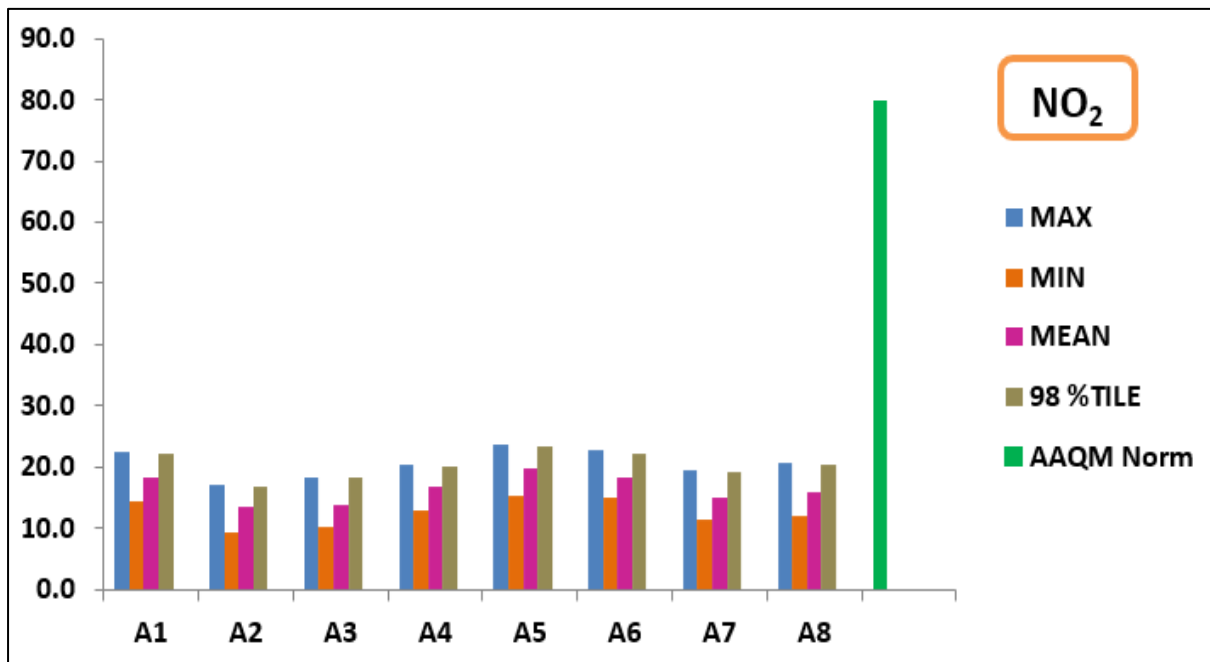
(Source: VardanEnviroLab LLP)

3.4.4 Interpretation

Ambient Air Quality Monitoring for all the 8 AAQM stations reveals that the average value of concentrations of:

- PM₁₀ and PM_{2.5} were found between 27.0 ug/m³ to 47.0 ug/m³ and 11.0 ug/m³ to 25.8 ug/m³ respectively,
- SO₂ and NO_x were found to be between 4.2 ug/m³ to 15.2 ug/m³ and 9.4 ug/m³ to 23.06 ug/m³ respectively,
- CO was found between 0.42 mg/m³ and 0.93 mg/m³,
- Due to proposed expansion, there will be increment in air emissions of the surrounding environment, which shall be mitigated through suitable EMP.
- The baseline data for air quality was compared with Assam Pollution Control Board air quality monitoring data base and the baselines values were observed to be well below the overall air quality data for the area.





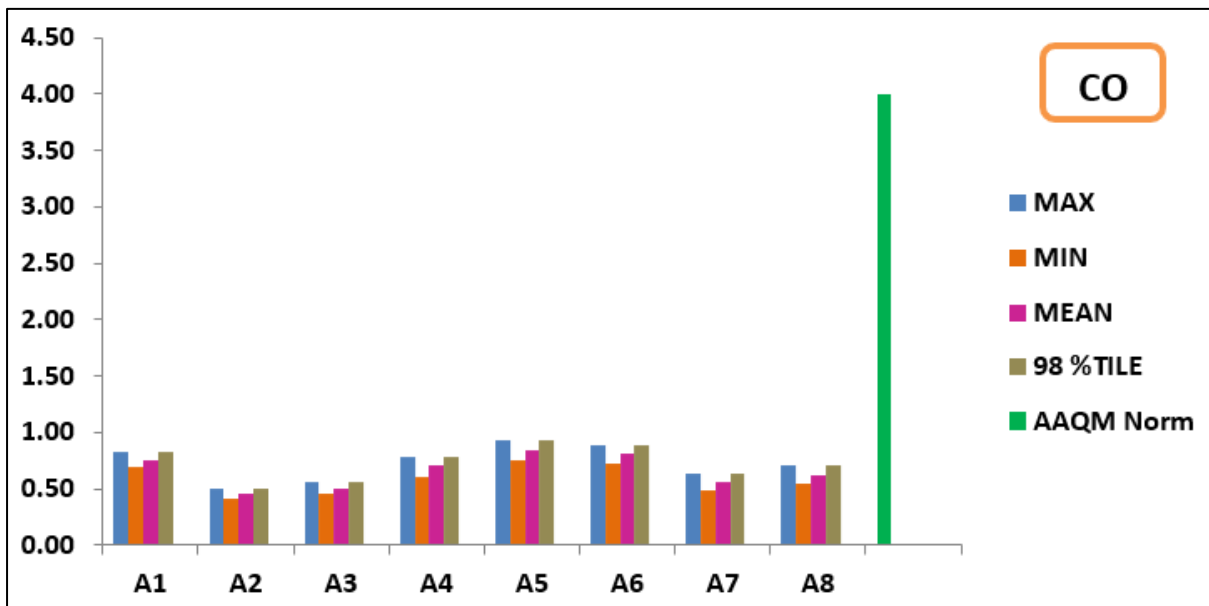


Figure 3-2: Graphs Showing Pollutants Concentration of the Study Area

3.5 NOISE ENVIRONMENT

Noise often defined as unwanted sound, interferes with speech communication, causes annoyance, distraction from work; disturb sleep, thus deteriorating quality of human environment. Noise Pollution survey has therefore been carried out. The acoustical environment varies dynamically in magnitude and character throughout most communities.

To know the baseline noise levels, in and around the project site, noise levels were measured at the project site and at villages in the study area.

3.5.1 Sampling Location

Noise levels were recorded at 8 locations by Sound Level Meter in dB (A). Noise levels were recorded as per IS: 9989 entitled “Assessment of noise with respect to community response” methodology. Noise levels were recorded at approximately 1.5 meter above the ground level and about 3 m away from walls, buildings or other sound reflecting sources. The measurements were carried out 1 m away from the sources and 1 m away from the edge of the roads. To reduce the disturbances from standing waves, the noise levels measurements were averaged over + 0.5 m each of at least three positions. The mean values were taken for reporting. Ambient noise levels were compared with the Noise Pollution (Regulation & Control) Rules, 2000 and subsequent amendments. The Noise Quality Monitoring locations have been presented in **Fig 3.4**.

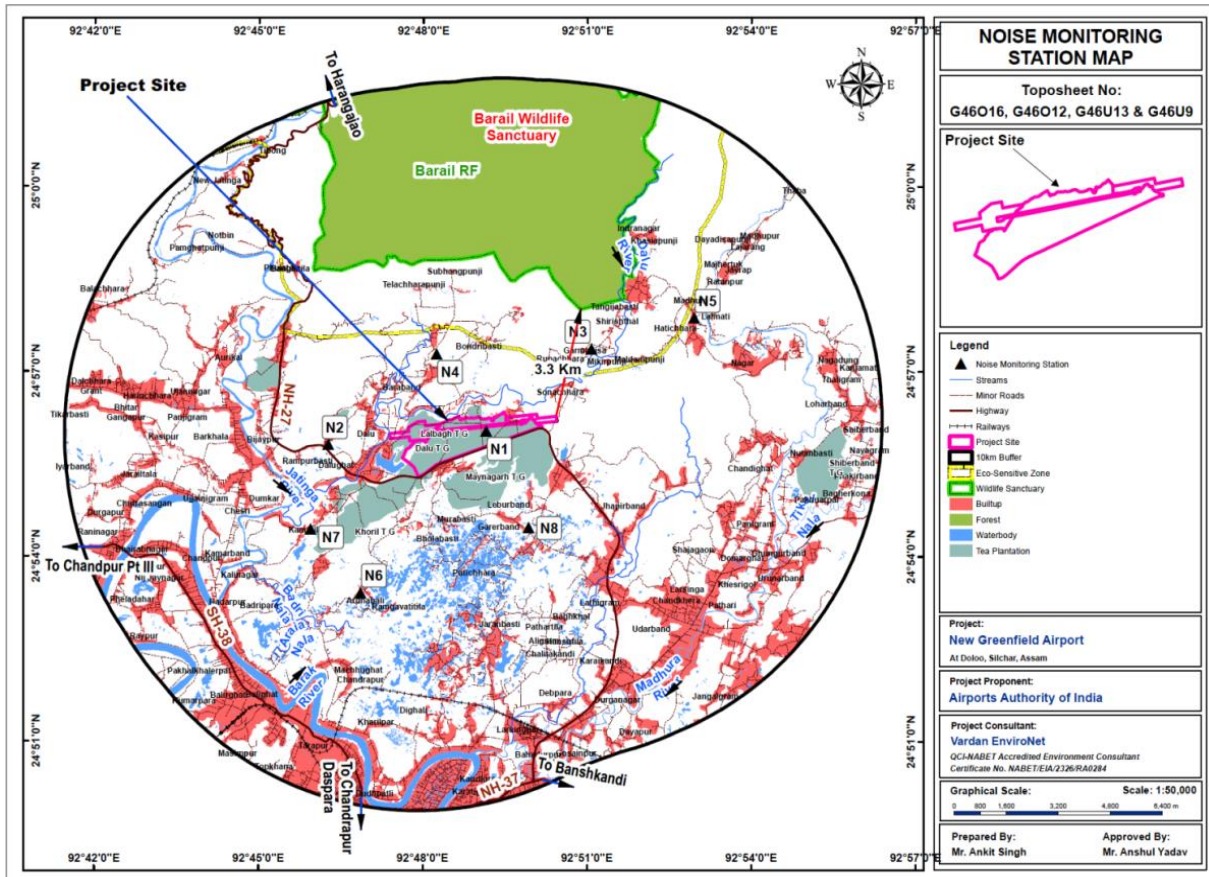


Figure 3-3: Noise Quality Monitoring Location

Table 3-6: Noise Monitoring Sampling Station

Station	Location	Distance	Direction	Latitude	Longitude
N1	Project Site	0	-	24°56'2.33"N	92°49'8.90"E
N2	Boro Rampur	1.92	W	24°55'48.90"N	92°46'16.01"E
N3	Madhurapur Grant	2.08	NE	24°57'22.30"N	92°51'4.36"E
N4	Barabond	2.21	NNW	24°57'17.08"N	92°48'14.61"E
N5	Chandighat Grant	7.35	ENE	24°57'52.27"N	92°52'56.87"E
N6	Dudhpatil Pt II	5.40	SSW	24°53'24.70"N	92°46'51.45"E
N7	Ardvallik	4.40	SW	24°54'26.71"N	92°45'56.53"E
N8	Borodudhpatil Grant	3.18	SSE	24°54'28.23"N	92°49'55.57"E

3.5.2 Methodology of Noise Measurement

For noise measurement calibrated and integrated sound level meter (SLM) Lutron (SL-4001) was used. SLM was mounted on a tripod as per the standard methodology for noise measurements. Special care was taken for not making noises while taking the measurement and ensuring the least amount of reflective surface is exposed from our body to the meter.

Equivalent Sound Pressure Level (Leq) of Day and Night: The Leq is the equivalent continuous sound level, which is equivalent to the same sound energy as the actual

fluctuating sound measured in the same period. This is necessary because sound from noise source often fluctuates widely during a given duration.

$$Leq=L50+ (L10-L90)2/60$$

Lday is defined as the equivalent noise level measured over a period of time during day (6 am to 10 pm). Lnight is defined as the equivalent noise level measured over a period of time during night (10 pm to 6 am). Hourly noise recorded data and Lday values (16 hours) Lnight (8 hours) and Ldn (24 hours) are computed and tabulated.

3.5.3 Data Analysis

The statistical analysis is done for recorded noise levels at 8 locations. The lab results are given in **Annexure-2**. The parameters are analyzed for Leq and are represented in **Table 3.6** and the Leq values are plotted in the **graph (Fig 3.5)**.

Table 3-7: Noise Monitoring Result

S. No.	Locations	Noise Level Leq. dB (A)	
		Day Time	Night Time
1	N1	63.64	53.20
2	N2	51.65	41.24
3	N3	52.66	40.72
4	N4	52.66	41.83
5	N5	50.20	40.25
6	N6	52.98	41.45
7	N7	52.42	42.16
8	N8	52.40	41.32
CPCB Standards			
a.	Residential Area	55.0	45.0
b.	Industrial Area	75.0	70.0
c.	Commercial Zone	65.0	55.0
d.	Silence Zone	50.0	40.0
e.	Other airports excluding proposed airports	65.0	60.0

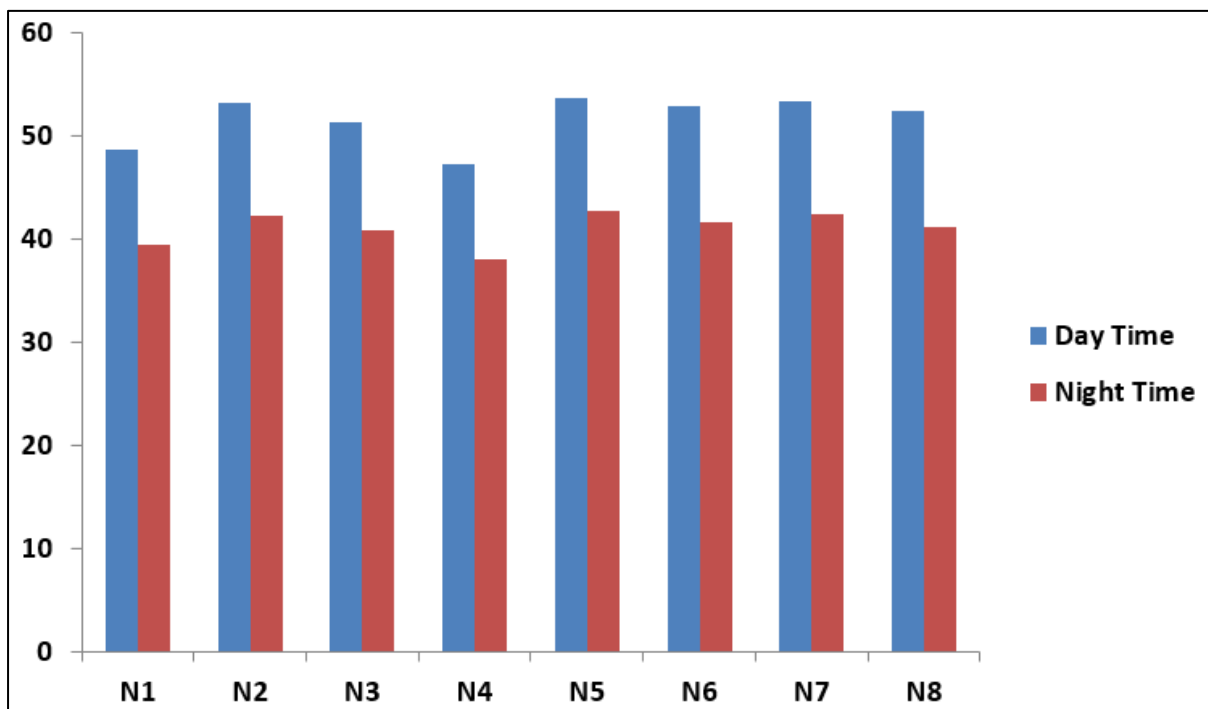


Figure 3-4: Graph Showing Pollutants Concentration of the Study Area

3.5.4 Interpretation

Ambient noise levels were measured at 8 locations around the project site. Minimum and maximum noise levels recorded during the day time were from 47.24 Leq dB to 53.75 Leq dB respectively and minimum and maximum level of noise during night time were 38.12 Leq dB to 42.8 Leq dB respectively. Lab result is attached as **Annexure-2** and noise levels at all locations were observed exceeding the prescribed limits and Ambient Air Quality Standards in respect of Noise is available online.

- Out of all 8 locations measured for noise levels, the Leq at the Boro Rampur site (N2) was found to be higher. The Leq values at this location for day and night time was observed to be 53.75 and 42.8 Leq dB, respectively.
- With the operation of unit, the noise levels near the project site will have some impacts on the nearby areas as it is on slightly higher side. The maximum noise in the instant noise being generated during the Flight operations on runway i.e. while landing and take-off. Mainly due to defense aircraft operations.

The noise levels recorded at all locations were within the ambient noise standards as per the Noise Pollution (Regulation & Control) Rules, 2000.

With the setup of proposed unit, the noise levels inside the project site will have some impacts on the nearby areas.

However, with suitable control measures and EMP, the noise levels will be reduced and the impacts will be minimized.

3.6 SOIL ENVIRONMENT

Soils in the district are deep and well drained, with loamy surface. In the northeastern part, the soils are mainly fine silty to coarse loamy, whereas in southwestern part they are mainly fine to coarse loamy and calcareous (based on Soil Map published by NBSS & LUP).

3.6.1 Soil Quality and Characteristics

The information on soils has been collected from various secondary sources and through primary soil sampling analysis of which is described in this section.

The sampling locations have been finalized with the following objectives:

- To determine the base line characteristics
- To determine the soil characteristics of proposed project site.
- To determine the impact of industrialization/urbanization on soil characteristics.
- To determine the impacts on soils from agricultural productivity point of view.

3.6.2 Sampling Locations

Criteria Adopted for selection of Sampling Locations: For studying the soil types and soil characteristics, 6 sampling locations site were selected to assess the existing soil conditions representing various land use conditions and geological features.

Details of the soil sampling locations are given in **Table 3.7**.

Table 3-8: Soil Sample Monitoring Station

S. No.	Location	Distance	Direction	Latitude	Longitude
S1	Project Site	0	-	24°55'59.49"N	92°48'57.46"E
S2	Dhumkar Village	4.63	SW	24°54'50.99"N	92°45'27.81"E
S3	Boro Rampur	3.82	SW	24°55'28.98"N	92°46'46.27"E
S4	Masughat	8.04	SSW	24°52'12.06"N	92°46'10.47"E
S5	Dalu Grant	1.12	NNE	24°56'32.99"N	92°49'12.47"E
S6	Gorer Bond Pt II	1.92	S	24°54'37.92"N	92°48'55.14"E

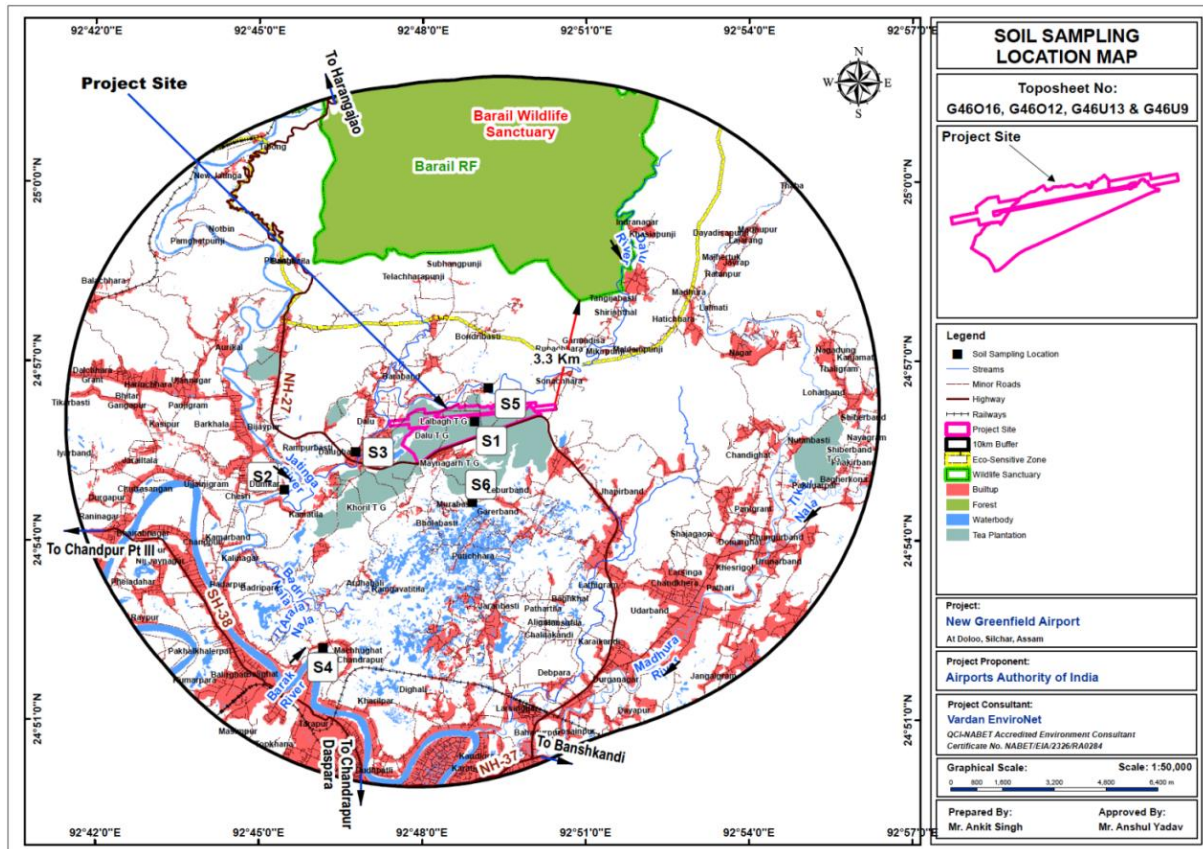


Figure 3-5: Soil Sampling Stations

3.6.3 Methodology

Soil Sampling was carried out at five sites to understand the soil quality. Meticulous attention was paid to collect adequate amount of composite soil samples for analysis. After removing the surface vegetation cover, visible roots, plant litter, gravel, plastic materials, and other foreign materials. Samples were collected by using Agar at a depth of 30 cm. The samples were packed in dependable, waterproof zip lock pouch bag and was marked specifically, accurately, and distinctly and brought to the laboratory for testing. This will establish the baseline characteristics and facilitate to identify contamination if any.

3.6.4 Data Analysis

Table 3-9: Soil Analysis Results

S. No	Parameter	Result (S1)	Result (S2)	Result (S3)	Result (S4)	Result (S5)	Result (S6)
1.	pH (at 25°C)	7.15	7.20	7.54	7.26	7.55	7.59
2.	Conductivity (mS/cm)	0.236	0.310	0.264	0.242	0.239	0.286
3.	Soil Texture (%)	Sand - 45	Sand - 48	Sand - 46	Sand - 44	Sand - 51	Sand - 47
		Silt - 36	Silt - 41	Silt - 37	Silt - 39	Silt - 35	Silt - 38
		Clay - 19	Clay - 11	Clay - 17	Clay - 17	Clay - 14	Clay - 15

4.	Color	Yellowish Brown	Yellowish Brown	Yellowish Brown	Yellowish Brown	Yellowish Brown	Yellowish Brown
5.	Water holdin capacity (%)	35.59	38.18	37.13	35.75	38.35	35.81
6.	Bulk density (gm/cc)	1.41	1.45	1.67	1.55	1.58	1.46
7.	Chloride as Cl (mg/100g)	16.76	26.22	16.35	27.01	25.96	25.22
8.	Calcium as Ca(mg/100g)	91.40	96.06	99.54	91.75	86.11	84.76
9.	Sodium as Na (mg/kg)	141.95	47.76	150.00	141.64	143.98	162.50
10.	Potassium as K (kg/hect.)	163.15	161.5	142.5	138.5	161.30	140.00
11.	Organic Matter (%)	0.58	0.56	0.90	0.72	0.90	0.94
12.	Magnesium as Mg (mg/100g)	4.14	7.42	6.28	7.25	7.76	7.93
13.	Available Nitrogen as N (kg/ha)	176.15	164.83	162.79	195.15	186.14	167.75
14.	Available Phosphorus (kg/ha)	20.03	21.61	17.12	28.76	28.32	29.15
15.	Zinc as Zn (mg/kg)	24.93	27.74	26.66	27.76	24.98	31.58
16.	Manganese (as Mn) (mg/kg)	91.95	83.25	90.26	85.23	84.18	88.92
17.	Lead (as Pb) (mg/kg)	1.94	1.84	1.87	1.97	1.90	1.22
18.	Cadmium (as Cd)(mg/kg)	*BLQ (**LOQ - 0.5)	*BLQ (**LOQ - 0.5)	*BLQ (**LOQ - 0.5)	*BLQ (**LOQ - 0.5)	*BLQ (**LOQ - 0.5)	*BLQ (**LOQ - 0.5)
19.	Chromium (as Cr) (mg/kg)	1.60	2.46	1.03	1.17	1.30	1.41
20.	Copper (as Cu) (mg/kg)	20.61	22.80	21.93	22.91	24.74	23.51

3.6.5 Observations

The analysis results show that soil is basic in nature as pH value ranges from 7.15 to 7.59 with organic matter 0.58% to 0.94%. The concentration of Nitrogen (162.79 Kg/ha. to 195.15 Kg/ha), Phosphorus (17.12 Kg/ha. to 29.15 Kg/ha) and Potassium (140.00 Kg/ha. to 163.15 Kg/ha) has been found to be in good amount in the soil samples. The consumption of fertilizers is as important factor as their production. There should be appropriate balance in the consumption of different fertilizer nutrients. Soil Quality data attached as **Annexure-2**.

3.6.6 Interpretation

- The analysis results show that soil is Slight to Moderate Alkaline in nature as pH



value ranges from 7.15 to 7.59 with organic matter 0.58% to 0.94%.

- The concentration of Nitrogen is recorded in the range of 162.79 Kg/ha. to 195.15 Kg/ha., indicating the soils have good to better quantity of Nitrogen.
- The concentration of Phosphorus is recorded in the range of 17.12 Kg/ha. to 29.15 Kg/ha., indicating the soils have less to medium quantity of Phosphorus.
- The concentration of Potassium is recorded in the range of 140.00 Kg/ha. to 163.15 Kg/ha which shows that the soils have less to medium quantity of potassium.

3.7 WATER ENVIRONMENT

The impact has been assessed on randomly selected surface and ground water sources falling within the impact zone. To assess the existing water quality, the Ground water samples were collected from 6 different locations and Surface Water quality from 5 locations within the study area and analysed it as per the procedure specified in standard methods for examination of water and wastewater published by American Public Health Association and Bureau of Indian Standards (APHA/BIS).

Monitored values have been used for describing the water environment and assessing the impacts on it. To assess the water quality impacts, water resources in the impact area have been grouped into 2 classes.

- Ground water resources in the deeper strata of the ground
- Surface water resources

3.7.1 Sampling Locations

Ground Water: 6 ground water samples were collected from the study area to assess the water quality during the study period. The ground water samples were drawn from the hand pumps and open wells being used by the villagers for their domestic needs. The details of the locations are given in below tables:

Table 3-10: Ground Water Sampling Stations

Station	Location	Distance	Direction	Latitude	Longitude
GW1	Boro Rampur	3.65	WSW	24°55'22.54"N	92°46'42.87"E
GW2	Hatichara	2.95	SE	24°55'21.35"N	92°50'23.89"E
GW3	Dalu Grant	1.99	NW	24°56'55.23"N	92°48'5.25"E
GW4	Niz- Borkhola Pt II	6.43	W	24°55'44.40"N	92°44'47.33"E
GW5	Madhurapur Grant	4.18	NE	24°57'21.79"N	92°50'55.47"E
GW6	Masimpur Pt II	5.68	SW	24°53'55.33"N	92°46'10.82"E

Surface Water: 7 Surface water sampling was carried out from distributary and pond present within 10 Km of the project site. The details of the locations are given in below tables. Surface water sampling locations is given in **Table 3.10**.

Table 3-11: Surface Water Sampling Stations

Station	Location	Distance	Direction	Latitude	Longitude
SW1	Jatinga River (Downstream)	5.06	SW	24°54'44.43"N	92°45'14.67"E
SW2	Jatinga River (Upstream)	4.84	W	24°55'35.43"N	92°45'6.73"E
SW3	Doloo Lake	0.4	SW	24°55'33.91"N	92°47'25.58"E
SW4	Barak River (Upstream)	8.68	WSW	24°54'57.29"N	92°43'25.89"E
SW5	Barak River (Downstream)	9.16	SW	24°53'36.96"N	92°43'54.95"E
SW6	Madhura River (Upstream)	8.78	SE	24°52'59.42"N	92°53'7.91"E
SW7	Madhura River (Downstream)	9.07	SE	24°52'33.01"N	92°52'54.34"E

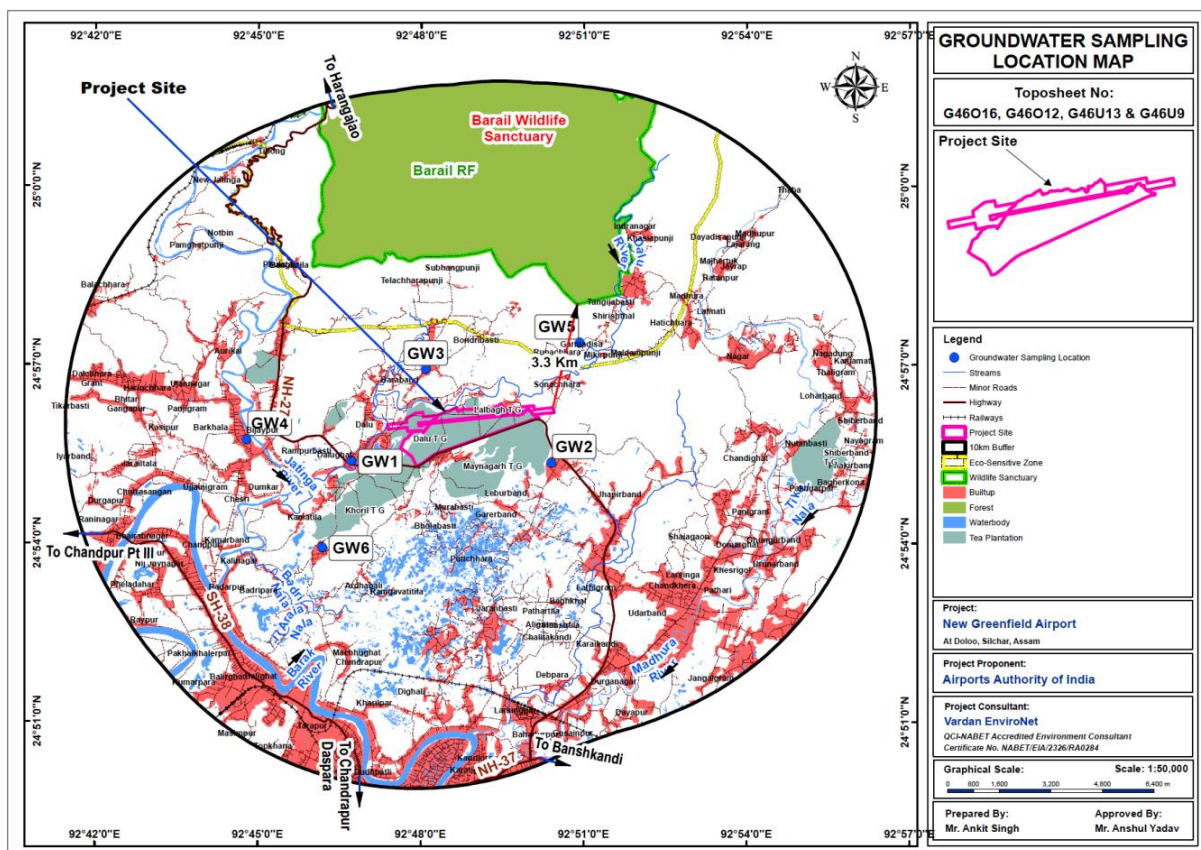


Figure 3-6: Ground Water Sampling Station Map

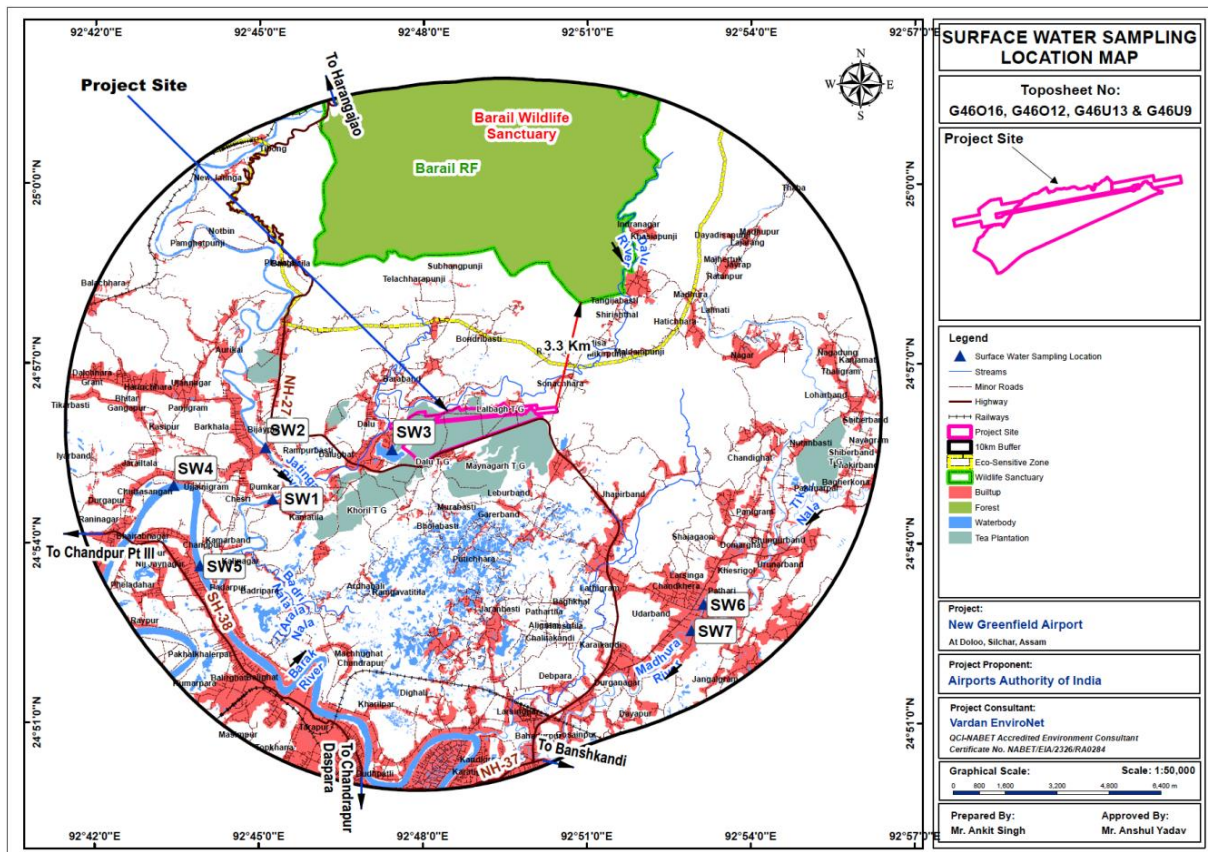


Figure 3-7: Surface Water Sampling Station Map

3.7.2 Methodology and Sampling

The water samples were collected accordingly IS 3025 (Part-1): 1987 (Reaffirmed 2019). The following procedures were used while water sampling: Before collection of water the bottles/cans are washed 2-3 times with the same water. For surface water, bottles were lowered to a minimum depth of 30 cm below water surface by using depth sampler. The samples were collected in a sterile sampling container for microbiological analysis. At each point, different sets of water samples were collected to cover all the parameters. Dissolved Oxygen is fixed and analysed in the field itself. Appropriate preservatives are added, depending upon the elements to be analysed, and marked. All the water samples collected and stored in the ice box and immediately transported to the laboratory.

3.7.3 Data Analysis

Table 3-12: Ground Water Analysis Results

S.no	Parameter	GW1	GW2	GW3	GW4	GW5	GW6	Desirable Limit	Permissible Limit
1.	pH (at 25°C)	7.88	7.65	7.51	7.72	7.76	7.85	6.5 to 8.5	No Relaxation
2.	Colour	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	5	15
3.	Turbidity	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	*BLQ (**LOQ-1.0)	1	5
4.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
6.	Total Hardness as CaCO ₃	157	153	148	150	155	157	200	600
7.	Calcium as Ca	33.91	34.67	30.2	34.8	31.25	31.68	75	200
8.	Alkalinity as CaCO ₃	110.66	165.28	192.09	193.73	221.17	146.3	200	600
9.	Chloride as Cl	43.37	77.64	46.46	40.59	50.06	85.75	250	1000
10.	Cyanide as CN	*BLQ (**LOQ-0.02)	*BLQ (**LOQ-0.02)	*BLQ (**LOQ-0.02)	*BLQ (**LOQ-0.02)	*BLQ (**LOQ-0.02)	*BLQ (**LOQ-0.02)	0.05	No Relaxation
11.	Magnesium as Mg	17.55	16.11	17.61	15.30	18.68	18.90	30	100
12.	Total Dissolved Solids	213	222	215	222	218	221	500	2000
13.	Sulphate as SO ₄	25.96	23.28	28.04	24.59	28	26.21	200	400
14.	Fluoride as F	0.3	0.31	0.47	0.38	0.46	0.33	1	1.5
15.	Nitrate as NO ₃	9.29	9.18	10.31	10.03	10.9	10.88	45	No Relaxation
16.	Iron as Fe	0.15	0.22	0.18	0.13	0.13	0.23	1	No relaxation
17.	Aluminium as Al	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	0.03	0.2

18.	Boron	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	0.5	2.4
19	Chromium as Cr	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	0.05	No Relaxation
20.	Phenolic Compounds	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	0.001	0.002
21.	Mineral Oil	*BLQ (**LOQ-0.1)	*BLQ (**LOQ-0.1)	*BLQ (**LOQ-0.1)	*BLQ (**LOQ-0.1)	*BLQ (**LOQ-0.1)	*BLQ (**LOQ-0.1)	1	No Relaxation
22.	Anionic Detergents as MBAS	*BLQ (**LOQ-0.05)	*BLQ (**LOQ-0.05)	*BLQ (**LOQ-0.05)	*BLQ (**LOQ-0.05)	*BLQ (**LOQ-0.05)	*BLQ (**LOQ-0.05)	0.2	1
23.	Zinc as Zn	1.45	1.39	1.47	1.54	1.69	1.29	5	15
24.	Copper as Cu	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	0.05	1.5
25.	Manganese as Mn	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	*BLQ (**LOQ-0.01)	0.1	0.3
26.	Cadmium as Cd	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	0.003	No Relaxation
27.	Lead as Pb	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	*BLQ (**LOQ-0.002)	0.01	No Relaxation
28.	Selenium as Se	*BLQ (**LOQ-0.001)	*BLQ (**LOQ-0.001)	*BLQ (**LOQ-0.001)	*BLQ (**LOQ-0.001)	*BLQ (**LOQ-0.001)	*BLQ (**LOQ-0.001)	0.01	No Relaxation
29.	Arsenic as As	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	*BLQ (**LOQ-0.005)	0.01	No Relaxation
30.	Mercury as Hg	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	*BLQ (**LOQ-0.0005)	0.001	No Relaxation
31.	Total Coliform	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	-	
32.	E. Coli	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	< 1.8	-	

Table 3-13: Surface Water Analysis Results

S.No	Parameter	SW1	SW2	SW3	SW4	SW5	SW6
1.	pH (at 25°C)	7.65	7.44	7.72	7.78	7.56	7.60
2.	Colour (Hazen)	10.00	8.00	17.00	13.00	11.00	22.00
3.	Turbidity (NTU)	64.00	55.00	67.00	66.00	60.00	63.00
4.	Odour	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
5.	Total Hardness as CaCO ₃ (mg/l)	288.00	216.00	281.00	280.00	284.00	288.00
6.	Calcium as Ca (mg/l)	94.29	96.94	94.92	86.79	96.5	93.75
7.	Alkalinity as CaCO ₃ (mg/l)	235.49	264.25	273.77	293.66	255.02	265.54
8.	Chloride as Cl (mg/l)	150.62	160.31	138.36	88.21	81.62	139.29
9.	Residual free Chlorine(mg/l)	*BLQ(**LOQ-0.15)	*BLQ(**LOQ-0.15)	*BLQ(**LOQ-0.15)	*BLQ(**LOQ-0.15)	*BLQ(**LOQ-0.15)	*BLQ(**LOQ-0.15)
10.	Cyanide as CN (mg/l)	*BLQ(**LOQ-0.02)	*BLQ(**LOQ-0.02)	*BLQ(**LOQ-0.02)	*BLQ(**LOQ-0.02)	*BLQ(**LOQ-0.02)	*BLQ(**LOQ-0.02)
11.	Magnesium as Mg (mg/l)	12.70	6.40	10.61	15.31	10.38	13.03
12.	Total Dissolved Solids (mg/l)	442	397	469	480	679	549
13.	Total Suspended solids(mg/l)	62.00	51.00	62.00	62.00	55.00	61.00
14.	Dissolved Oxygen(mg/l)	5.9	5.7	5.6	5.3	5.1	4.3
15.	Sulphate as SO ₄ (mg/l)	48.82	42.28	57.79	56.52	74.46	46.06
16.	Fluoride as F (mg/l)	0.56	0.52	0.50	0.35	0.33	0.37
17.	BOD (3 Days at 270C)	20.00	21.00	24.00	25.00	29.00	38.00
18.	COD(mg/l)	78.00	62.00	74.00	82.00	74.00	72.00
19.	Conductivity (µS/cm)	0.735	0.674	0.784	0.798	1.114	0.925
20.	Nitrate as NO ₃ (mg/l)	44.10	58.03	57.24	96.02	41.89	104.17
21.	Sodium as Na(mg/l)	189.45	86.41	144.61	145.10	123.86	159.81
22.	Potassium as K(mg/l)	12.4	12.34	13.5	10.4	13.8	12.54
23.	Iron as Fe (mg/l)	0.41	0.59	0.68	0.60	0.35	0.66
24.	Aluminium as Al (mg/l)	*BLQ(**LOQ-0.005)	*BLQ(**LOQ-0.005)	*BLQ(**LOQ-0.005)	*BLQ(**LOQ-0.005)	*BLQ(**LOQ-0.005)	*BLQ(**LOQ-0.005)
25.	Boron (mg/l)	0.22	0.25	0.23	0.36	0.27	0.26
26.	Chromium as Cr(mg/l)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)

27.	Phenolic Compounds(mg/l)	*BLQ(**LOQ-0.0005)	*BLQ(**LOQ-0.0005)	*BLQ(**LOQ-0.0005)	*BLQ(**LOQ-0.0005)	*BLQ(**LOQ-0.0005)	*BLQ(**LOQ-0.0005)
28.	Mineral Oil(mg/l)	*BLQ(**LOQ-0.1)	*BLQ(**LOQ-0.1)	*BLQ(**LOQ-0.1)	*BLQ(**LOQ-0.1)	*BLQ(**LOQ-0.1)	*BLQ(**LOQ-0.1)
29.	Anionic Detergents as MBAS (mg/l)	*BLQ(**LOQ-0.05)	*BLQ(**LOQ-0.05)	*BLQ(**LOQ-0.05)	*BLQ(**LOQ-0.05)	*BLQ(**LOQ-0.05)	*BLQ(**LOQ-0.05)
30.	Zinc as Zn (mg/l)	1.94	1.61	2.31	1.52	2.23	1.69
31.	Copper as Cu (mg/l)	0.12	0.22	0.20	0.24	0.27	0.27
32.	Manganese as Mn (mg/l)	*BLQ(**LOQ-0.01)	*BLQ(**LOQ-0.01)	*BLQ(**LOQ-0.01)	*BLQ(**LOQ-0.01)	*BLQ(**LOQ-0.01)	*BLQ(**LOQ-0.01)
33.	Cadmium as Cd (mg/l)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)	*BLQ(**LOQ-0.002)
34.	Total Coliform (MPN/100ml)	700	1200	840	940	920	1100
35.	Fecal Coliform(MPN/100ml)	490	840	540	580	470	700

3.7.4 Observations

Analysis results of ground water reveal the following:

- pH varies from 7.51 to 7.88
- Total Hardness varies from 148 mg/l to 157 mg/l.
- Total Dissolved Solids varies from 213 mg/l to 222 mg/l.

Analysis results of surface water reveal the following:

- pH varies from 7.44 to 7.78
- Total Hardness varies from 216.0 to 288.0 mg/l.
- Total Dissolved Solids varies from 397 mg/l to 679 mg/l.
- BOD varies from 20 to 38(mg/l)
- COD varies from 62 to 82 (mg/l)

3.7.5 Interpretation

- All the toxic substances like Selenium, Arsenic, Cadmium, Lead, cyanide, Mercury in ground water samples were found below the detection limits indicating water free from any industrial pollution. Absence E-coli at all sampling locations in ground water samples depicts that no interception of untreated sewage in the groundwater table within the study area.
- The surface water quality data indicates that surface water samples fall under Class C classification, which means that water sources that must undergo special or intensive treatment, such as activated carbon adsorption, ion exchange, and reverse osmosis, etc., before they may be used as public water source.
- In study area, water quality has been observed not to vary considerably between the sampling locations. Mostly the parameters fall within the permissible limits of drinking water standards.

3.8 LAND USE AND LAND COVER

GIS and Remote Sensing technology has emerged as a powerful tool in providing reliable information on various natural resources at different levels of spatial details. It has played an important role in effective mapping and periodic monitoring of natural resources including environment.

With the availability of high-resolution remote sensing data, newer areas of remote sensing applications have been identified, techniques of data processing have been improved and computer-based image processing systems have become more effective. Based on this application, the land use and land cover studies refer to man's activities on land, utilitarian in nature whereas land cover denotes the vegetation cover, water body cover and artificial constructions etc.

Objective: The objectives of Land use studies are:

- To determine the present land use pattern as per EIA/EMP norms by MoEFCC.
- To determine the drainage pattern, present in the study area

- Data Used
- Remote sensing data
- Sentinel 2A
- SRTM-1 Arc Second Global Data

3.8.1 Sampling Location

Land Use of Study Area: The land use & land cover map of the 10 km radius study area from the periphery of project site has been prepared using Sentinel 2A satellite image having 10 m spatial resolution. Land use pattern of the study area was carried out by standard methods of analysis of remotely sensed data and followed by ground truth collection and interpretation of satellite data. The outcome of land use study is presented below in subsequent tables and figures.

Collateral Data: The study area comprises 10km around the project site. The study area is falling in G46O16, G46O12, G46U13 & G46U9 Survey of India Topographic sheet (1:50,000 Scale).

3.8.2 Methodology

Salient features of the adopted methodology are given below:

- Acquisition of satellite data
- Preparation of base map from Survey of India toposheets
- Data analysis using visual interpretation techniques
- Ground truth studies or field checks using GPS
- Finalization of the map
- Digitization using head up vectorisation method
- Topology construction in GIS
- Area calculation for statistics generation

The spatial resolution and the spectral bands in which the sensor collects the remotely sensed data are two important parameters for any land use survey. Sentinel 2A provides a ground resolution of 10 m. The shapes, sizes, colours, tone, and texture of several geomorphic features are visible in the data.

Three 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, sentinel 2A data has been used for land use mapping.

The digital image processing was performed on ERDAS IMAGINE 2014 and ArcGIS 10.5 software system on high-configured computer. The software package is a collection of image processing functions necessary for pre-processing, rectification, band combination, filtering, statistics, classification etc.

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.

Unsupervised 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:

- Acquisition of ground truth
- Calculation of the statistics of training area
- 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 Colour Composite (FCC) of LANDSAT- ETM+ satellite imagery having 15m spatial resolution satellite data and SOI toposheet at 1:50,000 scale was used for pre-field interpretation work. Taking the help of toposheets and by using the image elements, the features were identified. Each feature was identified on image by their image elements like tone, texture, colour, 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 land use/land cover feature cum image characteristics. Map 3.10 shows the FCC of 10 km radius of LANDSAT- ETM+ imagery.

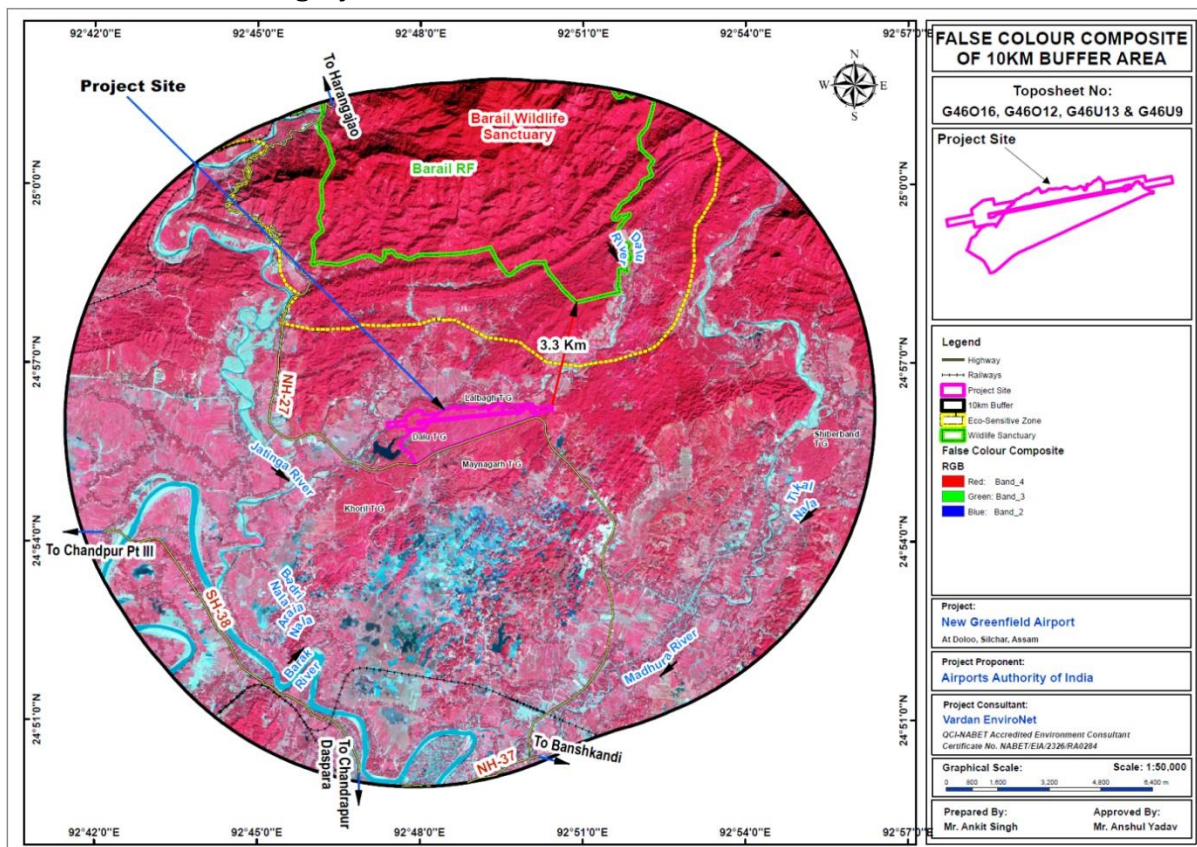


Figure 3-8: FCC Map of the Study Area

Both toposheets and imagery were carried for field verification and a transverse plan using existing road network was made to cover as many representative sample areas as possible to observe the broad land use features and to adjust the sample areas according to field conditions. Detail field observations and investigations were carried out and noted the land use features on the imagery.

Ground Truth Collection: Both toposheets and imagery were carried for field verification and a transverse plan using existing road network was made to cover as many representative sample areas as possible to observe the broad land use features and to adjust the sample areas according to field conditions. Detail field observations and investigations were carried out and noted the land use features on the imagery.

Post Field Work for Land Use/Land Cover Classification: The base maps of the study area were prepared, with the help of Survey of India Toposheets on 1:50,000 scale. Preliminary interpreted land use and land cover features boundaries from Sentinel 2A having 10m spatial resolution, False Colour Composite were modified considering field information and the final thematic details were transferred onto the base maps. The final interpreted and classified thematic map was cartograph. The cartograph map was categorically differentiate with standard colour coding and described features with standard symbols. All the classes were identified and marked by the standard legend on the map. The following Land Cover classes were derived and classified as under:

1. Agricultural Land
2. Barren Land
3. Built-up
4. Industry
5. Open Scrub
6. Forest
7. Sandy Area
8. Waterbody

3.8.3 Interpretation of Land Use/Land Cover Classification

The Land Cover classes were extracted following a visual interpretation method or on-screen digitization of the Imagery Sentinel 2A having 10m spatial resolution image. These were later verified by using SOI toposheet and Google Earth imagery. Polygon layers for each class were digitized and the respective areas were calculated. The Land Cover classes and their coverage can be seen in the following **Table 3.13** and its distribution is shown in **Fig. 3.11**. Total seven major land use/ land cover classes were demarcated in the study area and a thematic map of 1:50,000 scales were generated incorporating these classified categories considering the area of the project.

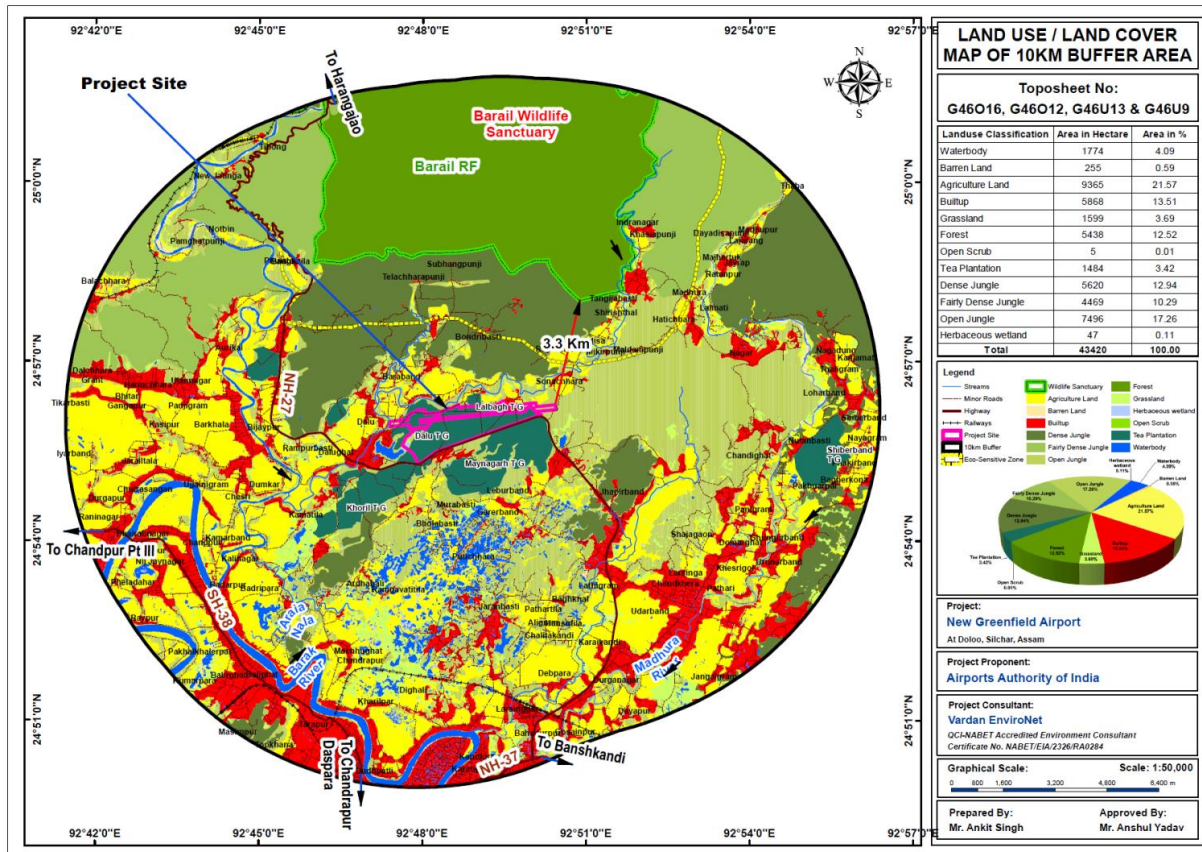


Figure 3-9: LU/LC details of 10 km Radius

Table 3-14: Land Use Pattern of the Study Area

S. No.	Landuse Classification	Area in Ha.	Area in %
1.	Waterbody	1774	4.09
2.	Barren Land	255	0.59
3.	Agriculture Land	9365	21.57
4.	Builtup	5868	13.51
5.	Grassland	1599	3.69
6.	Forest	5438	12.52
7.	Open Scrub	5	0.01
8.	Tea Plantation	1484	3.42
9.	Dense Jungle	5620	12.94
10.	Fairly Dense Jungle	4469	10.29
11.	Open Jungle	7496	17.26
12.	Herbaceous wetland	47	0.11
	Total	43420	100.00

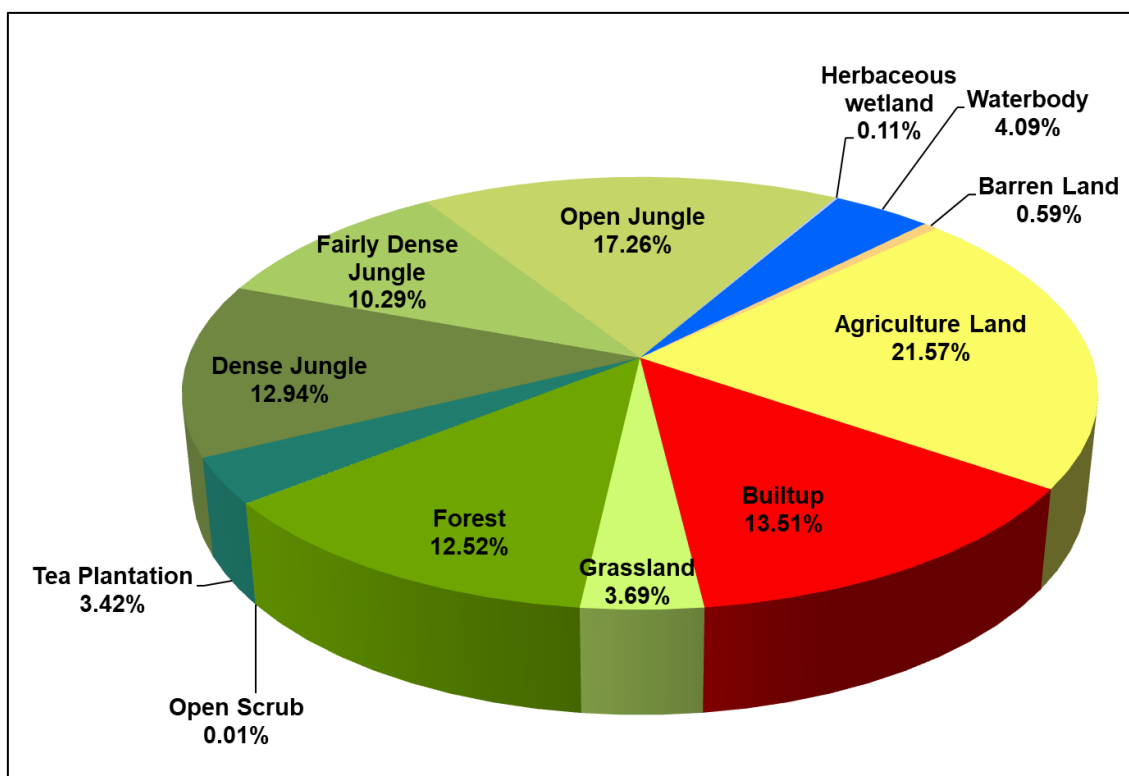


Figure 3-10: Pictorial Representation of Land Use Classification

From the Table 3.14, it has been depicted that total seven major land use/land cover classes were demarcated in the study area.

- 1) **Waterbody:** The water bodies cover around 1774 ha. (4.09%).
- 2) **Barren Land:** The barren land cover is around 255 ha. (0.59%).
- 3) **Agriculture Land:** The coverage of agricultural land is 9365 ha. (21.57%).
- 4) **Builtup:** The residential area is a land used in which housing predominates. The residential areas cover about 5868 ha. (13.51%).
- 5) **Grassland:** The coverage of grassland is 1599 ha. (3.69%).
- 6) **Forest:** The forest land covers around 5438 ha. (12.52%).
- 7) **Open Scrub:** The coverage of Scrub Land is around 5 ha. (0.01%).
- 8) **Tea Plantation:** The study area also has tea plantataion cover of around 1484 h. (3.42%).
- 9) **Dense Jungle:** The dense jungle is around 5620 ha. (12.94%).
- 10) **Fairly Dense Jungle:** The fairly-dense jungle is around 4469 .ha. (10.29%).
- 11) **Open Jungle:** The open jungle is around 7496 ha. (17.26%).
- 12) **Herbaceous wetland:** The herbaceous wetland is around 47 ha. (0.11%).

Drainage Details of 10 km radius:

District of Meerut is drained by Hindan River, Karsuni Nadi and many other drainages in study area are Sardhana Drain, Right Salawa Distributary, Karnawal Minor, Rasulpur Minor, Upper Ganga Canal in the 10 km radius from the project site. There is no natural lake in the district. Seasonal ponds emerge during rainy season and shrink dry during summer, the drainage map of the 10 km buffer zone is showing major drainage network in study area.

Elevation Details of 10 km radius:

The contour map has been prepared by taking the elevation information by using Survey of India toposheet no. H43X5, H43X9, H43R8 & H43R12 and also using the help of satellite data SRTM-1 Arc Second Global Data with 30 m spatial resolution with respect to Google Earth imagery information and contour has been generated at 10 m intervals as depicted in Fig. 3.14. The 10 km radius of the proposed project area is confined within 230 meter above MSL (mean sea level) as derived from DEM data.

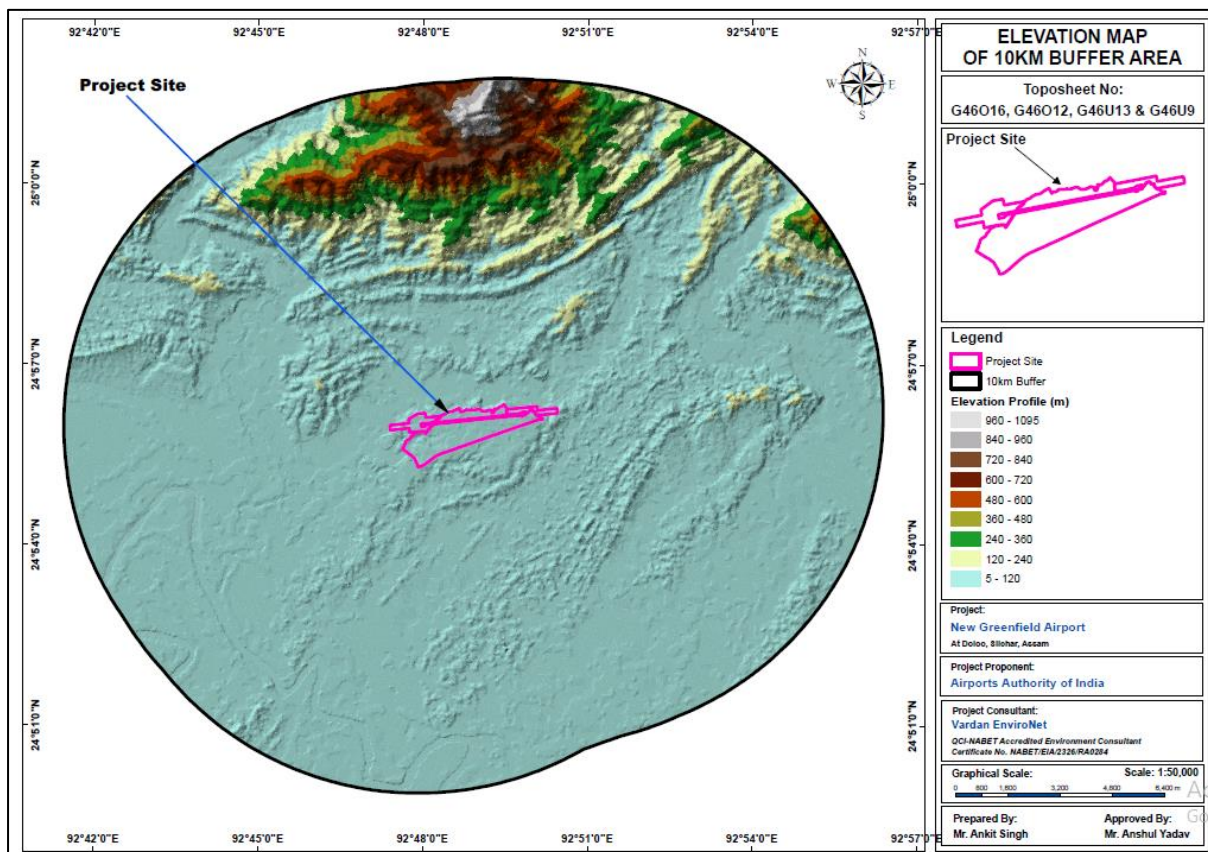


Figure 3-11: Elevation Map of the Study Area

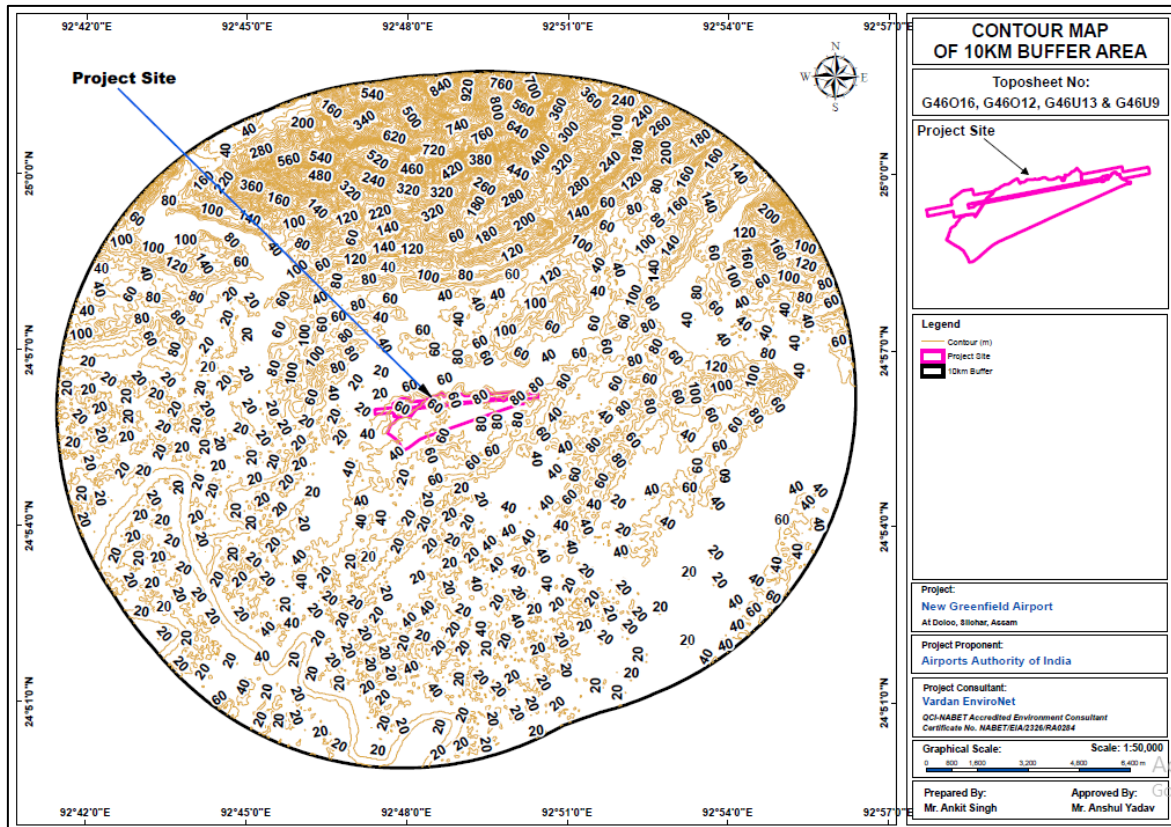


Figure 3-12: Contour Map of the Study Area

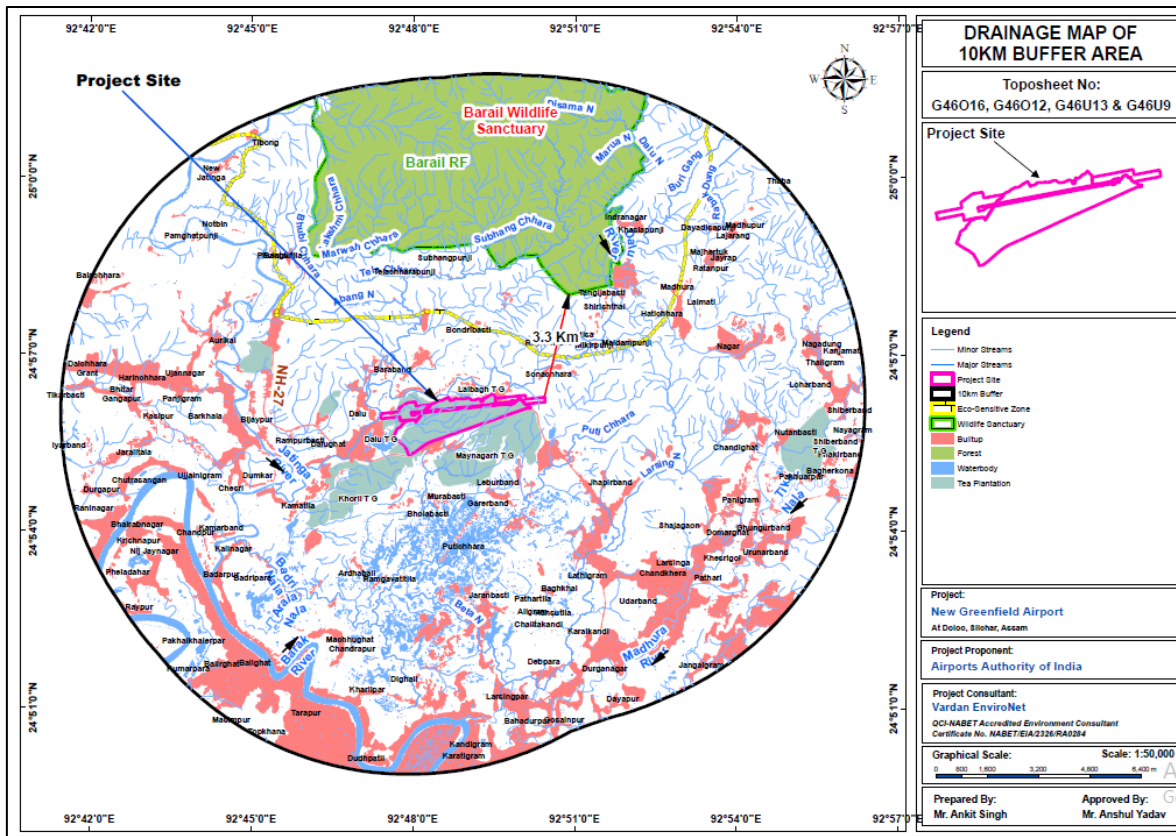


Figure 3-13: Drainage Map of the Study Area

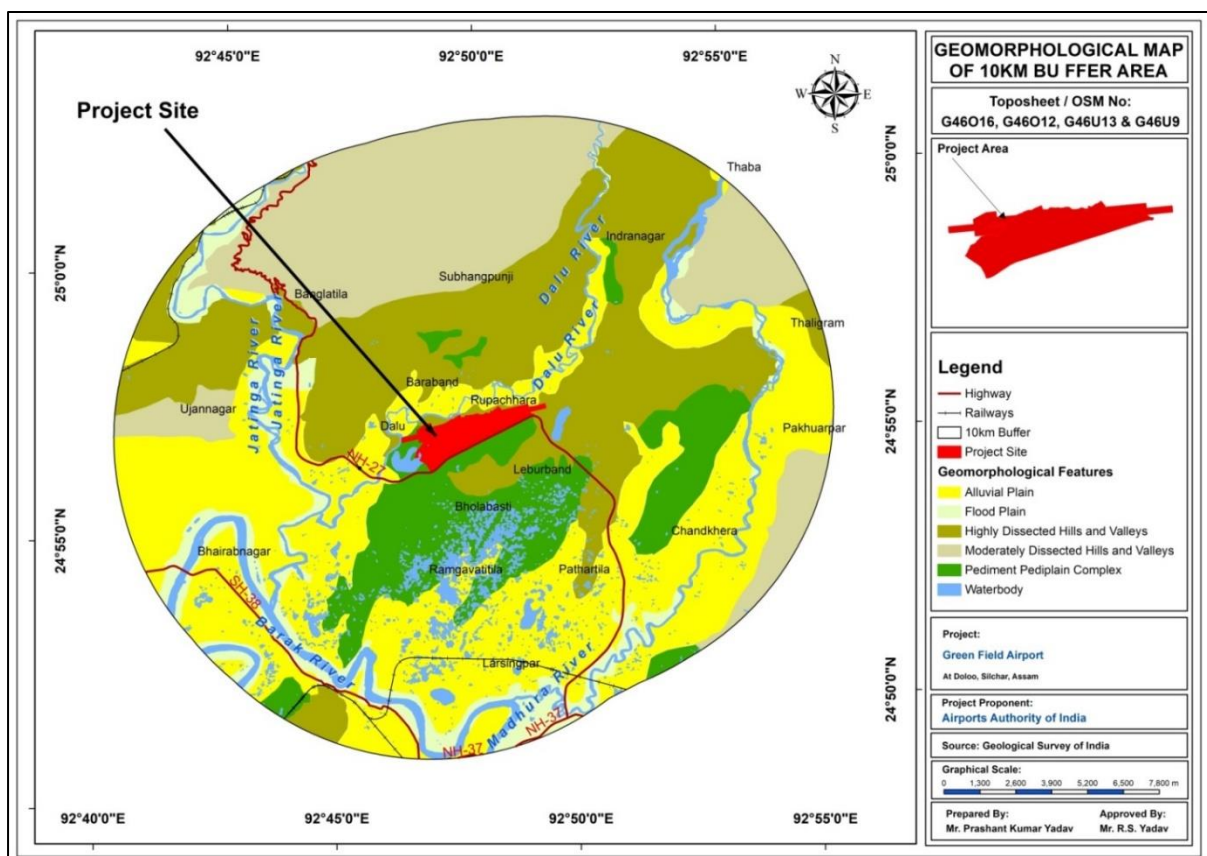


3.9 GEOLOGY

3.9.1 Geomorphology

The major geomorphic features observed in the area are both structural and topographic highs and flats and are in accordance with the normal first order structural elements suggesting comparatively recent orogenic movement in the area and immature topography. The “highs” comprise areas of Barak, Sonai and Katakhal reserve forests. The total area occupied by the hills is 750 sq. km and the maximum height attained by the anticlinal hills is 512 meters above mean sea level in the Barak reserve forest. It is observed that the central part of these hill ranges which have a north-south trend show the highest elevation. The ‘flats’ essentially form the central portion of the area and can be called Silchar- Dhalai and Hailakandi- Lala synclinal valleys. The total area occupied by these flat valleys is 900 sq km. The average elevation of the plains is 30m above mean sea level. The valleys are broad and flat with low to moderate Bed Relief index (Mathur and Evans, 1964). The southern foot of E-W running Barail ranges forms the low lying hilly terrain to the north of Barak River. It is intervened by broad valleys like Dalu and Madhura. One salt spring at Noonkhuli near Lalmati area, Srikona is reported from the area. Gas seepages are associated with the spring and are found within the Bhuban Formation of Surma Group and along the fault line.

(Source: https://www.cgwb.gov.in/old_website/AQM/NAQUIM_REPORT/Assam/Cachar.pdf)



(Source: GSI- Bhukosh)

Figure 3-14: Geomorphological Map of the study Area



3.9.2 Drainage

Barak is a major river which flows about 7.5 Km on the west from the Project Site. Barak River and its tributaries control the entire drainage system in the area and inundate large area annually. The Barak River originates in the southern slopes of the mountain ranges north of Manipur and after flowing to north again touching the northern top of Mizoram and then it flows westward through Cachar district and joins the Kushiara River, ultimately meeting the Surma and forms the Meghna in Bangladesh. The upper reaches of Barak are marked by steep banks and several falls and the river is highly meandering with many oxbow lakes. The total length of the river up to its out fall in Meghna is 900km of which 560 km is within the Indian Territory. The catchment area of Barak River up to Badarpur is 25900 sq. km. The anticlinal hill ranges form the watershed from which various drainage channel emerged. The common drainage pattern is sub parallel to parallel and dendritic. In general, drainage pattern of the area is in conformity with the topography, which area structurally controlled.

Source: https://www.cgwb.gov.in/old_website/AQM/NAQUIM_REPORT/Assam/Cachar.pdf

3.9.3 Soil type

Both residual and transported soils are found in the study area. The residual soils on the hills are loamy sands and support dense vegetation with bamboos, bananas and grass vegetation. Tea is exclusively grown on the hill slopes. The transported soils mostly comprise clay, silts and sands are found in plains. Due to predominance of clay, the soil in the area has low water absorption capacity and as such pools of water are seen accumulated in low lying areas. Due to enormous amount of surface run off during the rainy season the flood plains are enriched every year with the suspended silt and clay brought by the rivers, thus contributing towards annual replenishment of the fertility of the soils where rice, jute and sugarcane are extensively grown. Due to clayey nature of the soil moisture retention capacity is high.

Among the 15 agro-climatic regions of the country, categorized/identified on the basis of homogeneity in agro characteristics, Cachar falls in the Barak Valley zone. The agro-climatic conditions of the district are conducive for various agricultural activities like development of the plantation crops viz., tea, rubber, cashew, coffee, areca nut, coconut and also aromatic plant like Patchouli. The types of land available in the district are classified as: medium land 69048 Ha, high land 11642 hectares, low land 19512 hectares, very low Land 10792 hectares and beel area 4735 hectares.

Source: https://www.cgwb.gov.in/old_website/AQM/NAQUIM_REPORT/Assam/Cachar.pdf

3.9.4 Geology

The Project area is situated in the Barak Valley of Assam. It is occupied by the folded Sedimentary formations of Surma, Tipam, Dupitila, Alluvium groups ranging in age from Lower Miocene (Tertiary) to Holocene (Quaternary). The regional strike of the folded Geosynclinals facies sequences are NNE-SSW.

The stratigraphic succession of the district is given below-

Table 3-15: Stratigraphic succession of local area

SYSTEM	SERIES	GROUP	FORMATION	LITHOLOGY
Quaternary	Holocene to Pleistocene	Recent	Alluvium	Alluvium, represented by unconsolidated pale to dirty grey silt, sand, clay, silty clay, sandy clay, yellowish brown coarse river sand, gravel, and concretions.
				-----UNCONFORMITY-----
Upper Tertiary	Miocene to Pliocene	Dupitila	Dupitila	Sandstone, mottled clay, grit, conglomerate, poorly consolidated sand with layers and packets of pebbles, clayey sandstone with ferruginous material and laterites.
				-----UNCONFORMITY-----
	Miocene	Tipam Group	Tipam	Fairly bedded fine to medium grained sub arkosic sandstone with sandy shale and siltstone
				-----UNCONFORMITY-----
	Miocene	Surma Group	Bokabil	Shale, sandy shale, siltstone, mudstone, and lenticular coarse ferruginous sandstone.
			Bhuban	Alternation of sandstone, sandy shale, thin conglomerate shaly in the middle part.
	-----UNCONFORMITY-----			
	Oligocene	Barail Group	Renji Formation	Massive bedded sandstone.
Jenam Formation			Shale, Sandy shale and carbonaceous shale with interbedded hard sandstone.	
Laisong Formation			Well bedded compact flaggy sandstone and subordinate shale.	

Geologically the area is divided into two units-

- 1) Older Alluvium/Varanasi Alluvium underlying Younger Alluvium Plain/upland area
- 2) Younger Alluvium underlying, Younger Alluvium Plain or Flood Plains of river.

Geologically the study area is characterized with *Older Alluvium and Newer Alluvium* and lithologically composed of Grey micaceous sand, silt & clay, grey sand, Oxidised silt-clay with kankar and micaceous sand.

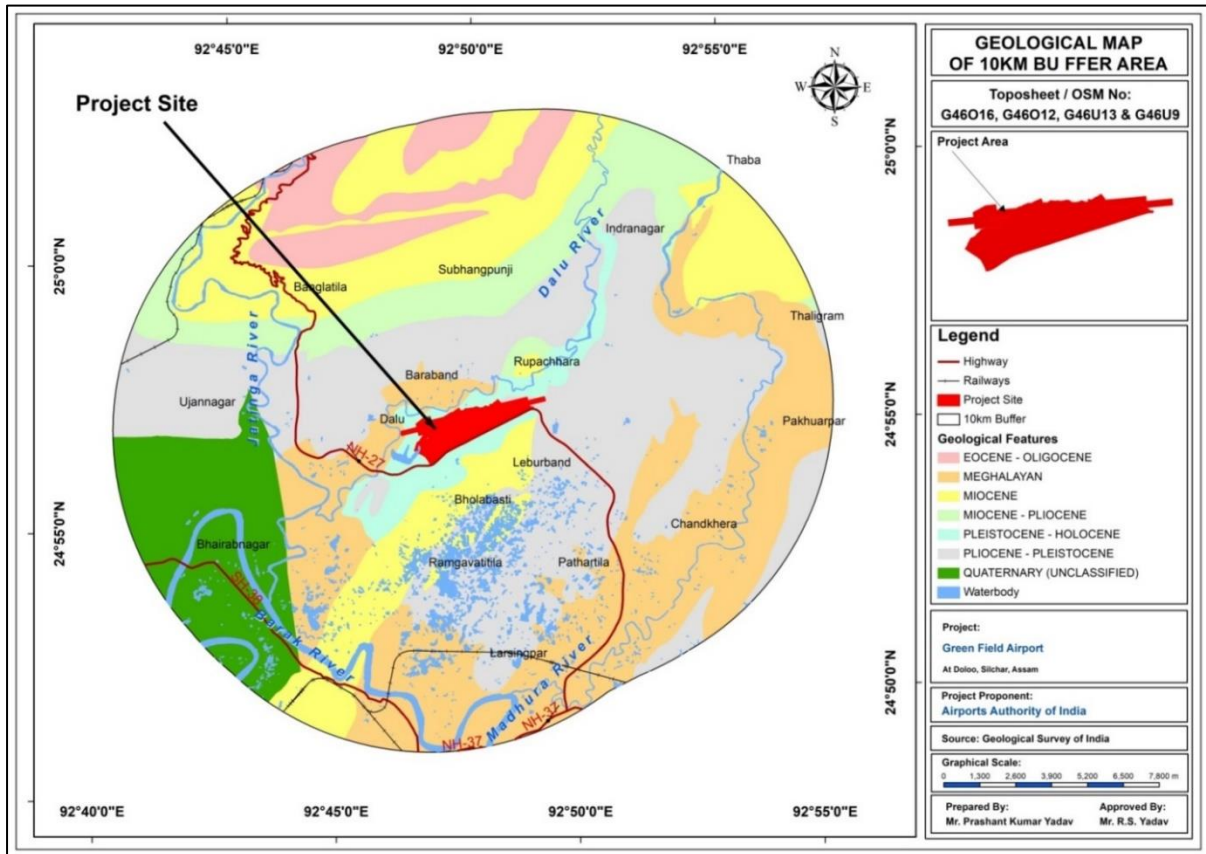
Source: Geological Survey of India (GSI)

Geological Impacts and its Mitigation Measure:

Appropriate mitigation measures can enormously reduce the damage caused by geological hazards listed below.

Geological Impacts	Mitigation Measure
There may be influence of large-scale	There will be no major constructions

Geological Impacts	Mitigation Measure
construction activity on geology.	activities will be involved in this project.



(Source: Bhukosh-GSI)

Figure 3-15: Geological Map of the Study Area

3.9.5 Natural Disaster

- Earthquake:** The Project site may be affected by earthquakes. At the time of construction, the Project will be developed by considering proper design measures as per Project plan. As per seismic map of Assam, the Study area falls under the **Very high damage risk zone – V**. There will be high chances of land disturbance due to earthquake activities so precaution measures are followed accordingly.
- Landslide:** However the Assam state has many areas which are Prone to Landslide but the project site is present at no land slide active zone as per land slide incidence map of Assam. All the Project activities will be carried out as per the details provide in the approved Project plan.
- Flood:** The hazardous problem of flood is a combination of several natural and anthropogenic factors. Precisely the unique geographic setting of the region, high potent monsoon rainfall regime, easily erodible geological formations in the upper

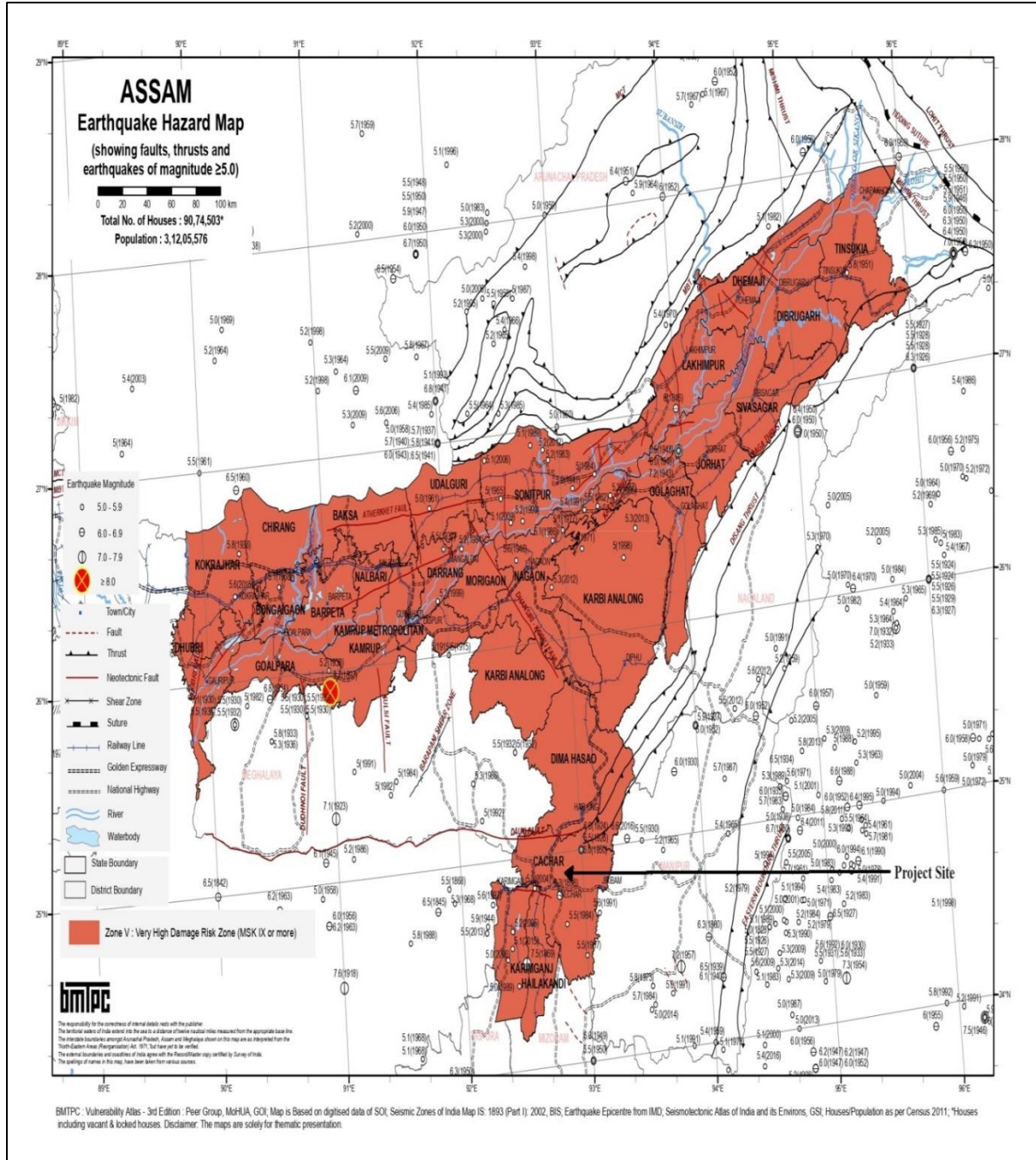
catchments, seismic activity, accelerated rate of basin erosion, rapid channel aggradations, massive deforestation, intense land use pressure, explosive population growth especially in the flood prone belt and adhoc type of temporary measures of flood control are some of the dominant factors that cause for intensify floods in district Cachar. Flood map of the Assam shows that a small stream flows on the eastern side (Singhijuri Stream) and western side (Maghura Stream) of the Project site, they flows from North to South and later on merges into Barak river. However there is no flooding noticed in the Project area but there might be very low chances of flooding in the area. Hence, precautionary major should be taken and project should plan accordingly.

Table 3-16: Recent Major flood events in Cachar District

S. No.	Year	Areas affected due to Flood
1.	2004	Silchar Sadar Revenue Circle, Sonai Revenue Circle, Katigora Revenue Circle, Udharbond Revenue Circle, Lakhimpur Revenue Circle.
2.	2010	Silchar Sadar Revenue Circle, Sonai Revenue Circle, Katigora Revenue Circle, Udharbond Revenue Circle, Lakhimpur Revenue Circle.
3.	2012	Silchar Sadar Revenue Circle, Sonai Revenue Circle, Katigora Revenue Circle, Udharbond Revenue Circle, Lakhimpur Revenue Circle.
4.	2018	Silchar Sadar Revenue Circle, Sonai Revenue Circle, Katigora Revenue Circle, Udharbond Revenue Circle, Lakhimpur Revenue Circle.

Source: https://dlrs.assam.gov.in/sites/default/files/swf_utility_folder/departments/asdma_revenue_unecopscloud_com_oid_70/menu/document/cachar_2024_25.pdf

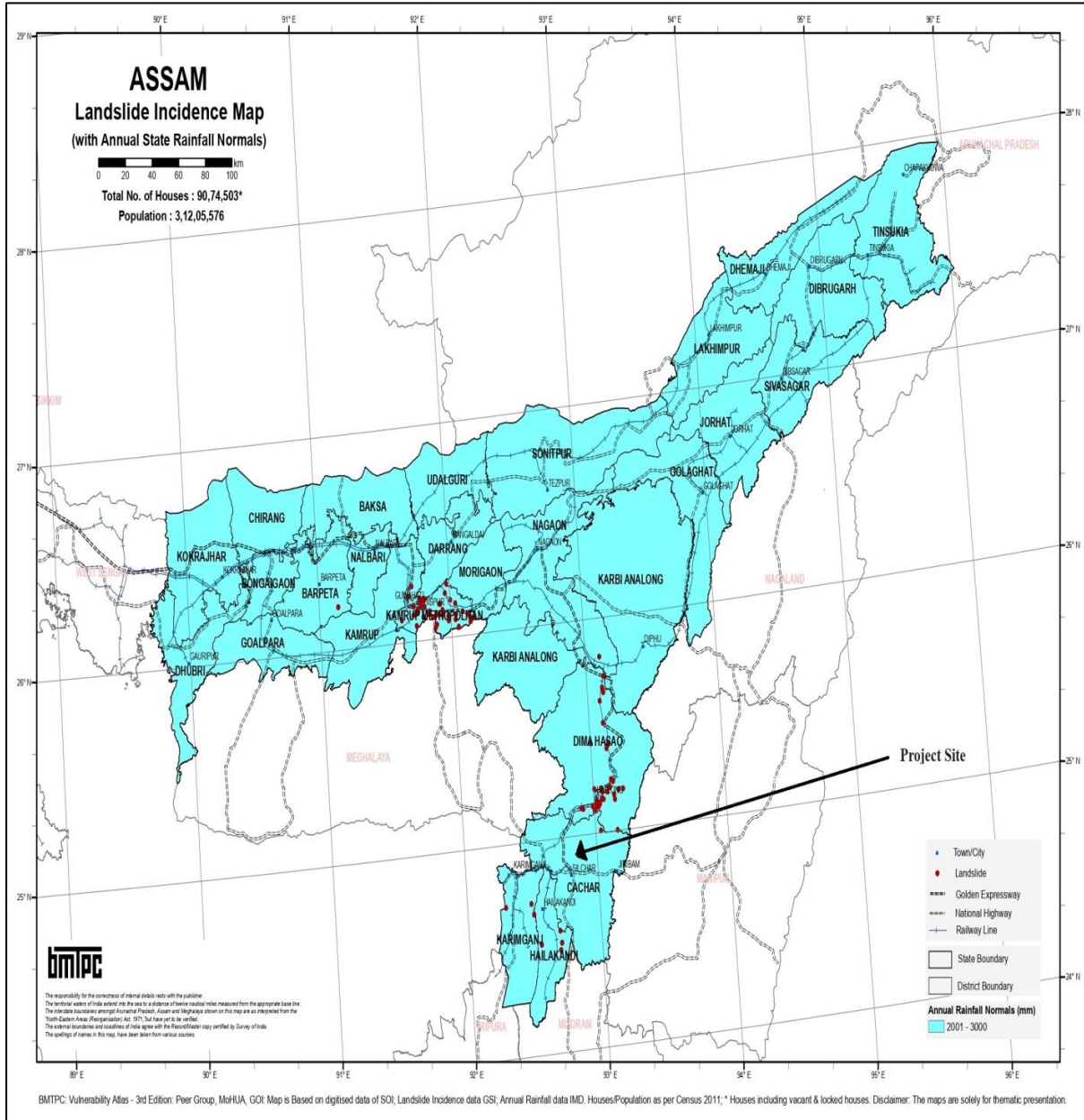
Seismic study: As per Earthquake hazard map of Assam, The Cachar district falls under the **High Damage Risk Zone (Zone - V)**. The Earthquake hazard map of Assam is given below-



Source: <https://vai.bmtpc.org/eq-assam.html>

Figure 3-16: Seismic Map

Study of Land Slide: As, the Project site is located on flat surface, so there will be no chances of the land slide due to any tectonic activity. The landslide Incidence Map of India is given below-



Source: <https://vai.bmtpc.org/ls-assam.html>

Figure 3-17: Landslide map

Flood Study: As per the Vulnerability Atlas – 3rd Edition; Peer Group, MoHUA; digitised data of SOI, the project site does not fall under the area liable to flood. The river Ganga is situated approx. 55.11 km away from the project site in East direction while the Yamuna River is 35.2 km in Western direction. The Flood Hazard Map of Assam is given below-

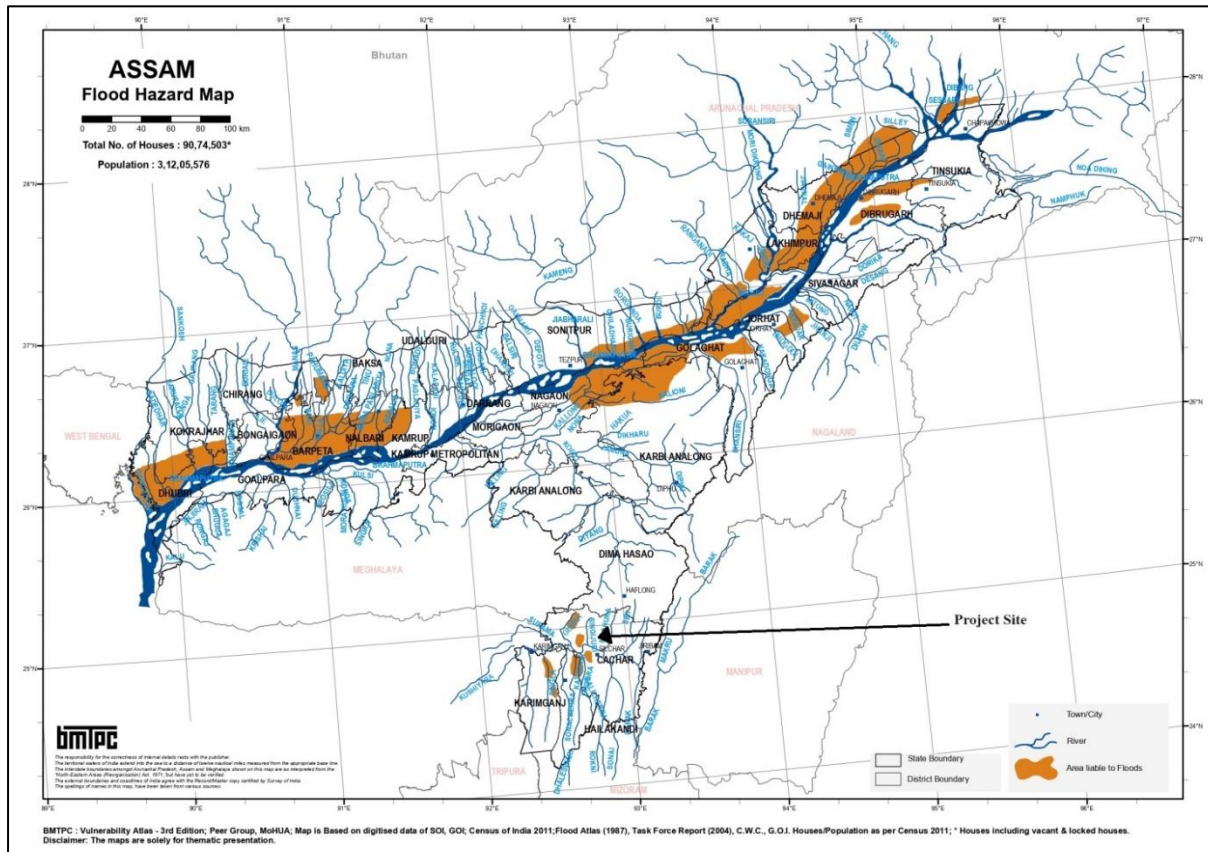


Figure 3-18: Flood Hazard map

3.10 HYDROGEOLOGY

Cachar district is surrounded by dissected hills on Northern, Eastern and Southern sides. Due to which valley lies only in the central portion of the district. The general slope is towards Barak River from both Northern and Southern sides. CGWB has constructed 13 exploratory wells across the Cachar district with depth ranging from 72.0 m to 300.0 m. The major aquifers of the district have been delineated based on the litholog of these exploratory wells. In the

District, two principal aquifers have been delineated.

Alluvial aquifer of Quaternary age- The alluvial aquifer consists of clay, sand, gravels, and pebbles. The clay is grey in color.

Sandstone aquifer of Tertiary age- The sandstone aquifer is composed of friable sandstone with clay and Shale. Sandstone and clay/shale occurs as alternating layers.



Shallow Aquifer zone in the Southern Bank of Barak River- The data is prepared using lithologs from Salchapra, Ghungoor, Sonaimukh, Binnakandi and Palanghat tube well. It is found that the shallow aquifer zone in the southern bank of the Barak River mainly comprises of younger alluvium and it is argillaceous in nature. In Salchapra area, clay occur upto a depth of 50m with no granular zone. This clay layer continues up to Palanghat with intervening granular zone occurring at different depth. A granular zone of about 6m thickness is encountered near Ghungoor area at a depth of 16-21m. This granular zone extends up to Sonaimukh. At Binnakandi granular zone extends from surface to 24m with a clay layer separating another granular zone occurring at a depth of 27-50m. The first granular zone near Binnakandi is absent in Palanghat area. The thickness of second granular zone encountered at Binnakandi decreases in Palanghat to 6m occurring at a depth of 34-40m. Aquifer performance tests at Silkuri shows that transmissivity, discharge and storativity of the aquifer is 41.25m²/day, 2.16m³/hr and 5.5 x 10⁻⁴ to 8.8 x 10⁻⁴.

Shallow aquifer zone in the Northern Bank of Barak River:

The data is prepared using lithologs from Kalain, Dhalchara, Pangram, Rajabazar, Pailapool, and Baskandi and Badribast observation well. The shallow aquifer zone in the northern part of the district mainly comprises of younger alluvium and is mostly arenaceous in nature with multiple granular zones. The northern shallow aquifer comprises of a top clay layer of varying thickness from Kalain to Badribasti via Pangram, Rajabazar, Pailapool and Baskandi. In Dhalchara area instead of the top clay layer pebble bed is encountered near the surface. In Kalain area first granular zone occurs at a depth of 19-42m with pebbles occurring at a depth of 24-27m. In Dhalchara area pebbles occurs from surface to 10m depth with three granular zones encountered at a depth of ground level (GL) to 18m, 21-42m and 43-50m respectively. In Pangram granular zone occurs at a depth of 10- 46m. In Rajabazar area granular zone occurs at a depth of 10-50m, however it is characterized by sandy clay and the thus yield may be less. A gravel bed is encountered at different depths near Badribasti, Baskandi and pinches out near Pailapool area. Aquifer performance tests at

Kalain, Pangram and Badribasti show that transmissivity, discharge and storativity of the aquifer varies from 116-210 m²/day, 2.8-7.2m³/hr and 2.1x 10⁻⁴ to 8.8 x 10⁻⁴ respectively.

Ground Water Level: Investigations carried out by CGWB show that ground water in the near surface aquifers in the flood plain areas occur under water table conditions. CGWB has so far established 624 observation net work stations in the state, which are being monitored four times in a year i.e. January, March, August and November. The water level data indicated that depth to water level in the Bhabar zone is within ground level to 8m below ground level (bgl) and at times above 10m bgl. In the intermountain valleys of Cachar, water levels are found to vary from within 1m to 8m bgl. In the alluvial formations the water levels are found mostly to be 2 to 5m bgl. Ground water at deeper

levels is found to occur under semi-confined to confined conditions with piezometric head varying between 2 to 6 mbgl. Auto flow zones have also been identified in some parts of Baksa, Darrang and Udalguri districts of Assam. The long term trend of both pre-monsoon and post monsoon depict no significant change of ground water level in the state.

Source: https://www.cgwb.gov.in/old_website/GW-Assessment/GWR-2022-Reports%20State/Assam.pdf

3.10.1 Ground Water Level

Dynamic Groundwater Resources of Cachar district has been estimated based on the methodology recommended by Groundwater Estimation Committee (GEC"2015). The present methodology used for resources assessment is known as Ground Water Resource Estimation Methodology - 2015 (GEC"2015). GEC 2015 recommends estimation of Replenishable and instorage ground water resources for both unconfined and confined aquifers. In GEC"2015, two approaches are recommended - water level fluctuation method and norms of rainfall infiltration.

- ❖ **Hilly Area:** Area with more than 20% slope has been excluded for the recharge computation. As per NESAC, total recharge worthy area in the district is 273358 Hectare.
- ❖ **Command and Non-Command Area-** The methodology envisages computation of various figures separately for command & non-command area. In the district, there is no major or medium canal irrigation scheme and thus the entire rechargeable area has been considered as a Non-command area.
- ❖ **Recharge from Rainfall-** has been computed separately for monsoon and non-monsoon periods for the entire district. The recharge from rainfall during monsoon season has not been computed using water level fluctuation method (WLFM) as Ground Water Monitoring Wells (GWMW) in the district is very few.
- ❖ **Recharge from All Sources-** Total recharge to groundwater has several components, rainfall being the major one. The other components include seepage from canals, return flow from surface water irrigation, return flow from groundwater irrigation, seepage from tanks/ ponds etc. Dynamic Groundwater Resources of the study area has been estimated based on the methodology recommended by Groundwater Estimation Committee (GEC"2015). The net ground water availability was 40443 ha.m. and the stage of ground water extraction was 9.97% which comes under safe category.

Sr. No.	Project Area	Assessment Zone
1	Doloo Airport	Safe

As per the Block wise ground water Resource Assessment (2022)

Source: <https://cgwa-noc.gov.in/Sub/CheckEligibility/CheckEligibility.aspx>

3.10.2 Suggestions regarding Water conservation and Recharging

As per geographical location of the project site we can develop a roof top rainwater harvesting system and can be used for activities such as flushing, cleaning, green belt

development. As the project site is present on a mountain region, the water collected during rainfall need to be drained in a manageable way such as by constructing check dams and other supportive structure to prevent erosion while downhill movement of water. The western part of the Project is adjacent to pre-existing water body named as Doloo Lake which can be used to drain water accordingly if required with the consent of proper regarding authority.

3.10.3 Impacts and its Mitigation Measure

Appropriate mitigation measures can enormously reduce the damage caused by Hydrogeology is listed below;

Table 3-17: Geological and Hydrogeological Impacts and its Mitigation Measure

HYDRO-GEOLOGICAL IMPACTS	
Hydro-geological Impacts	Mitigation Measure
1. Existing drainage pattern will be changed due to topographical alteration.	We will not disturb any natural drainage flowing in and around our project area
2. Improper storage, handling, or disposal of overburden can lead to groundwater contamination	We will Establish proper storage and handling protocols, conduct regular monitoring of potential contamination sources.
3. Alterations in surface water flow patterns can impact groundwater recharge and discharge areas	We will preserve all the natural waterbodies, drainage pattern to maintain sustainable flow regimes in rivers and streams, we will also try to implement watershed management practices, and conduct hydrological assessment to assess impacts
4. Uncontrolled surface runoff and erosion can lead to sedimentation in water bodies, rivers affecting water quality and habitat.	We will promote the Implementation of erosion control measures such as terracing, garland drains, settling ponds, sediment basins, promote sustainable land management practices and monitor sedimentation rates.
GEOLOGICAL IMPACTS	
Geological Impacts	Mitigation Measure
1. During excavation, or construction of project site we can destabilize surrounding slopes and lead to landslides or slope failures	We will adopt following activities as a mitigation measure <ul style="list-style-type: none"> • Geotechnical investigations • Slope stability analysis, • Implement proper engineering design and construction practices • Install retaining structures or slope stabilization measures • Establish early warning systems

<p>2. Uncontrolled land clearing, deforestation, or improper agricultural practices can result in soil erosion, leading to loss of topsoil and land degradation</p>	<p>We will Implement erosion control measures such as terracing, contour plowing, and vegetative cover, promote sustainable land management practices, restore vegetation in degraded areas, and establish sedimentation control structures</p>
<p>3. Certain areas are prone to geological hazards such as earthquakes etc.</p>	<p>We will conduct geological hazard assessments, establish building codes and regulations for hazard-prone areas, develop early warning systems, and implement structural reinforcement measures</p>

The Pre-Monsoon and Post-Monsoon Ground Water Level map is given below-

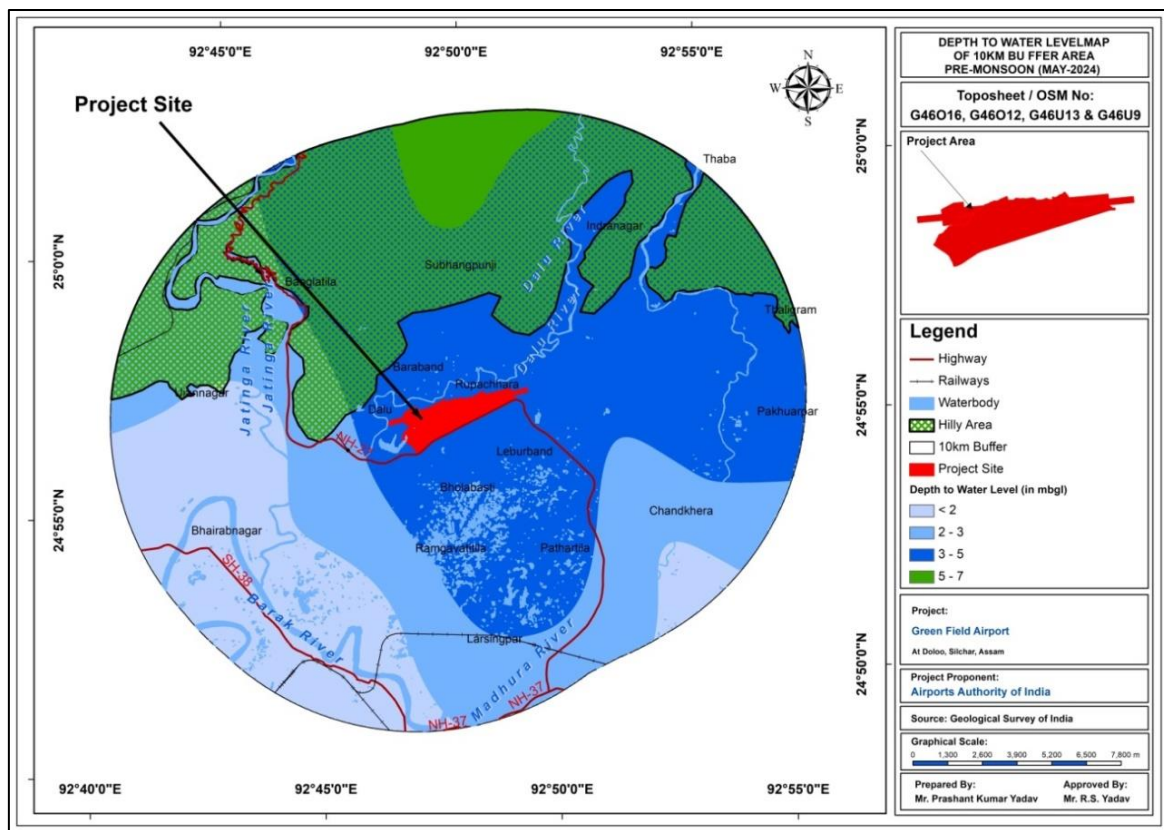


Figure 3-19: Pre-Monsoon Ground Water Level 10 Km Buffer

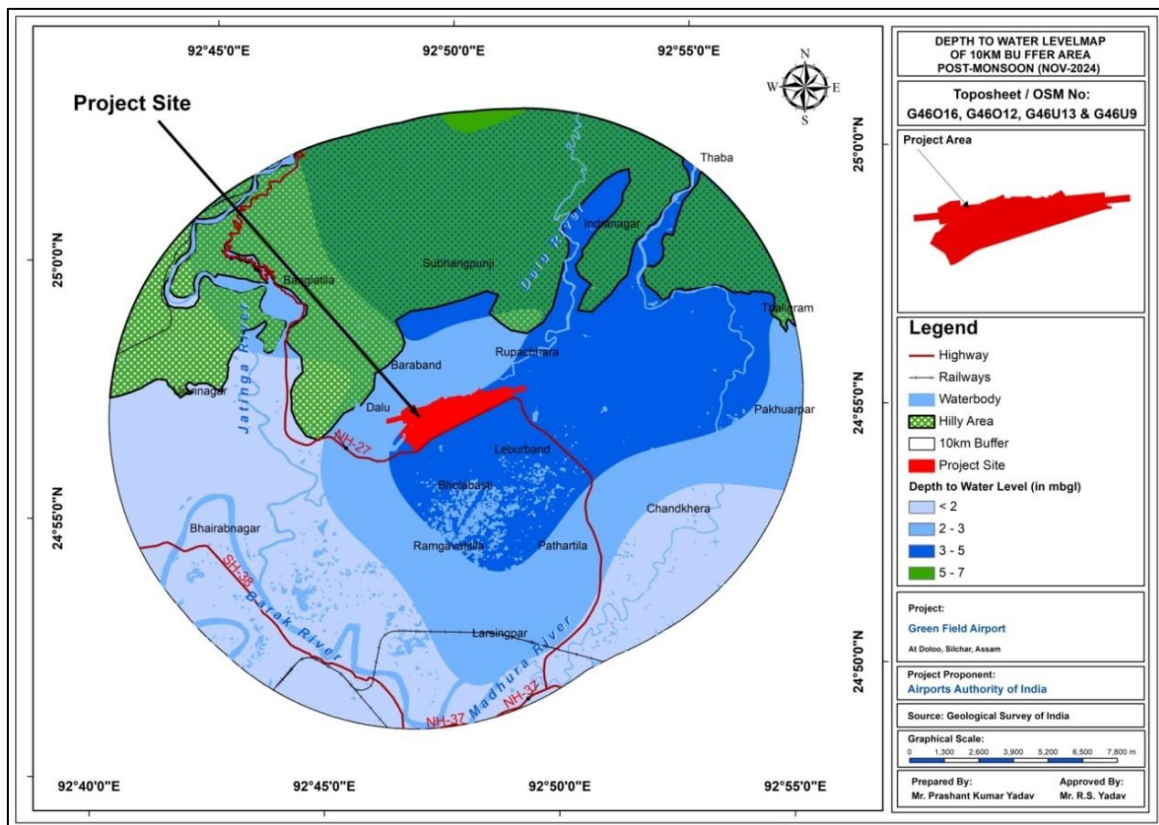


Figure 3-20: Post Monsoon Ground Water Level 10 Km Buffer

3.11 BIOLOGICAL ENVIRONMENT

The study of biological environment is one of the key aspects of the Environmental Impact Assessment (EIA), in view of the need for the conservation of Environmental quality and biodiversity of a particular geographical area. Ecological systems show complex interrelationships such as dependence, mutualism, and competition between Biotic and Abiotic components. Biotic components include all living organisms-plants and animals; these organisms not only interact between or within themselves but also with the Abiotic components viz. Physical, Chemical and Environmental components.

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

The animal and plant communities exist in their natural habitats in a well-organized manner. Their natural settings can be disturbed by any externally induced anthropological activities or by naturally induced calamities or disasters. Therefore, once this setting is disturbed, it becomes practically impossible or takes a longer time to come to its original state. Plants and animals are more susceptible to environmental

stress. The sensitivity of animal and plant species to the changes occurring in their existing ecosystem can, therefore, be used for monitoring Environmental Impact Assessment studies of any project.

Objectives of Biological Study: -

The main objectives of biological study of present project are:

- To collect the baseline data on terrestrial and aquatic biodiversity.
- To assess the Schedule-I, rare, endangered, threatened, endemic and vulnerable floral and faunal species.
- To identify the locations and features of ecological significance.
- To identify the Impacts of the proposed project on biodiversity during the construction and operation phases.
- To develop strategies to prevent and address negative impacts on biodiversity through mitigation measures and action plans.

3.11.1 Study Area

The Doloo T.E. site is situated parallel to NH54, approximately 8 nautical miles from Silchar Airport and 22 kilometers by road from the city center. During a site visit, the AAI team, in collaboration with State Government officials, established the coordinates of the Doloo site as 24° 56' 12.00"N 092° 49' 52.60"E and 24° 55' 54.01"N 092° 47' 30.50"E. The elevation of the site varies from 30 meters above mean sea level (AMSL) on the western side to 80 meters AMSL on the eastern side, indicating a slope that may necessitate earthworks for leveling the surface. The area is characterized by dense vegetation, tea plantations, and the Doloo Lake, a significant tourist attraction located on the western side. The probable orientation for the runway, taking into account various factors such as land availability, prevailing wind direction and speed, airspace conditions, obstructions in the approach funnel, and surrounding topography, is 08/26. A transmission line has been noted in the approach path to the northwest. The site is encircled by hills to the north, west, and northeast. According to the initially proposed runway location (RWY 08/26), the instrument approach procedures for both runways are feasible, although the minima are higher than those at the Khoreel site. All-weather access to this aerodrome location may be limited.

The Study Area is situated in Doloo, approximately 15 kilometers from Silchar Airport and 22 kilometers from Silchar city via road. The terrain is primarily characterized by gently undulating land, with low hillocks that reach elevations of up to 80 meters. This region mainly consists of altered habitats, featuring agricultural land interspersed with plantation zones. The majority of the landscape has been modified from what was once a tea garden, approximately 200 years old, during which a significant number of tea plants and shade trees were removed to facilitate land acquisition.

While the project area does not fall within any officially designated forest land, much of the northern section of the buffer zone is covered by forest. The Barail Reserve Forest represents the principal forested area, and the Barail Wildlife Sanctuary is a key ecologically sensitive region located within the Barail RF. The closest point of the Barail Wildlife Sanctuary to the project boundary is roughly 3.3 kilometers away, with the eco-sensitive zone (ESZ) of the Sanctuary extending within 2 kilometers of the nearest project boundary. Additionally, the Daloo River, which flows near the northern boundary of the project, is another significant area of biodiversity.

The southern buffer zone of the project includes several rivers: The Barak River (6.6 kilometers to the southwest), Jatinga River (3.1 kilometers), Badri Nala (5.4 kilometers), Araia Nala (5.9 kilometers), Madhura River (7.4 kilometers), and Tikal Nala (8.0 kilometers), along with various dense and open bamboo forests.

In close proximity to the project site, towards the west, lies a natural lake known as Doloo Lake, along with several other lakes, locally referred to as Bil or Beel, located within the buffer zone especially towards south of the study area.

The region's soil is classified into two categories: i) Residual soil and ii) Transported soil. The residual soil, located in the hilly areas, consists of loamy sands that foster dense vegetation. Tea cultivation occurs on the slopes of these hills. In contrast, the transported soils, which are primarily composed of clay, silts, and sands, are found in the plains. The high clay content in these soils results in a low capacity for water absorption, leading to the accumulation of water in lower-lying regions. Additionally, this type of soil exhibits a significant capacity for moisture retention.

Baseline Status

This segment of the report outlines the biodiversity baseline for the Study Area conducted in relation to the Environmental Impact Assessment (EIA). It defines the geographical scope of the assessment, details the methodology employed, and establishes a biodiversity baseline that encompasses species, habitats, ecosystem services, invasive alien species, and designated areas. This biodiversity baseline serves as a foundation for forecasting the potential effects of the project on biodiversity and recommending mitigation strategies to address the anticipated impacts.

The ecosystem present in the Study Area consists of both terrestrial and aquatic elements. On land, it is predominantly defined by the Cachar tropical evergreen forest (1B/C3), Pioneer Euphorbiaceous scrub (2B/C112S1), Cachar semi-evergreen forest (2B/C2), and Secondary moist bamboo brakes (2/2S1), which represent the primary types of natural vegetation. The diversity of flora and fauna is notable, featuring a mix of generalist species along with a limited number of habitat specialists that inhabit the coastal zones. Regarding aquatic ecosystems, the area encompasses both lentic (such as lakes) and lotic systems (such as river). The land use within the Study Area is mainly focused on forested regions, settlements and water bodies. The habitat profile indicates

a predominance of natural environments, contributing to a substantial area of intact natural habitat. Following the government's acquisition of land, the discontinuation of tea gardening activities at the project site has initiated a gradual shift towards grassland.

3.11.2 Methodology

- The methodology employed to establish the biodiversity baseline encompassed the following steps: a) Performing a general assessment utilizing the Integrated Biodiversity Assessment Tool (IBAT) to identify the number of IUCN Red List-assessed species that may exist within a 10 km radius of the Project Site; b) Compiling a list of IUCN Red List-assessed species with ranges that intersect the Study Area, thereby creating a comprehensive list of species that could potentially inhabit the Study Area; c) Conducting an on-site visit to the Study Area to confirm the habitat characteristics and identify any significant natural habitats through both walk-through and drive-through surveys; d) Engaging with local Forest Department officials and community members to validate the presence of potential CH trigger species and habitats within the Study Area; e) Establishing a habitat baseline that includes various habitat types recognized by the IUCN Habitat Classification Scheme, as observed during the site visit; and f) Creating a species baseline that identifies species for which suitable habitat types are available within the Study Area, as confirmed during the site visit.
- The methodology employed for the screening of species encompassed the following strategies: a) The prior exclusion of entire taxonomic groups, such as lower flora and lower fauna, due to the known absence of relevant screening data in the public domain. b) The inclusion solely of species classified as globally threatened by the IUCN Red List during the identification of potential critical habitat (CH) triggers, with non-threatened species considered only if they qualify as trigger species concerning any Key Biodiversity Areas (KBAs) that intersect with the Study Area. c) The exclusion of potential CH trigger species primarily based on the lack of sufficient suitable habitat types or elevation ranges relative to the species-specific threshold numbers necessary to trigger CH.
- The methodology for habitat screening involved the following strategies: a) The utilization of satellite imagery of the Study Area, accessible via Google Earth, in combination with governmental Land Use Land Cover (LULC) maps to delineate the habitat types present. b) The application of governmental maps of designated Protected Areas and Eco-Sensitive Zones, as provided in official notifications, to ascertain the boundaries of the nearest legally protected areas. c) The employment of the Integrated Biodiversity Assessment Tool (IBAT) alongside KBA maps to identify the boundaries of the nearest internationally recognized areas that lack legal protection. The steps undertaken in the species screening methodology included: i. Excluding lower floral and faunal species from the screening process due to the known lack of relevant data, while including only

higher floral species, specifically Angiosperms, and higher faunal species, namely Vertebrates, which include Mammals, Birds, Reptiles, Amphibians, and Fishes. ii. Screening out species not classified as globally threatened by the IUCN Red List, as non-threatened species are less likely to fulfil the necessary CH trigger thresholds.

- The methodology applied for screening habitats involved the following steps: Conducting a generic assessment using the Integrated Biodiversity Assessment Tool (IBAT) to obtain numbers of internationally recognised Designated Areas situated within 10 km of the centre of the Project Area. Identifying, mainly from governmental maps, any nationally designated legally protected areas that qualify as potential CH triggers, in terms of overlapping the Project Site and being classified as highly threatened or unique ecosystems, situated within the Study Area. Evaluating the identified potential CH trigger habitats within the Study Area to screen in any likely CH triggers as per CH Criteria. The approach to the field-based assessment involved collection of primary data through walk-over surveys at accessible locations within the Study Area and collection of secondary data through opportunistic, informal interviews with local Project personnel, government officials and community members.
- The Study Area was visited for primary study. Primary data on species and habitats was collected through sampling of floral and faunal species. The timings of the primary data collection covered the diurnal faunal activity-period, from early morning till late evening, but excluded the nocturnal faunal activity-period. Qualitative data on floral and faunal species was recorded through the visual encounter method. Records were based on direct sightings of species, as well as, indirect evidence, such as flowers, pods, calls, nests, burrows, droppings, scats, moults, and tracks. The field assessment included a rapid survey, specifically aimed at detecting presence of soaring and wetland bird species vulnerable to project. The said rapid survey was focused on the Project Site and involved searches focused on habitat-types or habitat-features associated with the species, such as forests, cliffs, and riparian habitat. The primary biodiversity data was collected through qualitative sampling at 10-15 sites in the Study Area. The sites were selected through stratified random sampling, governed by considerations of safety and accessibility. At each site, primary observations on species, habitats and ecosystem services were recorded. Area-specific secondary data was collected through formal consultations with the following Sources- Assam Forest Department; Divisional Forest Officer Cachar; Range Forest Officer & opportunistic informal consultations were conducted with a few members of the local community and project staff.

3.11.3 Habitat Profile of the Study Area

The findings from a standard evaluation conducted with the Integrated Biodiversity Assessment Tool (IBAT) concerning the World Data Base of Protected Areas and World Data Base of key Biodiversity Areas. Following Key areas were identified within the study area of the current Project:

Table 3-18: Key Biodiversity Areas within Study Area

Sl. No.	Global Biodiversity Dataset	Within and surrounding of the project corridors	Location
1.	World Data Base on Protected Areas	Nil	-
2.	World Data Base of key Biodiversity Area	Barail Wildlife Sanctuary, Barail Range forests	Within Buffer Zone
3.	Biodiversity Hot Spot	The Indo-Burma region	Core & Buffer Zone

3.11.4 Species Profile of the Study Area

The findings from a standard evaluation conducted with the Integrated Biodiversity Assessment Tool (IBAT) concerning the IUCN Red List indicate that at least four species listed by the IUCN may exist within a 10 km radius of the center of the Project Site. A total of 1063 species of flora and fauna including terrestrial and aquatic were reviewed under this assessment.

The table below displays the findings of the IBAT assessment concerning species listed on the IUCN Red List that may be found within a 10 km radius of the Project Site.

Table 3-19: IBAT assessment on IUCN Red List assessed species

S. No.	IUCN Category	No. of Species within 10 Km Radius
1.	Critically Endangered	05
2.	Endangered	14
3.	Vulnerable	26
4.	Near Threatened	27
5.	Least Concern	664
6.	Data Deficient	14
7.	Not Assessed/Not Available/Not Listed	313
Total		1063

3.11.5 Floral Species

This segment of the report outlines the floral characteristics of the Study Area, categorized by the various forest types that define its natural vegetation. Additionally, it details the floral species documented during the site visit. This subsection encompasses both the reported and observed floral species within the Study Area. The classification of forest types is based on the work of Champion, H. G., and Seth, S. K. (1968) in their

Revised Survey of the Forest Types of India, published by the Manager of Publications, Government of India, Delhi, as well as the Forest Working Plan of the relevant Forest Division. The Geographical Area of Assam is 78,438 Km² and the recorded Forest cover of Assam is 26,832 Km², which is 34.21% of its geographical area.

The natural vegetation within the Study Area is representative of Cachar tropical evergreen forest (1B/C3), Pioneer Euphorbiaceous scrub (2B/C112S1), Cachar semi-evergreen forest (2B/C2) and Secondary moist bamboo brakes (2/2S1).

During the initial survey, a total of 472 plant species (444 terrestrials and 28 aquatics) were identified in the Study Area, comprising 197 tree species that contribute to the perennial groundcover. Given that the site visit occurred during the monsoon season, the area was predominantly characterized by seasonal herbs. Table 3.20 presents the details of the floristic species with range overlapping the study area, including the scientific, common/local name and family of each species and the conservation status assigned to it as per the IUCN Red List. 02 Critically Endangered, 02 Endangered and 04 Vulnerable Plant species were recorded in the study area. List of Floral Species recorded from the study area represented in the table below

Table 3-20: Flora of the Study Area

S. No.	Common Name	Scientific Name	Family	IUCN Status
Trees				
1	<i>Acacia auriculiformis</i>	Sickle leaf Acacia	Mimosaceae	LC
2	<i>Adenanthera pavonina</i>	Red bead Tree/Chandan	Mimosaceae	LC
3	<i>Aegle marmelos</i>	Beal / Bel	Rutaceae	NT
4	<i>Aesculus assamica</i>	-	Sapindaceae	LC
5	<i>Aglaia spectabilis</i>	Bhoto-mayna/Rata	Meliaceae	NA
6	<i>Ailanthus excelsa</i>	Mahaneem/Indian Tree of Heaven	Simaroubaceae	DD
7	<i>Ailanthus grandis</i>	Buva	Simaroubaceae	NA
8	<i>Albizia chinensis</i>	Hansh	Mimosaceae	LC
9	<i>Albizia lebbeck</i>	Siris/Khok	Mimosaceae	LC
10	<i>Albizia lucida</i>	Pipla	Simaroubaceae	LC
11	<i>Albizia odoratissima</i>	Hinaru/Koroi /Sirolu	Mimosaceae	LC
12	<i>Albizia procera</i>	White Siris/Khaal/Koroi	Mimosaceae	LC
13	<i>Albizia spp.</i>	Moroj	Mimosaceae	-
14	<i>Alseodaphne owdenii</i>	Tilsundi/ Sundi	Lauraceae	VU
15	<i>Alstonia scholaris</i>	Saptaparni/Chatim	Apocynaceae	LC
16	<i>Alysicarpus vaginalis</i>	Khariya	Fabaceae	NA
17	<i>Annona reticulata</i>	Ramphal	Annonaceae	LC
18	<i>Anthocephalus cadamba</i>	Kadam	Rubiaceae	NA
19	<i>Anthocephalus chinensis</i>	Purple Neo-cheesewood	Rubiaceae	NA
20	<i>Antidesma spp.</i>	Heloch	Phyllanthaceae	LC
21	<i>Aphanamixis polystachya</i>	Hakhori Bhkhori	Meliaceae	LC

S. No.	Common Name	Scientific Name	Family	IUCN Status
22	<i>Aquilaria agallocha</i>	Agar	Thymelaeaceae	CR
23	<i>Areca catechu</i>	Tamul/Supari	Arecaceae	LC
24	<i>Artocarpus chama</i>	Cham	Moraceae	NA
25	<i>Artocarpus heterophyllus</i>	Jackfruit/Lamkhuang/ Kathal	Moraceae	NA
26	<i>Artocarpus integrifolia</i>	Kathal	Moraceae	NA
27	<i>Artocarpus lacucha</i>	Dowa/Bohot/Lakoocha	Moraceae	NA
28	<i>Artocarpus integra</i>	Kathal	Moraceae	NA
29	<i>Azadirachta indica</i>	Neem	Meliaceae	LC
30	<i>Baccaurea sapida</i>	Bhubi	Euphorbiaceae	NA
31	<i>Bambax insigne</i>	Bon simul	Bombacaceae	NA
32	<i>Barringtonia acutangula</i>	Hijal	Lecythidaceae	LC
33	<i>Bauhinia acuminata</i>	Kanchan	Fabaceae	LC
34	<i>Bauhinia purpurea</i>	Rakta Kanchan	Caesalpiniaceae	LC
35	<i>Bauhinia spp.</i>	Kanchan	Caesalpiniaceae	-
36	<i>Bauhinia variegata</i>	Chingthrao/Orchid Tree/Kotora	Caesalpiniaceae	LC
37	<i>Bischofia javanica</i>	Jboki	Phyllanthaceae	NA
38	<i>Bixa Orellana</i>	Jolandhar/Lipstick tree	Bixaceae	LC
39	<i>Bombax ceiba</i>	Dumboi/Simul	Malvaceae	LC
40	<i>Bombax insigne</i>	Bon Semal	Malvaceae	LC
41	<i>Bridelia retusa</i>	Kuhir / Kunhi	Phyllanthaceae	LC
42	<i>Bursera serrata</i>	Heru	Burseraceae	NA
43	<i>Butea monosperma</i>	Polax/Flame of the Forest	Fabaceae	LC
44	<i>Callicarpa arborea</i>	Bonmola/Gunmola/Khoja	Lamiaceae	LC
45	<i>Callicarpa macrophylla</i>	Fulujha	Lamiaceae	LC
46	<i>Calophyllum inophyllum</i>	Telo	Calophyllaceae	LC
47	<i>Camphora glandulifera</i>	Gondroi	Lauraceae	NA
48	<i>Canarium bengalense</i>	Bhuna rata	Bignoniaceae	LC
49	<i>Canarium strictum</i>	Dhuna	Bignoniaceae	NA
50	<i>Carallia brachiate</i>	Mathang	Rhizophoraceae	LC
51	<i>Careya arborea</i>	Kum	Lecythidaceae	LC
52	<i>Carica papaya</i>	Papaya	Caricaceae	DD
53	<i>Caryota urens</i>	Fishtail Palm/	Arecaceae	LC
54	<i>Cassia fistula</i>	Amaltas/Hunaru Phool/ Bandar Lathi	Fabaceae	LC
55	<i>Cassia javanica</i>	Java Cassia/Java rani	Fabaceae	LC
56	<i>Cassia siamea</i>	Siamese Cassia	Fabaceae	LC
57	<i>Castanopsis indica</i>	Hingori	Fagaceae	LC
58	<i>Castanopsis purpurella</i>	Chinquapin/Kat badam	Fagaceae	NA
59	<i>Catunaregam spinosa</i>	Mon	Rubiaceae	LC
60	<i>Cephalanthus occidentalis</i>	Pani Kadam	Rubiaceae	LC
61	<i>Chukrasia tabularis</i>	Boga-poma/Chakrosi	Meliaceae	LC

S. No.	Common Name	Scientific Name	Family	IUCN Status
62	<i>Chukrasia velutina</i>	Hatia	Meliaceae	LC
63	<i>Cinnamomum tamala</i>	Mahpat/Tezpata	Lauraceae	LC
64	<i>Cinnamomum glanduliferum</i>	Gonhorai	Lauraceae	LC
65	<i>Citrus hystrix</i>	Satkora	Rutaceae	LC
66	<i>Citrus maxima</i>	Robab tenga	Rutaceae	LC
67	<i>Clausena heptaphylla</i>	Koronful	Rutaceae	LC
68	<i>Cordia fragrantissima</i>	Kawa tbuti/ Mahidal	Boraginaceae	LC
69	<i>Cordia myxa</i>	Aslia/Kalaujha	Boraginaceae	LC
70	<i>Crateva religiosa</i>	Barun/Large Garlic Pear	Capparaceae	LC
71	<i>Croton bonplandianus</i>	Ram Kol	Euphorbiaceae	NA
72	<i>Crypteronia paniculata</i>	Garumara	Crypteroniaceae	LC
73	<i>Cyathea sp.</i>	-	Cyatheaceae	LC
74	<i>Cynometra polyandra</i>	Ping	Fabaceae	DD
75	<i>Dalbergia sericea</i>	Gajai Lota	Fabaceae	LC
76	<i>Dendrophthoe falcata</i>	Jiddu	Loranthaceae	NA
77	<i>Desmodium heterophyllum</i>		Fabaceae	NA
78	<i>Desmodium triflorum</i>	Kodalia	Fabaceae	LC
79	<i>Dillenia indica</i>	Chaitta	Dilleniaceae	LC
80	<i>Dillenia pentagyna</i>	Okshi /Chailta ban/ Hergoza	Dilleniaceae	NA
81	<i>Diospyros toposia</i>	Gulal	Ebenaceae	LC
82	<i>Diplospora singularis</i>	Pongta	Rubiaceae	NA
83	<i>Dipterocarpus turbinatus</i>	Garjan/ Kuroil	Dipterocarpaceae	VU
84	<i>Duabanga grandiflora</i>	Ramdata	Lythraceae	LC
85	<i>Dysoxylum binectariferum</i>	Bandar fela	Malvaceae	NA
86	<i>Dysoxylum gotadhora</i>	Bandardima	Malvaceae	NA
87	<i>Dysoxylum hamiltonii</i>	Rauni poma	Malvaceae	NA
88	<i>Echinocarpus assamicus</i>	Sita	Elaeocarpaceae	NA
89	<i>Elaeocarpus angustifolius</i>	Rudraksha/ Poreng	Elaeocarpaceae	LC
90	<i>Elaeocarpus floribundus</i>	Belphai/Jatpai	Elaeocarpaceae	LC
91	<i>Embllica officinalis</i>	Amloki/Eonla	Phyllanthaceae	LC
92	<i>Endospermum chinense</i>	Tarua	Euphorbiaceae	LC
93	<i>Erythrina suberosa</i>	Corky Coral Tree	Fabaceae	NA
94	<i>Erythrina variegata</i>	Kurao/Madua	Fabaceae	LC
95	<i>Ficus benghalensis</i>	Khongnang taru/Bargad	Moraceae	NA
96	<i>Ficus benjamina</i>	Pukar/Weeping Fig/Jari gach	Moraceae	LC
97	<i>Ficus hispida</i>	Asi Heibong/Hairy Fig	Moraceae	LC
98	<i>Ficus palmata</i>	Wild fig	Moraceae	LC
99	<i>Ficus racemosa</i>	Heibong/Damur	Moraceae	LC
100	<i>Ficus religiosa</i>	Pippol/Aswatha	Moraceae	LC
101	<i>Flacourtia indica</i>	Indian plum/Bilangada	Salicaceae	LC

S. No.	Common Name	Scientific Name	Family	IUCN Status
102	<i>Flacourtia jangomas</i>	Lukuki	Salicaceae	NA
103	<i>Garcinia cowa</i>	Kow	Clusiaceae	LC
104	<i>Garcinia xanthochymus</i>	Dephal	Clusiaceae	LC
105	<i>Garuga pinnata</i>	Pama/Bombuk/Kayengh	Burseraceae	NA
106	<i>Gmelina arborea</i>	Gamhar/Wang	Verbenaceae	LC
107	<i>Grewia microcos</i>	Pisanti	Tiliaceae	NA
108	<i>Gynocardia odorata</i>	Bonsha, Dalmugra	Salicaceae	NA
109	<i>Haldina cordifolia</i>	Haldi kat	Rubiaceae	LC
110	<i>Heritiera acuminata</i>	Banbojoi	Malvaceae	NA
111	<i>Hibiscus macrophyllus</i>	Chamia	Malvaceae	LC
112	<i>Holarrhena pubescens</i>	dhulkari/Indrajao	Apocynaceae	LC
113	<i>Holigarna longifolia</i>	Jhawa	Anacardiaceae	NA
114	<i>Hydnocarpus kurzii</i>	Chalmugra	Achariaceae	DD
115	<i>Ixora arborea</i>	Torchwood Tree	Rubiaceae	NA
116	<i>Kayea floribunda</i>	Korol	Calophyllaceae	NA
117	<i>Knema erratica</i>	Chinese Nutmeg	Myristicaceae	LC
118	<i>Kydia calycina</i>	Kydia/Pichhola	Malvaceae	LC
119	<i>Lagerstroemia flos-reginae</i>	Janul	Lythraceae	LC
120	<i>Lagerstroemia speciosa</i>	Ajara/Sanjanel	Lythraceae	LC
121	<i>Lannea coromandelica</i>	Jia/Indian Ash Tree	Anacardiaceae	LC
122	<i>Litsea monopetala</i>	Sowalu	Lauraceae	LC
123	<i>Litsea glutinosa</i>	Indian Laurel/Fuara	Lauraceae	LC
124	<i>Lophopetalum fimbriatum</i>	Satrong	Celastraceae	NA
125	<i>Macaranga denticulata</i>	Moralia/Jakura	Euphorbiaceae	LC
126	<i>Macaranga spp.</i>	Larubandha	Euphorbiaceae	-
127	<i>Magnolia champaca</i>	Champa	Magnoliaceae	LC
128	<i>Magnolia hodgsonii</i>	Ukhail	Magnoliaceae	LC
129	<i>Mallotus philippensis</i>	Gangai	Euphorbiaceae	LC
130	<i>Mangifera indica</i>	Aam	Anacardiaceae	DD
131	<i>Mangifera sylvatica</i>	Ban-am	Anacardiaceae	LC
132	<i>Melia azedarach</i>	Lilac tree/Sejtrak/Ghura Neem	Meliaceae	LC
133	<i>Meliosma pinnata</i>	Bon Posala	Sabiaceae	NA
134	<i>Mesua ferrea</i>	Nageswar	Calophyllaceae	VU
135	<i>Microcos paniculata</i>	Heitup/Elm-Leaf Grewia	Tiliaceae	LC
136	<i>Milusa spp.</i>	Koinari	Annonaceae	-
137	<i>Mimusops elengi</i>	Bakul	Sapotaceae	LC
138	<i>Moringa oleifera</i>	Drumstick Tree/Sajna	Moringaceae	LC
139	<i>Morus laevigata</i>	Bhola	Moraceae	NA
140	<i>Morus macroura</i>	Kabrangchak/Himalayan Mulberry	Moraceae	LC
141	<i>Myristica angustifolia</i>	Tezhuara	Myristicaceae	LC

S. No.	Common Name	Scientific Name	Family	IUCN Status
142	<i>Neolamarckia cadamba</i>	Kadam	Rubiaceae	NA
143	<i>Oroxylum indicum</i>	Shamba/Hona	Bignoniaceae	LC
144	<i>Pajanelia longifolia</i>		Bignoniaceae	LC
145	<i>Palaquium polyanthum</i>	Kurta	Sapotaceae	EN
146	<i>Parkia Roxburghii</i>	Lonchak	Mimosaceae	LC
147	<i>Phoebe hainesiana</i>	Bonsum	Lauraceae	EN
148	<i>Phyllanthus amarus</i>	Bhumi Amla	Phyllanthaceae	NA
149	<i>Phyllanthus emblica</i>	Amlakhi	Euphorbiaceae	LC
150	<i>Podocarpus neriifolius</i>	Jinari	Podocarpaceae	LC
151	<i>Polyalthia simiarum</i>	Chami	Annonaceae	LC
152	<i>Pongamia pinnata</i>	Karchaw/Karach	Fabaceae	LC
153	<i>Premna bengalensis</i>	Gohora/Pakhirhar	Lamiaceae	NA
154	<i>Protium serratum</i>	-	Burseraceae	NA
155	<i>Psidium guajava</i>	Amrood/ Madhuriam	Myrtaceae	LC
156	<i>Pterospermum acerifolium</i>	Madhubura	Malvaceae	LC
157	<i>Sapindus mukorossi</i>	Manishal/ Ritha	Sapindaceae	LC
158	<i>Sapium baccatum</i>	Bella	Euphorbiaceae	LC
159	<i>Saraca asoca</i>	Ashok/Sita Ashok	Fabaceae	VU
160	<i>Saurauia armata</i>	-	Actinidiaceae	LC
161	<i>Saurauia roxburghii</i>	Pani posola	Actinidiaceae	LC
162	<i>Schima khasiana</i>	Banak	Theaceae	LC
163	<i>Schima wallichii</i>	Makria/Needlewood Tree	Theaceae	LC
164	<i>Shorea robusta</i>	Sal	Dipterocarpaceae	NA
165	<i>Spondias pinnata</i>	Amra	Anacardiaceae	NA
166	<i>Sterculia alata</i>	Udal	Sterculiaceae	LC
167	<i>Sterculia foetida</i>	Java Olive/Amara lota	Sterculiaceae	LC
168	<i>Sterculia versicolor</i>	Durong	Malvaceae	LC
169	<i>Stereospermum chelonoides</i>	Padari/ Paraia awal	Bignoniaceae	LC
170	<i>Stereospermum spp.</i>	Hunur	Bignoniaceae	LC
171	<i>Syzygium cumini</i>	Jamun/ Jamuk	Myrtaceae	LC
172	<i>Syzygium jambos</i>	Jam	Myrtaceae	LC
173	<i>Syzygium kurzii</i>	Bogi Jamuk	Myrtaceae	NA
174	<i>Talauma phellocarpa</i>	Sundi, Til	Magnoliaceae	LC
175	<i>Tamarindus indica</i>	Mange/Imli/Tetul	Fabaceae	LC
176	<i>Tectona grandis</i>	Chingsu/Teak	Verbenaceae	EN
177	<i>Terminalia arjuna</i>	Arjun/Maiyokpha	Combretaceae	NA
178	<i>Terminalia bellirica</i>	Bahera/bauri/Boera	Combretaceae	LC
179	<i>Terminalia chebula</i>	Manahi/Hilika/Hartaki	Combretaceae	LC
180	<i>Terminalia myriocarpa</i>	Hollokh/Jhalna	Combretaceae	NA
181	<i>Tetrameles nudiflora</i>	Bhelu/Tula	Tetramelaceae	LC
182	<i>Toona ciliata</i>	Poma Jatipoma/Kuma	Meliaceae	LC
183	<i>Trema orientalis</i>	Jiban	Cannabaceae	LC

S. No.	Common Name	Scientific Name	Family	IUCN Status
184	<i>Trevesia palmata</i>	Bhotola	Araliaceae	LC
185	<i>Trewia nudiflora</i>	Bhuri	Euphorbiaceae	LC
186	<i>Vatica lanceifolia</i>	Mahal	Dipterocarpaceae	CR
187	<i>Vitex altissima</i>	Jharua/Moruwa	Verbenaceae	LC
188	<i>Vitex negundo</i>	Bhatkur	Verbenaceae	LC
189	<i>Vitex pubescens</i>	Bhadruk, Awal	Verbenaceae	NA
190	<i>Wendlandia budleioides</i>	Kadam	Rubiaceae	NA
191	<i>Wrightia arborea</i>	Dudhi	Apocynaceae	LC
192	<i>Xerospermum noronhianum</i>	-	Sapindaceae	NA
193	<i>Zanthoxylum acanthopodium</i>	-	Rutaceae	LC
194	<i>Zanthoxylum oxyphyllum</i>	-	Rutaceae	NA
195	<i>Zanthoxylum rhetsa</i>	Bajrang	Rutaceae	LC
196	<i>Ziziphus jujuba</i>	Boroc	Rhamnaceae	LC
197	<i>Ziziphus mauritiana</i>	Indian Jujube/Boroi	Rhamnaceae	LC
Shrubs				
198	<i>Abelmoschus moschatus</i>	-	Malvaceae	LC
199	<i>Abutilon indicum</i>	-	Malvaceae	NA
200	<i>Aeschynomene indica</i>	-	Fabaceae	LC
201	<i>Agave amica</i>	Rajnigandha/Kundalei	Asparagaceae	NA
202	<i>Alangium sp</i>	-	Cornaceae	LC
203	<i>Anodendron paniculatum</i>	-	Apocynaceae	NA
204	<i>Antidesma acidum</i>	-	Phyllanthaceae	LC
205	<i>Antidesma ghaesembilla</i>	Heloch, Mikhan-tenga	Euphorbiaceae	LC
206	<i>Aralia armata</i>	-	Apocynaceae	LC
207	<i>Ardisia paniculata</i>	-	Primulaceae	NA
208	<i>Arenga pinnata</i>	-	Arecaceae	LC
209	<i>Arundina graminifolia</i>	-	Orchidaceae	NA
210	<i>Boehmeria macrophylla</i>	-	Urticaceae	NA
211	<i>Buddleja asiatica</i>	Asian Butterfly Bush/Shamei	Scrophulariaceae	LC
212	<i>Camellia kissi</i>	-	Theaceae	LC
213	<i>Camellia sinensis</i>	Tea/Cha	Theaceae	DD
214	<i>Caryota urens</i>	-	Arecaceae	DD
215	<i>Casearia vareca</i>	East-Himalayan Casearia	Salicaceae	NA
216	<i>Chassalia curviflora</i>	-	Rubiaceae	NA
217	<i>Chromolaena odorata</i>	Siam Weed/Kambirei	Asteraceae	NA
218	<i>Clerodendrum infortunatum</i>	Bhat/Kuthap manbi	Verbenaceae	LC
219	<i>Curcuma spp.</i>	Ban laldi	Zingiberaceae	-
220	<i>Debregeasia longifolia</i>	-	Urticaceae	LC
221	<i>Deeringia amaranthoides</i>	-	Amaranthaceae	NA
222	<i>Dendrocnide sinuata</i>	Suchutra	Urticaceae	LC
223	<i>Eupatorium spp.</i>	Pisach ban	Asteraceae	-

S. No.	Common Name	Scientific Name	Family	IUCN Status
224	<i>Eurya acuminata</i>	-	Pentaphragaceae	LC
225	<i>Girardinia diversifolia</i>	-	Urticaceae	NA
226	<i>Glochidion khasicum</i>	-	Euphorbiaceae	LC
227	<i>Homalomena rubescens</i>	Gandhi	Araceae	NA
228	<i>Indigofera cassioides</i>	Cassia Indigo/hakanu	Fabaceae	NA
229	<i>Lantana camara</i>	Lantana	Verbenaceae	NA
230	<i>Leea asiatica</i>	-	Vitaceae	NA
231	<i>Leea indica</i>	-	Vitaceae	LC
232	<i>Licuala peltate</i>	Chatta- pat/Patidul/Chhatipat	Arecaceae	NA
233	<i>Licuala spinosa</i>	-	Arecaceae	NA
234	<i>Lippia alba</i>	-	Verbinaceae	NA
235	<i>Litsea cubeba</i>	May Chang	Lauraceae	LC
236	<i>Livistona jenkinsiana</i>	Biardala	Aricaceae	NA
237	<i>Maesa ramentacea</i>	-	Primulaceae	LC
238	<i>Melastoma malabathricum</i>	Phuuki/Lutki	Melastomataceae	NA
239	<i>Micromelum integerrimum</i>	-	Rutaceae	LC
240	<i>Morinda angustifolia</i>	-	Rubiaceae	NA
241	<i>Mussaenda glabra</i>	-	Rubiaceae	NA
242	<i>Mussaenda macrophylla</i>	-	Rubiaceae	NA
243	<i>Mussaenda roxburghii</i>	-	Rubiaceae	NA
244	<i>Nyctanthes arbortristis</i>	Sewali	Oleaceae	LC
245	<i>Oreocnide integrifolia</i>	Ban rhea, Bon rhea	Ulmaceae	NA
246	<i>Osbeckia crinite</i>	Hairy Osbeckia	Melastomataceae	NA
247	<i>Osbeckia nepalensis</i>	Nepal Pink Osbeckia	Melastomataceae	NA
248	<i>Osbeckia stellata</i>	Starry Osbeckia	Melastomataceae	NA
249	<i>Phrynium imbricatum</i>	Kitta pata	Marantaceae	NA
250	<i>Pinanga gracilis</i>	Ramgua	Arecaceae	NA
251	<i>Rhus chinensis</i>	-	Anacardiaceae	LC
252	<i>Sarcochlamys pulcherrima</i>	-	Urticaceae	NA
253	<i>Saurauia cerea</i>	-	Actinidiaceae	LC
254	<i>Schefflera venulose</i>	-	Araliaceae	LC
255	<i>Schumannianthus dichotomus</i>	Patidoi	Marantaceae	NA
256	<i>Senna alata</i>	-	Fabaceae	LC
257	<i>Tabernaemontana divaricata</i>	-	Apocynaceae	LC
258	<i>Tithonia diversifolia</i>	-	Asteraceae	LC
259	<i>Viburnum cylindricum</i>	-	Adoxaceae	LC
260	<i>Woodfordia fruticosa</i>	Fire Flame Bush/Dhawai	Lythraceae	LC
261	<i>Wrightia antidysenterica</i>	-	Apocynaceae	NA
262	<i>Zizyphus rugosa</i>	Bon-boroi	Rhamnaceae	NA
Herbs/ Grasses/ Bamboos				

S. No.	Common Name	Scientific Name	Family	IUCN Status
263	<i>Acalypha indica</i>	-	Euphorbiaceae	NA
264	<i>Achyranthes aspera</i>	-	Amaranthaceae	NA
265	<i>Acmella oleracea</i>	-	Asteraceae	NA
266	<i>Agave americana</i>	Agave/Kewa	Agavaceae	:LC
267	<i>Ageratina adenophora</i>	Catweed/Japan napi	Asteraceae	NA
268	<i>Alocasia cucullata</i>	-	Araceae	NA
269	<i>Alternanthera sessilis</i>	-	Amaranthaceae	LC
270	<i>Amaranthus spinosus</i>	-	Amaranthaceae	NA
271	<i>Amaranthus viridis</i>	-	Amaranthaceae	NA
272	<i>Andrographis paniculata</i>	-	Acanthaceae	NA
273	<i>Andropogon squarrossus</i>	Benaghash	Poaceae	NA
274	<i>Anisomeles indica</i>	Thoiding Angouba/Indian Catmint	Lamiaceae	NA
275	<i>Arundo donax</i>	-	Poaceae	LC
276	<i>Asclepias curassavica</i>	Bloodflower/Krishnachura	Apocynaceae	NA
277	<i>Asparagus racemosus</i>	Shatmul	Liliaceae	NA
278	<i>Bambusa arundinacea</i>	Bansh/ Kata	Poaceae	NA
279	<i>Bambusa balcooa</i>	Bhaluka/Balcooa Bamboo	Poaceae	NA
280	<i>Bambusa cacharensis</i>	Betua	Poaceae	NA
281	<i>Bambusa nutans</i>	Pichlee	Poaceae	NA
282	<i>Bambusa pallida</i>	Bakail	Poaceae	NA
283	<i>Bambusa teres</i>	Pama	Poaceae	NA
284	<i>Bambusa tulda</i>	Bijuli banh, Mirtenga, Tulda	Poaceae	NA
285	<i>Bambusa vulgaris</i>	Tansti banh, Kalia, Kaligoda	Poaceae	NA
286	<i>Begonia palmata</i>	-	Begoniaceae	NA
287	<i>Begonia picta</i>	-	Begoniaceae	NA
288	<i>Begonia roxburghii</i>	-	Begoniaceae	NA
289	<i>Bidens bipinnata</i>	-	Asteraceae	NA
290	<i>Blumea lacera</i>	-	Asteraceae	DD
291	<i>Calamus guruba</i>	Sundi	Arecaceae	NA
292	<i>Calamus latifolius</i>	Horna	Arecaceae	NA
293	<i>Calamus tenuis</i>	Jali	Arecaceae	LC
294	<i>Carex dimorpholepis</i>	-	Cyperaceae	NA
295	<i>Cayratia trifolia</i>	-	Vitaceae	NA
296	<i>Centipeda minima</i>	-	Asteraceae	LC
297	<i>Cheilocostus speciosus</i>	-	Costaceae	LC
298	<i>Chrysopogon aciculatus</i>	Bonguti	Poaceae	NA
299	<i>Chrysopogon zizanioides</i>	Vetiver	Poaceae	NA
300	<i>Cissus adnata</i>	-	Vitaceae	NA
301	<i>Cleome gynandra</i>	-	Cleomaceae	NA
302	<i>Cleome viscosa</i>	-	Cleomaceae	NA

S. No.	Common Name	Scientific Name	Family	IUCN Status
303	<i>Colocasia fallax</i>	-	Araceae	LC
304	<i>Crassocephalum crepidioides</i>	-	Asteraceae	NA
305	<i>Cyanthillium cinereum</i>	-	Asteraceae	NA
306	<i>Cynodon dactylon</i>	-	Poaceae	NA
307	<i>Cyperus compactus</i>	-	Cyperaceae	LC
308	<i>Cyperus compressus</i>	-	Cyperaceae	LC
309	<i>Cyperus cyperinus</i>	-	Cyperaceae	NA
310	<i>Daemonorops jenkinsiana</i>	Golla	Areaceae	NA
311	<i>Dendrobium densiflorum</i>	-	Orchidaceae	NA
312	<i>Dendrocalamus hamiltonii</i>	Tama Bamboo/Pahari- kako/ Pecha	Poaceae	NA
313	<i>Dendrocalamus longispathus</i>	Khang	Poaceae	NA
314	<i>Dendrocalamus strictus</i>	Karail	Poaceae	NA
315	<i>Dentella repens</i>	-	Rubiaceae	LC
316	<i>Dichrocephala integrifolia</i>	-	Asteraceae	NA
317	<i>Dinochloa macclellandii</i>	Lota	Poaceae	NA
318	<i>Dioscorea alata</i>	-	Dioscoreaceae	NA
319	<i>Dioscorea bulbifera</i>	-	Dioscoreaceae	NA
320	<i>Dioscorea deltoidei</i>	-	Dioscoreaceae	NA
321	<i>Dioscorea esculenta</i>	-	Dioscoreaceae	NA
322	<i>Dioscorea hamiltonii</i>	-	Dioscoreaceae	NT
323	<i>Dioscorea pentaphylla</i>	-	Dioscoreaceae	NA
324	<i>Eclipta prostrata</i>	-	Asteraceae	LC
325	<i>Elatostema sessile</i>	-	Urticaceae	LC
326	<i>Elephantopus scaber</i>	-	Asteraceae	NA
327	<i>Eleusine indica</i>	-	Poaceae	LC
328	<i>Eragrostis cynosuroides</i>	Kushghash	Poaceae	NA
329	<i>Eragrostis pilosa</i>	-	Poaceae	NA
330	<i>Erianthus ravennae</i>	Ekora	Poaceae	LC
331	<i>Erigeron canadensis</i>	-	Asteraceae	NA
332	<i>Eupatorium sp</i>	-	Asteraceae	NA
333	<i>Fimbristylis eragrostis</i>	-	Cyperaceae	NA
334	<i>Globba clarkei</i>	-	Zingiberaceae	NA
335	<i>Globba multiflora</i>	-	Zingiberaceae	LC
336	<i>Globba racemosa</i>	-	Zingiberaceae	LC
337	<i>Hedychium coccineum</i>	-	Zingiberaceae	NA
338	<i>Helichrysum luteoalbum</i>	-	Asteraceae	NA
339	<i>Homalomena aromatica</i>	-	Araceae	NA
340	<i>Impatiens balsamina</i>	-	Asteraceae	NA
341	<i>Imperata cylindrica</i>	Khor	Poaceae	LC
342	<i>Iris domestica</i>	Surajakant/Leopard Flower,	Iridaceae	NA

S. No.	Common Name	Scientific Name	Family	IUCN Status
343	<i>Kyllinga brevifolia</i>	-	Cyperaceae	LC
344	<i>Melocalamus compactiflorus</i>	Darat	Poaceae	NA
345	<i>Melocanna baccifera</i>	Tavai/Terai bamboo/Muli	Poaceae	NA
346	<i>Melocanna bambusoides</i>	Muli	Poaceae	NA
347	<i>Mikania sp</i>	-	Asteraceae	NA
348	<i>Musa balbisiana</i>	-	Musaceae	NA
349	<i>Nicotiana plumbaginifolia</i>	-	Solanaceae	NA
350	<i>Oldenlandia diffusa</i>	-	Rubiaceae	LC
351	<i>Oplismenus compositus</i>	-	Poaceae	LC
352	<i>Oxytenanthera nigrociliata</i>	Kail	Poaceae	NA
353	<i>Paederia foetida</i>	-	Rubiaceae	LC
354	<i>Paederia scandens</i>	-	Rubiaceae	NA
355	<i>Panicum brevifolium</i>	-	Poaceae	NA
356	<i>Papilionanthe teres</i>	-	Orchidaceae	NA
357	<i>Pennisetum typhoideum</i>	Bajra	Poaceae	NA
358	<i>Peperomia pellucida</i>	-	Piperaceae	NA
359	<i>Persicaria barbata</i>	-	Polygonaceae	LC
360	<i>Persicaria chinensis</i>	-	Piperaceae	NA
361	<i>Persicaria hydropiper</i>	-	Polygonaceae	LC
362	<i>Persicaria strigosa</i>	-	Polygonaceae	LC
363	<i>Phragmites karka</i>	Nal	Poaceae	LC
364	<i>Phrynium pubinerve</i>	-	Marantaceae	NA
365	<i>Phyla nodiflora</i>	-	Verbanaceae	LC
366	<i>Physalis minima</i>	-	Solanaceae	LC
367	<i>Piper acutistigmum</i>	-	Piperaceae	NA
368	<i>Piper thomsonii</i>	-	Piperaceae	NA
369	<i>Polygonum perfoliatum</i>	-	Polygonaceae	NA
370	<i>Polygonum plebeium</i>	-	Polygonaceae	LC
371	<i>Pothos scandens</i>	-	Araceae	NA
372	<i>Pouzolzia hirta</i>	-	Urticaceae	NA
373	<i>Pseudechinolaena polystachya</i>	-	Poaceae	NA
374	<i>Remusatia hookeriana</i>	-	Araceae	NA
375	<i>Remusatia pumila</i>	-	Araceae	NA
376	<i>Rhaphidophora decursiva</i>	-	Araceae	NA
377	<i>Rhynchostylis retusa</i>	-	Orchidaceae	NA
378	<i>Rumex maritimus</i>	-	Polygonaceae	LC
379	<i>Saccharum procerum</i>	Kash	Poaceae	NA
380	<i>Saccharum spontaneum</i>	Khagra	Poaceae	LC
381	<i>Schizostachyum dullooa</i>	-	Poaceae	NA
382	<i>Senna occidentalis</i>	-	Fabaceae	LC
383	<i>Senna sophera</i>	-	Fabaceae	NA

S. No.	Common Name	Scientific Name	Family	IUCN Status
384	<i>Senna tora</i>	-	Fabaceae	NA
385	<i>Setaria palmifolia</i>	Palm Grass	Poaceae	NA
386	<i>Sida acuta</i>	-	Malvaceae	NA
387	<i>Sida cordifolia</i>	-	Malvaceae	NA
388	<i>Sida rhombifolia</i>	-	Malvaceae	NA
389	<i>Solanum aculeatissimum</i>	-	Solanaceae	NA
390	<i>Solanum americanum</i>	-	Solanaceae	NA
391	<i>Solanum indicum</i>	-	Solanaceae	LC
392	<i>Solanum sisymbriifolium</i>	Sticky Nightshade	Solanaceae	NA
393	<i>Solanum virginianum</i>	Leipungkhanga/Thorny Nightshade	Solanaceae	NA
394	<i>Sonchus wightianus</i>	-	Asteraceae	NA
395	<i>Spermacoce hispida</i>	-	Rubiaceae	NA
396	<i>Stachytarpheta jamaicensis</i>	-	Verbanaceae	LC
397	<i>Stellaria media</i>	-	Caryophyllaceae	LC
398	<i>Teinostachyum dullooa</i>	Dalu	Poaceae	NA
399	<i>Tetrastigma pedunculare</i>	-	Vitaceae	NA
400	<i>Thysanolaena latifolia</i>	-	Poaceae	NA
401	<i>Thysanolaena maxima</i>	Rema	Poaceae	NA
402	<i>Tridax procumbens</i>	-	Asteraceae	NA
403	<i>Xanthium strumarium</i>	-	Asteraceae	NA
Climbers/Vines/Lianas/Creepers/Epiphytes				
404	<i>Acacia pennata</i>	Kuchai	Fabaceae	NA
405	<i>Argyreia nervosa</i>	Bichtarak, Goguli	Convolvulaceae	NA
406	<i>Byttneria aspera</i>	-	Malvaceae	NA
407	<i>Cissus repens</i>	Creeping Treebine/Down-rang	Vitaceae	NA
408	<i>Coccinia grandis</i>	Ivy Gourd/Kwakthabi	Cucurbitaceae	NA
409	<i>Combretum indicum</i>	-	Combretaceae	NA
410	<i>Combretum pilosum</i>	-	Combretaceae	NA
411	<i>Combretum wallichii</i>	-	Combretaceae	NA
412	<i>Cuscuta reflexa</i>	-	Convolvulaceae	LC
413	<i>Entada scandens</i>	Ghilla	Fabaceae	NA
414	<i>Ficus spp.</i>	Bat	Moraceae	-
415	<i>Hoya verticillate</i>	-	Apocynaceae	NA
416	<i>Illigera khasiana</i>	Kerkerilata	Hernandiaceae	NA
417	<i>Ipomoea cairica</i>	Singa/Morning Glory	Convolvulaceae	LC
418	<i>Ipomoea cheirophylla</i>	-	Convolvulaceae	NA
419	<i>Ipomoea hederifolia</i>	-	Convolvulaceae	NA
420	<i>Ipomoea nil</i>	-	Convolvulaceae	NA
421	<i>Ipomoea purpurea</i>	-	Convolvulaceae	NA
422	<i>Loranthus scurrula</i>	Karau	Loranthaceae	NA

S. No.	Common Name	Scientific Name	Family	IUCN Status
423	<i>Momordica charantia</i>	-	Cucurbitaceae	NA
424	<i>Mucuna imbricata</i>	Makori ghila	Fabaceae	LC
425	<i>Passiflora edulis</i>	Passion Fruit/Lata Bel	Passifloraceae	NA
426	<i>Pegia nitida</i>	-	Anacardiaceae	NA
427	<i>Phanera glauca</i>	-	Fabaceae	LC
428	<i>Phanera ornata</i>	-	Fabaceae	NA
429	<i>Phanera scandens</i>	Snake Climber, Monkey ladders	Fabaceae	NA
430	<i>Phanera vahlii</i>	Kanchan lota, Nak-kati-lewa	Fabaceae	NA
431	<i>Phanera wallichii</i>	-	Fabaceae	LC
432	<i>Piper longum</i>	Long Pepper	Piperaceae	NA
433	<i>Piper nigrum</i>	Jaluk/ Kali Mirch	Piperaceae	NA
434	<i>Poikilospermum suaveolens</i>	Jog-kag, kamlata	Moraceae	NA
435	<i>Poranopsis paniculata</i>	-	Convolvulaceae	NA
436	<i>Pueraria montana</i>	Kudzu	Fabaceae	NA
437	<i>Sabia lanceolata</i>	-	Sabiaceae	NA
438	<i>Smilax zeylanica</i>	Smilax	Smilacaceae	NA
439	<i>Tetracera sarmentosa</i>	Chaittalat	Dilleniaceae	NA
440	<i>Thunbergia grandiflora</i>	Kukua loti	Acanthaceae	NA
441	<i>Tinospora cordifolia</i>	aamoi lota/Indian Tinospora	Menispermaceae	NA
442	<i>Tinospora crispa</i>	Gulanha	Menispermaceae	NA
443	<i>Trichosanthes cochinchinensis</i>	-	Cucurbitaceae	NA
444	<i>Trichosanthes tricuspidata</i>	-	Cucurbitaceae	NA

3.11.6 Faunal Species

This section of the report presents the key faunal species, particularly vertebrates, encompassing mammals, birds, reptiles, amphibians, Butterflies, and fish, that have been recorded in the Study Area. Detailed species tables are provided. It specifies both the scientific and common names of the species, family/order as well as their conservation status as classified by the International Union for Conservation of Nature (IUCN).

Mammals: An analysis of primary and secondary data indicates that a minimum of 58 mammal species have documented ranges that either fully or partially intersect with the Study Area. Notably, according to the IUCN Red List, 01 species classified as Critically Endangered, 05 species classified as Endangered and 11 as Vulnerable. The details of the mammal species of the Study Area is given in the table below.

Table 3-21: Mammals of the Study Area

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
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Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
1	Asian Golden cat	<i>Catopuma temminckii</i>	Sch-I	NT
2	Asian House Shrew	<i>Suncus murinus</i>	NL	LC
3	Asian Small-clawed Otter	<i>Aonyx cinerea</i>	Sch-I	VU
4	Asiatic black bear	<i>Ursus thibetanus thibetanus</i>	Sch-I	VU
5	Assamese macaque	<i>Macaca assamensis</i>	Sch-I	NT
6	Barking deer	<i>Muntiacus muntjak</i>	NL	LC
7	Bay Bamboo Rat	<i>Cannomys badius</i>	NL	LC
8	Bengal Slow loris	<i>Nycticebas bengalensis</i>	Sch-I	EN
9	Binturong	<i>Arctictis binturong</i>	Sch-I	VU
10	Capped langur	<i>Trachypithecus pileatus</i>	Sch-I	EN
11	Clouded leopard	<i>Neofelis nebulosa</i>	Sch-I	VU
12	Eastern Bent-Winged Bat	<i>Miniopterus schreibersii</i>	NL	LC
13	Fulvous Roundleaf Bat	<i>Hipposideros fulvus</i>	NL	LC
14	Golden Jackal	<i>Canis aureus</i>	Sch-I	LC
15	Greater Asian Yellow Bat	<i>Scotophilus heathii</i>	NL	LC
16	Greater Short-Nosed Fruit Bat	<i>Cynopterus sphinx</i>	NL	LC
17	Himalayan Stripped Squirrel	<i>Tamiops macclellandi</i>	NL	LC
18	Hoolock gibbon	<i>Hoolock hoolock</i>	Sch-I	EN
19	House Mouse	<i>Mus musculus</i>	NL	LC
20	House Rat	<i>Rattus rattus</i>	NL	LC
21	Indian Flying Fox	<i>Pteropus giganteus</i>	Sch-II	LC
22	Indian Grey Mongoose	<i>Urva edwardsii</i>	Sch-I	LC
23	Indian Hare	<i>Lepus nigricollis</i>	Sch-II	LC
24	Irrawaddy Squirrel	<i>Callosciurus pygerythrus</i>	NL	LC
25	Jungle cat	<i>Felis chaus</i>	Sch-I	LC
26	Large Indian Civet	<i>Viverra zibetha</i>	Sch-I	LC
27	Leopard cat	<i>Prionailurus bengalensis</i>	Sch-I	LC
28	Lesser Asian Yellow Bat	<i>Scotophilus kuhlii</i>	NL	LC
29	Long-Tailed Tree Mouse	<i>Vandeleuria oleracea</i>	NL	LC
30	Northern Pig-Tailed Macaque	<i>Macaca leonina</i>	Sch-I	LC
31	Northern Tree Shrew	<i>Tupaia belangeri</i>	NL	LC
32	Red Giant Flying Squirrel	<i>Petaurista petaurista</i>	Sch-I	LC
33	Rhesus Macaque	<i>Macaca mulatta</i>	NL	LC
34	Serow	<i>Capricornis sp</i>	Sch-I	VU
35	Short-Tailed Mole	<i>Euroscaptor micruna</i>	NL	DD
36	Sloth Bear	<i>Melursus ursinus</i>	Sch-I	VU

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
37	Small Indian Civet	<i>Viverricula indica</i>	Sch-I	LC
38	Small Indian Mongoose	<i>Urva auropunctata</i>	Sch-I	LC
39	Small-toothed Ferret badger	<i>Melogale moschata</i>	Sch-II	LC
40	Stump-tailed macaque	<i>Macaca arctoides</i>	Sch-I	VU
41	Sun bear	<i>Helarctos malayanus</i>	Sch-I	VU
42	Wild Boar	<i>Sus scrofa</i>	Sch-II	LC
43	Yellow-Throated Marten	<i>Martes flavigula</i>	Sch-I	LC
44	Euralsian Otter	<i>Lutra lutra</i>	Sch-I	NT
45	Porcupine	<i>Hystrix indica</i>	Sch-I	LC
46	Hog Deer	<i>Axis porcinus</i>	Sch-I	EN
47	Muntjak	<i>Muntiacus vaginalis</i>	Sch-I	LC
48	Fishing Cate	<i>Prionailurus viverrinus</i>	Sch-I	VU
49	Phayre's leaf monkey	<i>Trachypithecus phayrei</i>	Sch-I	EN
50	Black Giant Squirrel	<i>Ratufa bicolor</i>	Sch-I	NT
51	Langur	<i>Semnopithecus entellus</i>	Sch-II	LC
52	Leopard	<i>Panthera pardus</i>	Sch-I	VU
53	Fruit Bat	<i>Rousettus leschenaultii</i>	NL	LC
54	Field Mouse	<i>Mus booduga</i>	NL	LC
55	Wood rat	<i>Madromys blanfordi</i>	NL	LC
56	Chinese Pangolin	<i>Manis pentadactyla</i>	Sch-I	CR
57	Sambar Deer	<i>Rusa unicolor</i>	Sch-I	VU
58	Indian Pipistrelle	<i>Pipistrellus coromandra</i>	NL	LC

Avifauna: The analysis of primary and secondary data indicates that a minimum of 270 bird species have documented ranges that either completely or partially intersect with the Study Area. Noteworthy species in relation to the IUCN Red List comprise 02 species classified as Endangered and 02 species categorized as Vulnerable. During the field visit, no records of Critically Endangered bird species were found within the Study Area. A detailed list of the bird species present in the Study Area can be found in the table below.

Table 3-22: Avian Diversity of the Study Area

S. No	Common Name	Scientific Name	WPAA 2022	IUCN
1	Asian Pied Starling	<i>Gracupica contra</i>	Sch-II	LC
2	Abbott's Babbler	<i>Malacocincla abbotti</i>	NT	LC
3	Aberrant Bush Warbler	<i>Horornis flavolivaceus</i>	Sch-II	LC
4	Alexandrine Parakeet	<i>Psittacula eupatria</i>	Sch-II	NT

S. No	Common Name	Scientific Name	WPA 2022	IUCN
5	Ashy Drongo	<i>Dicrurus leucophaeus</i>	Sch-II	LC
6	Ashy Minivet	<i>Pericrocotus divaricatus</i>	Sch-II	LC
7	Ashy Prinia	<i>Prinia socialis</i>	Sch-II	LC
8	Ashy-Headed Green Pigeon	<i>Treron pompadora</i>	Sch-II	LC
9	Asian Barred Owlet	<i>Glaucidium cuculoides</i>	Sch-II	LC
10	Asian Brown Flycatcher	<i>Muscicapa dauurica</i>	Sch-II	LC
11	Asian Fairy Bluebird	<i>Irena puella</i>	Sch-II	LC
12	Asian Koel	<i>Eudynamys scolopaceus</i>	Sch-II	LC
13	Asian Palm Swift	<i>Cypsiurus balasiensis</i>	Sch-II	LC
14	Baillon's Crane	<i>Zapornia pusilla</i>	Sch-II	LC
15	Banded Bay Cuckoo	<i>Cacomantis sonneratii</i>	Sch-II	LC
16	Barn Swallow	<i>Hirundo rustica</i>	Sch-II	LC
17	Barred Cuckoo Dove	<i>Macropygia unchall</i>	Sch-II	LC
18	Bay Woodpecker	<i>Blythipicus pyrrhotis</i>	Sch-II	LC
19	Besra	<i>Accipiter virgatus</i>	Sch-I	LC
20	Black Baza	<i>Aviceda leuphotes</i>	Sch-I	LC
21	Black Bulbul	<i>Hypsipetes leucocephalus</i>	Sch-II	LC
22	Black Drongo	<i>Dicrurus macrocercus</i>	Sch-II	LC
23	Black Eagle	<i>Ictinaetus malaiensis</i>	Sch-I	LC
24	Black Headed Oriole	<i>Oriolus xanthornus</i>	Sch-II	LC
25	Black-Backed Forktail	<i>Enicurus immaculatus</i>	Sch-II	LC
26	Black-Chinned Yuhina	<i>Yuhina nigrimenta</i>	Sch-II	LC
27	Black-Crested Bulbul	<i>Pycnonotus melanicterus</i>	Sch-II	LC
28	Black-Crowned Night Heron	<i>Nycticorax nycticorax</i>	Sch-II	LC
29	Black-Eared Kite	<i>Milvus (migrans) lineatus</i>	NL	LC
30	Black-Headed Bulbul	<i>Pycnonotus atriceps</i>	Sch-II	NA
31	Black-Naped Monarch	<i>Hypothymis azurea</i>	Sch-II	LC
32	Black-rumped Flameback	<i>Dinopium benghalense</i>	Sch-II	LC
33	Black-Winged Cuckooshrike	<i>Coracina melaschistos</i>	Sch-II	LC
34	Black-Winged Stilt	<i>Himantopus himantopus</i>	Sch-II	LC
35	Blue Rock Pigeon	<i>Columba livia</i>	NL	LC
36	Blue Rock Thrush	<i>Monticola solitarius</i>	Sch-II	LC
37	Blue Whistling Thrush	<i>Myophonus caeruleus</i>	Sch-II	LC
38	Blue-Bearded Bee-eater	<i>Nyctyornis athertoni</i>	Sch-II	LC
39	Blue-Eared Barbet	<i>Megalaima australis</i>	Sch-II	LC
40	Blue-Eared Kingfisher	<i>Alcedo meninting</i>	Sch-II	LC
41	Blue-Naped Pitta	<i>Pitta nipalensis</i>	Sch-II	LC
42	Blue-Tailed Bee-Eater	<i>Merops philippinus</i>	Sch-II	LC
43	Blue-Throated Barbet	<i>Megalaima asiatica</i>	Sch-II	LC
44	Blue-Winged Leafbird	<i>Chloropsis cochinchinensis</i>	Sch-II	EN
45	Blyth's Leaf Warbler	<i>Phylloscopus reguloides</i>	Sch-II	LC

S. No	Common Name	Scientific Name	WPA 2022	IUCN
46	Brahminy Kite	<i>Haliastur indus</i>	Sch-I	LC
47	Bronzed Drongo	<i>Dicrurus aeneus</i>	Sch-II	LC
48	Brown Fish Owl	<i>Ketupa zeylonensis</i>	Sch-I	LC
49	Brown Hornbill	<i>Anorrhinus tickelli</i>	Sch-II	NT
50	Brown Shrike	<i>Lanius cristatus</i>	Sch-II	LC
51	Brown-Cheeked Fulvetta	<i>Alcippe poioicephala</i>	Sch-II	LC
52	Brown-headed Barbet	<i>Psilopogon zeylanicus</i>	Sch-II	LC
53	Brownish-Flanked Bush Warbler	<i>Cettia fortipes</i>	Sch-II	LC
54	Cattle Egret	<i>Bubulcus ibis</i>	Sch-II	LC
55	Changeable Hawk Eagle	<i>Nisaetus cirrhatus</i>	Sch-I	LC
56	Chestnut-Bellied Nuthatch	<i>Sitta castanea</i>	Sch-II	LC
57	Chestnut-bellied Sandgrouse	<i>Pterocles exustus</i>	Sch-II	LC
58	Chestnut-Headed Bee-Eater	<i>Merops leschenaulti</i>	Sch-II	LC
59	Chestnut-Headed Tesia	<i>Tesia castaneocoronata</i>	Sch-II	LC
60	Citrine Wagtail	<i>Motacilla citreola</i>	Sch-II	LC
61	Collared Scops Owl	<i>Otus bakkamoena</i>	Sch-II	LC
62	Common Hawk Cuckoo	<i>Hierococcyx varius</i>	Sch-II	LC
63	Common Hoopoe	<i>Upupa epops</i>	Sch-II	LC
64	Common Iora	<i>Aegithina tiphia</i>	Sch-II	LC
65	Common Moorhen	<i>Gallinula chloropus</i>	Sch-II	LC
66	Common Myna	<i>Acridotheres tristis</i>	Sch-II	LC
67	Common Redshank	<i>Tringa totanus</i>	Sch-II	LC
68	Common Sandpiper	<i>Actitis hypoleucos</i>	Sch-II	LC
69	Common Tailorbird	<i>Orthotomus sutorius</i>	Sch-II	LC
70	Coppersmith Barbet	<i>Psilopogon haemacephalus</i>	Sch-II	LC
71	Cotton Pygmy Goose	<i>Nettapus coromandelianus</i>	Sch-I	LC
72	Crested Serpent Eagle	<i>Spilornis cheela</i>	Sch-I	LC
73	Crimson Sunbird	<i>Aethopyga siparaja</i>	Sch-II	LC
74	Crow-Billed Drongo	<i>Dicrurus annectens</i>	Sch-II	LC
75	Dark-Necked Tailorbird	<i>Orthotomus atrogularis</i>	Sch-II	LC
76	Dollar Bird	<i>Eurystomus orientalis</i>	Sch-II	LC
77	Drongo Cuckoo	<i>Surniculus lugubris</i>	Sch-II	LC
78	Dusky Warbler	<i>Phylloscopus fuscatus</i>	Sch-II	LC
79	Emerald Dove	<i>Chalcophaps indica</i>	Sch-II	LC
80	Eurasian Collard Dove	<i>Streptopelia decaocto</i>	Sch-II	LC
81	Fire-Breasted Flowerpecker	<i>Dicaeum ignipectus</i>	Sch-II	LC
82	Golden-Fronted Leafbird	<i>Chloropsis aurifrons</i>	Sch-II	LC
83	Great Cormorant	<i>Phalacrocorax carbo</i>	Sch-II	LC
84	Great Hornbill	<i>Buceros bicornis</i>	Sch-II	LC
85	Great Slaty Woodpecker	<i>Mulleripicus</i>	Sch-I	VU

S. No	Common Name	Scientific Name	WPA 2022	IUCN
		<i>pulverulentus</i>		
86	Great Tit	<i>Parus major</i>	Sch-II	LC
87	Greater Coucal	<i>Centropus sinensis</i>	Sch-II	LC
88	Greater Flameback	<i>Chrysocolaptes guttacristatus</i>	Sch-II	LC
89	Greater Flameback	<i>Chrysocolaptes lucidus</i>	Sch-II	LC
90	Greater Necklaced Laughing thrush	<i>Garrulax pectoralis</i>	Sch-II	LC
91	Greater Yellownape	<i>Picus flavinucha</i>	Sch-II	LC
92	Green Bee-Eater	<i>Merops orientalis</i>	Sch-II	LC
93	Green Sandpiper	<i>Tringa ochropus</i>	Sch-II	LC
94	Green-Billed Malkoha	<i>Phaenicophaeus tristis</i>	Sch-II	LC
95	Greenish Warbler	<i>Phylloscopus trochiloides</i>	Sch-II	LC
96	Green-Tailed Sunbird	<i>Aethopyga nipalensis</i>	Sch-II	LC
97	Grey Heron	<i>Ardea cinerea</i>	Sch-II	LC
98	Grey Peacock Pheasant	<i>Polyplectron bicalcaratum</i>	Sch-I	LC
99	Grey Treepie	<i>Dendrocitta formosae</i>	Sch-II	LC
100	Grey-Backed Shrike	<i>Lanius tephronotus</i>	Sch-II	LC
101	Grey-Bellied Tesia	<i>Tesia cyaniventer</i>	Sch-II	LC
102	Grey-Headed Canary Flycatcher	<i>Culicicapa ceylonensis</i>	Sch-II	LC
103	Grey-Headed Parakeet	<i>Psittacula finschii</i>	Sch-II	NT
104	Grey-headed Swamphen	<i>Porphyrio poliocephalus</i>	Sch-II	NA
105	Grey-Headed Woodpecker	<i>Picus canus</i>	Sch-II	LC
106	Grey-Hooded Warbler	<i>Seicercus xanthoschistos</i>	Sch-II	LC
107	Grey-Throated Babbler	<i>Stachyris nigriceps</i>	Sch-II	LC
108	Hill Myna	<i>Gracula religiosa</i>	Sch-I	LC
109	Himalayan Swiftlet	<i>Collocalia brevirostris</i>	Sch-II	LC
110	Himalayan Vulture	<i>Gyps himalayensis</i>	Sch-I	NT
111	Hooded Pitta	<i>Pitta sordida</i>	Sch-II	LC
112	House Crow	<i>Corvus splendens</i>	NL	LC
113	Indian Cormorant	<i>Phalacrocorax fuscicollis</i>	Sch-II	LC
114	Indian Cuckoo	<i>Cuculus micropterus</i>	Sch-II	LC
115	Indian Paradise Flycatcher	<i>Terpsiphone paradisi</i>	Sch-II	LC
116	Indian Pitta	<i>Pitta brachyura</i>	Sch-II	LC
117	Indian Pond Heron	<i>Ardeola grayii</i>	Sch-II	LC
118	Indian Roller	<i>Coracias benghalensis</i>	Sch-II	LC
119	Intermediate Egret	<i>Mesophoyx intermedia</i>	Sch-II	LC
120	Jungle Babbler	<i>Turdoides striatus</i>	Sch-II	LC
121	Jungle Myna	<i>Acridotheres fuscus</i>	Sch-II	LC
122	Jungle Owlet	<i>Glaucidium radiatum</i>	Sch-II	LC
123	Large Cuckooshrike	<i>Coracina macei</i>	Sch-II	LC

S. No	Common Name	Scientific Name	WPA 2022	IUCN
124	Large Egret	<i>Casmerodius albus</i>	Sch-II	LC
125	Large Niltava	<i>Niltava grandis</i>	Sch-II	LC
126	Large Woodshrike	<i>Tephrodornis virgatus</i>	Sch-II	LC
127	Large-Billed Crow	<i>Corvus macrorhynchos</i>	Sch-II	LC
128	Lesser Coucal	<i>Centropus bengalensis</i>	Sch-II	LC
129	Lesser Necklaced Laughingthrush	<i>Garrulax monileger</i>	Sch-II	LC
130	Lesser Racket-Tailed Drongo	<i>Dicrurus remifer</i>	Sch-II	LC
131	Lesser Yellownape	<i>Picus chlorolophus</i>	Sch-II	LC
132	Lineated Barbet	<i>Megalaima lineata</i>	Sch-II	LC
133	Little Cormorant	<i>Microcarbo niger</i>	Sch-II	LC
134	Little Egret	<i>Egretta garzetta</i>	Sch-II	LC
135	Little Forktail	<i>Enicurus scouleri</i>	Sch-II	LC
136	Little Pratincole	<i>Glareola lactea</i>	Sch-II	LC
137	Little Spiderhunter	<i>Arachnothera longirostra</i>	Sch-II	LC
138	Little Swift	<i>Apus affinis</i>	Sch-II	LC
139	Little Tern	<i>Sternula albifrons</i>	Sch-II	LC
140	Long-Tailed Broadbill	<i>Psarisomus dalhousiae</i>	Sch-II	LC
141	Long-Tailed Minivet	<i>Pericrocotus ethologus</i>	Sch-II	LC
142	Long-tailed Shrike	<i>Lanius schach</i>	Sch-II	LC
143	Loten's Sunbird	<i>Nectarinia lotenia</i>	Sch-II	LC
144	Maroon Oriole	<i>Oriolus traillii</i>	Sch-II	LC
145	Marsh Sandpiper	<i>Tringa stagnatilis</i>	Sch-II	LC
146	Nepal Fulvetta	<i>Alcippe nipalensis</i>	Sch-II	LC
147	Olive-Backed Pipit	<i>Anthus hodgsoni</i>	Sch-II	LC
148	Orange-headed Thrush	<i>Zoothera citrina</i>	Sch-II	LC
149	Oriental Darter	<i>Anhinga melanogaster</i>	Sch-II	NT
150	Oriental Honey Buzzard	<i>Pernis ptilorhynchus</i>	Sch-I	LC
151	Oriental Magpie Robin	<i>Copsychus saularis</i>	Sch-II	LC
152	Oriental Pied Hornbill	<i>Anthracoceros albirostris</i>	Sch-I	LC
153	Oriental Turtle Dove	<i>Streptopelia orientalis</i>	Sch-II	LC
154	Oriental White-Eye	<i>Zosterops palpebrosus</i>	Sch-II	LC
155	Osprey	<i>Pandion haliaetus</i>	Sch-I	LC
156	Paddyfield Pipit	<i>Anthus rufulus</i>	Sch-II	LC
157	Pale Billed Flowerpecker	<i>Dicaeum erythrorhynchos</i>	Sch-II	LC
158	Pale Blue Flycatcher	<i>Cyornis unicolor</i>	Sch-II	LC
159	Pied Kingfisher	<i>Ceryle rudis</i>	Sch-II	LC
160	Pin-Tailed Snipe	<i>Gallinago stenura</i>	Sch-II	LC
161	Plain Flowerpecker	<i>Dicaeum concolor</i>	Sch-II	LC
162	Plaintive Cuckoo	<i>Cacomantis merulinus</i>	Sch-II	LC
163	Plumbeous Water Redstart	<i>Rhyacornis fuliginosa</i>	Sch-II	LC
164	Plum-headed Parakeet	<i>Psittacula cyanocephala</i>	Sch-II	LC

S. No	Common Name	Scientific Name	WPA 2022	IUCN
165	Puff-Throated Babbler	<i>Pellorneum ruficeps</i>	Sch-II	LC
166	Purple Heron	<i>Ardea purpurea</i>	Sch-II	LC
167	Purple Sunbird	<i>Nectarinia asiatica</i>	Sch-II	LC
168	Purple-rumped Sunbird	<i>Nectarinia zeylonica</i>	Sch-II	LC
169	Racket Tailed Drongo	<i>Dicrurus paradiseus</i>	Sch-II	LC
170	Red Collared Dove	<i>Streptopelia tranquebarica</i>	Sch-II	LC
171	Red Junglefowl	<i>Gallus gallus</i>	Sch-II	LC
172	Red Whiskered Bulbul	<i>Pycnonotus jocosus</i>	Sch-II	LC
173	Red-breasted Parakeet	<i>Psittacula alexandri</i>	Sch-II	NT
174	Red-Headed Trogon	<i>Harpactes erythrocephalus</i>	Sch-II	LC
175	Red-Rumped Swallow	<i>Hirundo daurica</i>	Sch-II	LC
176	Red-Vented Bulbul	<i>Pycnonotus cafer</i>	Sch-II	LC
177	River Tern	<i>Sterna aurantia</i>	Sch-I	VU
178	Rose Ringed Parakeet	<i>Psittacula krameri</i>	Sch-II	LC
179	Ruby-Cheeked Sunbird	<i>Anthreptes singalensis</i>	Sch-II	LC
180	Ruddy-breasted Crake	<i>Zapornia fusca</i>	Sch-II	LC
181	Rufous Treepie	<i>Dendrocitta vagabunda</i>	Sch-II	LC
182	Rufous Woodpecker	<i>Celeus brachyurus</i>	Sch-II	LC
183	Rufous-Backed Sibia	<i>Heterophasia annectens</i>	Sch-II	LC
184	Rufous-Capped Babbler	<i>Stachyris ruficeps</i>	Sch-II	LC
185	Rufous-Gorgeted Flycatcher	<i>Ficedula strophiatea</i>	Sch-II	LC
186	Rufous-Throated Fulvetta	<i>Alcippe rufogularis</i>	Sch-II	LC
187	Scaly-Breasted Munia	<i>Lonchura punctulata</i>	Sch-II	NA
188	Scarlet Minivet	<i>Pericrocotus flammeus</i>	Sch-II	LC
189	Scarlet-Backed Flowerpecker	<i>Dicaeum cruentatum</i>	Sch-II	LC
190	Shikra	<i>Accipiter badius</i>	Sch-I	LC
191	Short-Billed Minivet	<i>Pericrocotus brevirostris</i>	Sch-II	LC
192	Silver-Breasted Broadbill	<i>Serilophus lunatus</i>	Sch-II	LC
193	Slaty-Blue Flycatcher	<i>Ficedula tricolor</i>	Sch-II	LC
194	Slender-Billed Oriole	<i>Oriolus tenuirostris</i>	Sch-II	LC
195	Slender-Billed Scimitar Babbler	<i>Pomatorhinus superciliaris</i>	Sch-II	LC
196	Small Blue Kingfisher	<i>Alcedo atthis</i>	Sch-II	LC
197	Small Niltava	<i>Niltava macgrigoriae</i>	Sch-II	LC
198	Spangled Drongo	<i>Dicrurus hottentottus</i>	Sch-II	LC
199	Speckled Piculet	<i>Picumnus innominatus</i>	Sch-II	LC
200	Spotted Dove	<i>Streptopelia chinensis</i>	Sch-II	LC
201	Spotted Owlet	<i>Athene brama</i>	Sch-II	LC
202	Spotted Redshank	<i>Tringa erythropus</i>	Sch-II	LC
203	Stork-Billed Kingfisher	<i>Pelargopsis capensis</i>	Sch-II	LC
204	Streak-Breasted Scimitar	<i>Pomatorhinus ruficollis</i>	Sch-II	LC

S. No	Common Name	Scientific Name	WPA 2022	IUCN
	Babbler			
205	Streaked Spiderhunter	<i>Arachnothera magna</i>	Sch-II	LC
206	Streaked Wren Babbler	<i>Napothera brevicaudata</i>	Sch-II	LC
207	Striated Heron	<i>Butorides striata</i>	Sch-II	LC
208	Striated Prinia	<i>Prinia criniger</i>	Sch-II	LC
209	Striated Swallow	<i>Hirundo striolata</i>	Sch-II	LC
210	Stripe-Breasted Woodpecker	<i>Dendrocopos atratus</i>	Sch-II	LC
211	Striped Tit Babbler	<i>Macronous gularis</i>	Sch-II	LC
212	Sultan Tit	<i>Melanochlora sultanea</i>	Sch-II	LC
213	Taiga Flycatcher	<i>Ficedula albicilla</i>	Sch-II	LC
214	Thick-Billed Flowerpecker	<i>Dicaeum agile</i>	Sch-II	LC
215	Thick-Billed Green Pigeon	<i>Treron curvirostra</i>	Sch-II	LC
216	Tickell's Leaf Warbler	<i>Phylloscopus affinis</i>	Sch-II	LC
217	Tickell's Blue Flycatcher	<i>Cyornis tickelliae</i>	Sch-II	LC
218	Verditer Flycatcher	<i>Eumyias thalassinus</i>	Sch-II	LC
219	Vernal Hanging Parrot	<i>Loriculus vernalis</i>	Sch-II	LC
220	Vigors's Sunbird	<i>Aethopyga vigorsii</i>	Sch-II	LC
221	Western Hooded Pitta	<i>Pitta sordida</i>	Sch-II	LC
222	Western Yellow Wagtail	<i>Motacilla flava</i>	Sch-II	LC
223	White Cheeked Barbet	<i>Megalaima viridis</i>	Sch-II	LC
224	White Throated Kingfisher	<i>Halcyon smyrnensis</i>	Sch-II	LC
225	White Wagtail	<i>Motacilla alba</i>	Sch-II	LC
226	White-Breasted Waterhen	<i>Amaurornis phoenicurus</i>	Sch-II	LC
227	White-Browed Piculet	<i>Sasia ochracea</i>	Sch-II	LC
228	White-browed Scimitar-babbler	<i>Pomatorhinus schisticeps</i>	Sch-II	LC
229	White-Capped Water Redstart	<i>Chaimarrornis leucocephalus</i>	Sch-II	LC
230	White-Crowned Forktail	<i>Enicurus leschenaulti</i>	Sch-II	LC
231	White-eyed Buzzard	<i>Butastur teesa</i>	Sch-I	LC
232	White-Rumped Munia	<i>Lonchura striata</i>	Sch-II	LC
233	White-Rumped Shama	<i>Copsychus malabaricus</i>	Sch-II	LC
234	White-Throated Bulbul	<i>Alophoixus flaveolus</i>	Sch-II	LC
235	White-Throated Fantail	<i>Rhipidura albicollis</i>	Sch-II	LC
236	Wood Sandpiper	<i>Tringa glareola</i>	Sch-II	LC
237	Yellow-Browed Warbler	<i>Phylloscopus inornatus</i>	Sch-II	LC
238	Yellow-Footed Green Pigeon	<i>Treron phoenicoptera</i>	Sch-II	LC
239	Yellow-Vented Flowerpecker	<i>Dicaeum chrysorrheum</i>	Sch-II	LC
240	Baya	<i>Ploceus philippinus</i>	Sch-II	LC
241	Rain Quil	<i>Coturnix coromandelica</i>	Sch-II	LC
242	Tree Swift	<i>Hemiprocne longipennis</i>	NT	LC
243	House Swift	<i>Apus nipalensis</i>	Sch-II	LC

S. No	Common Name	Scientific Name	WPAA 2022	IUCN
244	Eurasian Eagle Owl	<i>Bubo bubo</i>	Sch-I	LC
245	Ruddy Shelduck	<i>Tadorna ferruginea</i>	NL	LC
246	Eurasian Spoonbill	<i>Platalea leucorodia</i>	Sch-I	LC
247	House Sparrow	<i>Passer domesticus</i>	Sch-II	LC
248	Oriental Skylark	<i>Alauda gulgula</i>	Sch-II	LC
249	Spotted Dove	<i>Spilopelia chinensis</i>	NL	LC
250	Cattle Egret	<i>Bubulcus coromandus</i>	NL	LC
251	Bank Myna	<i>Acridotheres gigindia</i>	Sch-II	LC
252	Greater Adjutant	<i>Leptoptilos dubius</i>	Sch-I	NT
253	Pheasant-Tailed Jacana	<i>Hydrophasianus chirurgus</i>	Sch-II	LC
254	Bronze-winged Jacana	<i>Metopidius indicus</i>	Sch-II	LC
255	Grey Hornbill	<i>Ocyrceros birostris</i>	Sch-II	LC
256	Eurasian wigeon	<i>Mareca penelope</i>	Sch-II	LC
257	Northern Shoveler	<i>Spatula clypeata</i>	Sch-II	LC
258	Common Barn Owl	<i>Tyto alba</i>	Sch-I	LC
259	Cinnamon bittern	<i>Ixobrychus cinnamomeus</i>	Sch-I	LC
260	Pallard's Fish Eagle	<i>Haliaeetus leucoryphus</i>	Sch-I	EN
261	Nokta duck	<i>Sarkidiornis melanotos</i>	Sch-II	LC
262	Wire tailed swallow	<i>Hirundo smithii</i>	Sch-II	LC
263	Mallard	<i>Anas platyrhynchos</i>	Sch-II	LC
264	Snipe	<i>Rostratula benghalensis</i>	Sch-II	LC
265	Indian Nightjar	<i>Caprimulgus asiaticus</i>	Sch-II	LC
266	Open Bill	<i>Anastomus oscitans</i>	Sch-II	LC
267	Yellow-eyed Babbler	<i>Chrysomma sinense</i>	Sch-II	LC
268	Teal	<i>Anas crecca</i>	Sch-II	LC
269	Black partridge	<i>Francolinus francolinus</i>	Sch-II	LC
270	Lapwing	<i>Vanellus indicus</i>	Sch-II	LC

Reptiles: An examination of primary and secondary data indicates that a minimum of 52 reptile species have documented ranges that either fully or partially coincide with the Study Area. Notably, 02 species as Critically Endangered, 013 Endangered and 03 vulnerable listed on the IUCN Red List are found within this area. Detailed information regarding the reptile species present in the Study Area can be found in the table below.

Table 3-23: Reptiles of the Study Area

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
1	Oriental Garden Lizard	<i>Calotes versicolor</i>	NL	LC
2	Tokay Gecko	<i>Gekko gekko</i>	Sch-I	LC
3	Indian Wolf Snake	<i>Lycodon aulicus</i>	Sch-II	LC

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
4	Common House Gecko	<i>Hemidactylus frenatus</i>	NL	LC
5	Green Cat Snake	<i>Boiga cyanea</i>	Sch-II	LC
6	Oriental Whipsnake	<i>Ahaetulla prasina</i>	Sch-II	LC
7	Banded Krait	<i>Bungarus fasciatus</i>	Sch-II	LC
8	Heller's Red-necked Keelback	<i>Rhabdophis helleri</i>	Sch-II	LC
9	Eyed Cat Snake	<i>Boiga siamensis</i>	Sch-II	LC
10	White-Spotted Supple Skink	<i>Riopa albopunctata</i>	NL	LC
11	Spot-Tailed Pitviper	<i>Trimeresurus erythrurus</i>	Sch-II	LC
12	Common Mabuya	<i>Eutropis multifasciata</i>	NL	LC
13	Bronz Grass Skink	<i>Eutropis macularia</i>	NL	NA
14	Four Keeled Grass Skink	<i>Eutropis quadricarinata</i>	NL	LC
15	Spotted Forest Skink	<i>Sphenomorphus maculatus</i>	NL	LC
16	North-eastern Water Skink	<i>Tropidophorus assamensis</i>	NL	VU
17	Jawa Grass lizard	<i>Takydromus khasiensis</i>	NL	LC
18	Forest Garden Lizard	<i>Calotes emma</i>	NL	LC
19	Calotes irawadi	<i>Calotes cf. irawadi Zug</i>	NL	LC
20	Jerdon's Forest Lizard	<i>Calotes jerdoni</i>	NL	LC
21	Smooth-scaled Mountain Lizard	<i>Japalura planidorsata</i>	NL	LC
22	Khasi-hills Bent toed Gecko	<i>Cyrtodactylus khasiensis</i>	NL	LC
23	flat-tailed house gecko	<i>Hemidactylus platyurus</i>	NL	LC
24	Monitor Lizard	<i>Varanus bengalensis</i>	Sch-I	NT
25	Blind Snake	<i>Typhlops diardii</i>	NL	LC
26	Python	<i>Python molurus</i>	Sch-I	VU
27	Buff striped keelback	<i>Amphiesma stolatum</i>	NL	NA
28	Tawny Cat Snake	<i>Boiga ochracea</i>	NL	LC
29	Copper Head Trinket Snake	<i>Coelognathus radiatus</i>	NL	LC
30	Walls Bronzeback	<i>Dendrelaphis cyanochloris</i>	NL	LC
31	Common Bronzeback	<i>Dendrelaphis pictus</i>	NL	LC
32	Twin Spotted Wolf Snake	<i>Lycodon jara</i>	NL	LC
33	White-barred Kukri Snake	<i>Oligodon albocinctus</i>	NL	LC
34	Common Mock Viper	<i>Psammodynastes pulverulentus</i>	Sch-II	LC
35	Javan Rat Snake	<i>Ptyas korros</i>	NL	NT

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
36	Rat Snake	<i>Ptyas mucosa</i>	Sch-I	LC
37	Slug-eating Snake	<i>Pareas monticola</i>	NL	LC
38	Red-Necked Keelback	<i>Rhabdophis subminiatus</i>	NL	LC
39	Checkered Keelback	<i>Xenochrophis piscator</i>	Sch-I	LC
40	Bamboo Pit Viper	<i>Cryptelytrops erythrurus</i>	Sch-II	LC
41	Chinese Mountain Pit Viper	<i>Ovophis monticola</i>	Sch-II	LC
42	Greater Black Krait	<i>Bungarus niger</i>	NL	LC
43	Cobra	<i>Naja naja</i>	Sch-I	LC
44	King Cobra	<i>Ophiophagus hannah</i>	Sch-I	VU
45	Asian Giant Tortoise	<i>Manouria emys</i>	Sch-I	CR
46	Keeled Box Turtle	<i>Cuora mouhotii</i>	Sch-I	EN
47	Assam Leaf Turtle	<i>Cyclemys gemeli</i>	Sch-II	NT
48	Assam roofed turtle	<i>Pangshura sylhetensis</i>	Sch-I	CR
49	Softshell turtle	<i>Chitra indica</i>	Sch-I	EN
50	River turtle	<i>Hardella thurjii</i>	Sch-I	EN
51	Bamboo Viper	<i>Craspedocephalus gramineus</i>	Sch-II	LC
52	Green Keelback	<i>Rhabdophis plumbicolor</i>	Sch-II	LC

Amphibians: An examination of secondary data indicates that at least 17 amphibian species have documented ranges that either fully or partially coincide with the Study Area. None of these species hold significant status according to the IUCN Red List. Detailed information regarding the amphibian species within the Study Area can be found is given in table below.

Table 3-24: Amphibians of the Study Area

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
1	Indian Skipper Frog	<i>Euphlyctis cyanophlyctis</i>	Sch-II	LC
2	Indian Bullfrog	<i>Hoplobatrachus tigerinus</i>	Sch-II	LC
3	Ant Frog	<i>Microhyla ornata</i>	NL	LC
4	Terai Tree Frog	<i>Polypedates teraiensis</i>	Sch-II	LC
5	Cope's Assam Frog	<i>Hydrophylax leptoglossa</i>	NL	LC
6		<i>Fejervarya sp</i>	Sch-II	LC
7	Khasi Wart Frog	<i>Limnonectes laticeps</i>	NL	LC
8	Assam Hill Frog	<i>Clinotarsus alticola</i>	Sch-II	LC
9	Bhamo Frog	<i>Humerana humeralis</i>	NL	LC
10	Ranid Frog	<i>Hylarana tytleri</i>	NL	LC
11	Narrow Mouth Toad	<i>Kaloula pulchra</i>	NL	LC
12	Rice Frog	<i>Microhyla cf. butleri</i>	NL	LC
13	Litter Frog	<i>Leptobrachium smithi</i>	NL	LC

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
14	Weeping Frog	<i>Polypedates leucomystax</i>	NL	LC
15	Nepal Flying Frog	<i>Rhacophorus maximus</i>	NL	LC
16	Twin-spotted Tree Frog	<i>Rhacophorus bipunctatus</i>	Sch-II	LC
17	Asian common toad	<i>Duttaphrynus melanostictus</i>	NL	LC

Butterflies: Primary and secondary data reveals the presence of 51 butterfly species in the study zone. None of these species hold significant status according to the IUCN Red List. Detailed information regarding the butterfly species within the Study Area can be found is given in table below.

Table 3-25: Butterflies of the Study Area

Sr. No	Common Name	Scientific Name	WPAA 2022	IUCN
1	Angled Castor	<i>Ariadne ariadne</i>	NL	NA
2	Banded Blue Pierrot	<i>Discolampa ethion</i>	NL	NA
3	Clipper	<i>Parthenos sylvia</i>	NL	NA
4	Colour Sergeant	<i>Athyma nefte inara</i>	NL	NA
5	Commander	<i>Moduza procris</i>	NL	NA
6	Common Baron	<i>Euthalia aconthea garuda</i>	Sch-II	NA
7	Common Birdwing	<i>Troides helena</i>	NL	LC
8	Common Bluebottle	<i>Graphium sarpedon sarpedon</i>	Sch-II	LC
9	Common Emigrant	<i>Catopsilia fabricius</i>	NL	NA
10	Common Evening Brown	<i>Melanitis leda</i>	NL	LC
11	Common Four-Ring	<i>Ypthima huebneri</i>	NL	NA
12	Common Jester	<i>Symbrenthia lilaea khasiana</i>	NL	NA
13	Common Lascar	<i>Pantoporia hordonia hordonia</i>	NL	NA
14	Common Lineblue	<i>Prosotas nora nora</i>	NL	NA
15	Common Mime	<i>Papilio clytia clytia</i>	NL	NA
16	Common Palmfly	<i>Elymnias hypermnestra</i>	NL	NA
17	Common Pierrot	<i>Castalius rosimon</i>	NL	NA
18	Common Rose	<i>Pachliopta aristolochiae</i>	NL	LC
19	Common Sailor	<i>Neptis hylas</i>	NL	NA
20	Common Sergeant	<i>Athyma perius</i>	NL	NA

Sr. No	Common Name	Scientific Name	WPA 2022	IUCN
21	Common Small Flat	<i>Sarangesa dasahara</i>	NL	NA
22	Common Soldier	<i>Neptis hylas astola</i>	NL	NA
23	Common Tiger	<i>Danaus genutia</i>	NL	NA
24	common tinsel	<i>Catapaecilma major</i>	NL	NA
25	Common Tit	<i>Hypolycaena erylus himavantus</i>	NL	NA
26	Dark Blue Tiger	<i>Tirumala septentrionis</i>	NL	NA
27	Dark Grass Blue	<i>Zizeeria karsandra</i>	NL	LC
28	Gram Blue	<i>Euchrysops cnejus</i>	NL	NA
29	Great Mormon	<i>Papilio memnon agenor</i>	NL	NA
30	Great Orangetip	<i>Hebomoia glaucippe glaucippe</i>	NL	NA
31	Indian Cabbage White	<i>Pieris canidia</i>	NL	NA
32	Lesser Grass Blue	<i>Zizula otis</i>	NL	NA
33	Lime Butterfly	<i>Papilio demoleus</i>	NL	NA
34	Mottled Emigrant	<i>Catopsilia pyranthe</i>	NL	NA
35	One-spot Grass Yellow	<i>Eurema andersoni</i>	Sch-II	LC
36	Pale Grass Blue	<i>Zizeeria maha</i>	NL	NA
37	Pea Blue	<i>Lampides boeticus</i>	NL	LC
38	Plain Bushbrown	<i>Mycalesis malsarida</i>	NL	NA
39	Plain Tiger	<i>Danaus chrysippus</i>	NL	LC
40	Purple Sapphire	<i>Heliophorus epicles</i>	NL	NA
41	Pygmy Grass Hopper	<i>Aeromachus pygmaeus</i>	NL	NA
42	Redbase Jezebel	<i>Delias aglaia</i>	NL	NA
43	Red-based Jezebel	<i>Delias pasithoe</i>	NL	NA
44	Redspot Jezebel	<i>Delias descombesi</i>	NL	NA
45	Smooth-eyed Bushbrown	<i>Orsotriaena medus</i>	NL	NA
46	Straight Swift	<i>Parnara bada</i>	NL	NA
47	Tailed Jay	<i>Graphium agamemnon</i>	NL	NA
48	Tawny Coster	<i>Acraea terpsicore</i>	NL	NA
49	Yamfly	<i>Loxura atymnus</i>	NL	NA
50	Yellow Orange Tip	<i>Ixias pyrene</i>	NL	NA
51	Yellow Pansy	<i>Junonia hierta</i>	NL	LC

Aquatic Biodiversity:

Primary and secondary data on biodiversity of aquatic ecosystems (Rivers, Ponds, etc.) were also estimated. Macrophytes, Planktonic Communities and Nectones (Fish) within



study area were qualitatively assessed. The southern buffer zone of the project includes several rivers: The Barak River (6.6 kilometers to the southwest), Jatinga River (3.1 kilometers), Badri Nala (5.4 kilometers), Araia Nala (5.9 kilometers), Madhura River (7.4 kilometers), and Tikal Nala (8.0 kilometers), along with various dense and open bamboo forests.

Macrophytes: 28 macrophytes (floating, submerged, emergent anchored, semiaquatic, etc.) were recorded during primary survey. None of these species hold significant status according to the IUCN Red List. Detailed information regarding the butterfly species within the Study Area can be found is given in table below.

Table 3-26: Macrophytes Diversity of Study Area

Sr.No	Common Name	Scientific Name	Growth Form	IUCN Status
1	Floating Lace Plan	<i>Aponogeton natans</i>	Floating	LC
2	Mosquito Fern	<i>Azolla pinnata</i>	Floating	LC
3	Hornwort	<i>Ceratophyllum demersum</i>	submerged	LC
4	Swollen Fingergrass	<i>Chloris barbata</i>	Emergent anchored	NA
5	Kokilakshya	<i>Hygrophila auriculata</i>	Semiaquatic	LC
6	Water Morning Glory	<i>Ipomoea aquatica</i>	Semiaquatic	LC
7	Swollen Duckweed	<i>Lemna gibba</i>	floating	LC
8	Indian Lotus	<i>Nelumbo nucifera</i>	Floating leaved anchored	DD
9	Water Mimosa	<i>Neptunia prostrata</i>	Floating	NA
10	Pink Water-Lily	<i>Nymphaea pubescens</i>	Floating leaved anchored	LC
11	Crested Floating-Heart	<i>Nymphoides hydrophylla</i>	Floating leaved anchored	LC
12	Duck Lettuce	<i>Ottelia alismoides</i>	Submerged anchored	LC
13	Water Pepper	<i>Persicaria hydropiper</i>	Emergent anchored	LC
14	Water Cabbage	<i>Pistia stratiotes</i>	Floating	LC
15	Common Milkwort	<i>Polygala vulgaris</i>	Emergent anchored	NA
16	Common Water Hyacinth	<i>Pontederia crassipes</i>	Floating	NA
17	Golden Beaks edge	<i>Rhynchospora corymbosa</i>	golden beaksedge	LC
18	Dwarf Rotala	<i>Rotala rotundifolia</i>	Emergent	LC
19	Kans Grass	<i>Saccharum spontaneum</i>	Wetlands	LC
20	Arrowhead	<i>Sagittaria sagittifolia</i>	Emergent	LC

Sr.No	Common Name	Scientific Name	Growth Form	IUCN Status
21	Smut Grass	<i>Sporobolus indicus</i>	Emergent anchored	LC
22	Sago Pondweed	<i>Stuckenia pectinata</i>	Submerged	LC
23	Singhara Nut	<i>Trapa bispinosa</i>	Floating	NA
24	Narrowleaf Cattail	<i>Typha angustifolia</i>	Emergent anchored	LC
25	Floating Bladderwort	<i>Utricularia gibba</i>	Suspended	LC
26	Eel Grass	<i>Vallisneria spiralis</i>	Submerged anchored	LC
27	Water Speedwell	<i>Veronica anagallis-aquatica</i>	Emergent	LC
28	Rootless Duckweed	<i>Wolffia arrhiza</i>	Floating	LC

Planktons: Both Phyto and Zoo Plankton species were assessed and a total of 15 species of planktons were recorded in primary study. None of these species hold significant status according to the IUCN Red List. Detailed information regarding the butterfly species within the Study Area can be found in table below.

Table 3-27: Plankton Diversity of Study Area

Sr.No	Taxa	Family/Phylum	IUCN Status
Phytoplankton Sp.			
1	<i>Diatoma sp</i>		LC
2	<i>Synedra sp</i>		NA
3	<i>Cyclotella sp</i>		NA
4	<i>Gomphonema sp</i>		NA
5	<i>Nitischia sp</i>		NA
6	<i>Chlorella sp</i>		NA
7	<i>Scenedesmus sp</i>	Cyanophyceae	NA
8	<i>Nostoc Sp</i>		NA
9	<i>Merismopidia sp</i>	Chlorophyceae	NA
10	<i>Euglena sp</i>	Euglenophyceae	NT
Zooplankton Sp.			
1	<i>Brachionus sp</i>	Rotifera	NA
2	<i>Acroperus sp</i>		NA
3	<i>Macrothrix sp</i>	Arthropoda	DD
4	<i>Ceriodaphnia sp</i>		NA
5	<i>Simocephalus sp</i>		LC

Fish (Nectones): An analysis of primary and secondary data indicates that a minimum of 128 fishl species have documented ranges that either fully or partially intersect with the Study Area. Notably, according to the IUCN Red List, there are 01 species classified as Endangered and 06 as Vulnerable. The details of the mammal species of the Study Area is given in table below.

Table 3-28: Fish Diversity of Study Area

S. No	Scientific Name	IUCN Status
1	<i>Acanthocobitis botia</i>	LC
2	<i>Ailia coila</i>	NT
3	<i>Amblyiceps mangois</i>	LC
4	<i>Amblypharyngodon sp</i>	LC
5	<i>Anabas testudineus</i>	LC
6	<i>Aplocheilus panchax</i>	LC
7	<i>Aspidoparia morar</i>	LC
8	<i>Badis badis</i>	DD
9	<i>Bagarius bagarius</i>	VU
10	<i>Balitora brucei</i>	NT
11	<i>Barbonymus gonionotus</i>	LC
12	<i>Barilius bakeri</i>	LC
13	<i>Barilius barna</i>	LC
14	<i>Barilius barnoides</i>	LC
15	<i>Barilius dogarsinghi</i>	VU
16	<i>Barilius shacra</i>	LC
17	<i>Barilius teleo</i>	NA
18	<i>Barilius vagra</i>	LC
19	<i>Botia almorhae</i>	LC
20	<i>Botia dario</i>	LC
21	<i>Botia rostrata</i>	VU
22	<i>Cabdio morar</i>	LC
23	<i>Canthophrys gongota</i>	LC
24	<i>Catla catla</i>	LC
25	<i>Chaca chaca</i>	LC
26	<i>Chagunius chagunio</i>	LC
27	<i>Chagunius nicholsi</i>	LC
28	<i>Chanda nama</i>	LC
29	<i>Channa gachua</i>	LC
30	<i>Channa marulius</i>	LC
31	<i>Channa orieantalisis</i>	NA
32	<i>Channa punctata</i>	LC
33	<i>Channa striata</i>	LC
34	<i>Chela cachius</i>	LC

S. No	Scientific Name	IUCN Status
35	<i>Chela laubuca</i>	NT
36	<i>Chitala chitala</i>	NT
37	<i>Cirrhinus ariza</i>	LC
38	<i>Cirrhinus cirrhosus</i>	VU
39	<i>Cirrhinus mrigala</i>	LC
40	<i>Cirrhinus reba</i>	LC
41	<i>Clarias batrachus</i>	LC
42	<i>Clupisoma garua</i>	LC
43	<i>Clupisoma montana</i>	LC
44	<i>Colisa fasciatus</i>	NA
45	<i>Colisa lalia</i>	NA
46	<i>Colisa sota</i>	NA
47	<i>Crossocheilus latius</i>	LC
48	<i>Ctenopharyngodon idella</i>	LC
49	<i>Danio dangila</i>	LC
50	<i>Danio rerio</i>	LC
51	<i>Devario aequipinnatus</i>	LC
52	<i>Devario devario</i>	LC
53	<i>Devario naganensis</i>	VU
54	<i>Erethistes pussilus</i>	NA
55	<i>Esomus danricus</i>	LC
56	<i>Eutropiichthys murius</i>	LC
57	<i>Eutropiichthys vacha</i>	LC
58	<i>Gagata cenia</i>	LC
59	<i>Gagata gagata</i>	LC
60	<i>Garra gotyla</i>	LC
61	<i>Garra gravelyi</i>	NT
62	<i>Garra naganensis</i>	LC
63	<i>Garra nasuta</i>	LC
64	<i>Glossogobius giuris</i>	LC
65	<i>Glyptothorax striatus</i>	NT
66	<i>Glyptothorax telchitta</i>	LC
67	<i>Gudusia chapra</i>	LC
68	<i>Heteropneustes fossilis</i>	LC
69	<i>Johnius coitor</i>	LC
70	<i>Labeo bata</i>	LC
71	<i>Labeo boga</i>	LC
72	<i>Labeo calbasu</i>	LC
73	<i>Labeo calbasu</i>	LC
74	<i>Labeo catla</i>	LC
75	<i>Labeo dyocheilus</i>	LC

S. No	Scientific Name	IUCN Status
76	<i>Labeo gonius</i>	LC
77	<i>Labeo nandina</i>	NT
78	<i>Labeo pangusia</i>	NT
79	<i>Labeo rohita</i>	LC
80	<i>Lepidocephalichthys guntea</i>	LC
81	<i>Macrognathus pancalus</i>	LC
82	<i>Magrognathus aral</i>	NA
83	<i>Mastacembelus armatus</i>	LC
84	<i>Monopterus cuchia</i>	LC
85	<i>Mystus bleekeri</i>	LC
86	<i>Mystus cavasius</i>	LC
87	<i>Mystus vittatus</i>	LC
88	<i>Nandus nandus</i>	LC
89	<i>Nangra nangra</i>	LC
90	<i>Nangra viridescens</i>	NA
91	<i>Neolissochilus hexagonolepis</i>	LC
92	<i>Neonemacheilus peguensis</i>	NA
93	<i>Notopterus notopterus</i>	LC
94	<i>Ompok bimaculatus</i>	NT
95	<i>Ompok pabo</i>	NT
96	<i>Osteobrama cotio</i>	LC
97	<i>Parambassis ranga</i>	LC
98	<i>Pisodonophis boro</i>	LC
99	<i>Psilorhynchus balitora</i>	LC
100	<i>Puntius chola</i>	LC
101	<i>Puntius conchoniuis</i>	LC
102	<i>Puntius jerdoni</i>	LC
103	<i>Puntius puntio</i>	NA
104	<i>Puntius sarana</i>	LC
105	<i>Puntius sophore</i>	LC
106	<i>Puntius ticto</i>	LC
107	<i>Rasbora daniconius</i>	LC
108	<i>Rita rita</i>	LC
109	<i>Salmophasia bacaila</i>	LC
110	<i>Salmostoma phulo</i>	LC
111	<i>Schistura multifasciatus</i>	NA
112	<i>Schistura rupecula</i>	LC
113	<i>Schistura vincigurrae</i>	NA
114	<i>Securicula gora</i>	LC
115	<i>Sicamugil cascasia</i>	LC
116	<i>Silonia silondia</i>	LC

S. No	Scientific Name	IUCN Status
117	<i>Sperata seenghala</i>	LC
118	<i>Systemus sarana</i>	LC
119	<i>Tenualosa ilisa</i>	NA
120	<i>Tor mosal</i>	DD
121	<i>Tor progenius</i>	NA
122	<i>Tor putitora</i>	EN
123	<i>Tor tor</i>	DD
124	<i>Trichogaster fasciata</i>	NA
125	<i>Trichogaster lalius</i>	NA
126	<i>Trichogaster fasciata</i>	LC
127	<i>Wallago attu</i>	VU
128	<i>Xenentodon cancila</i>	LC

LC-Least Concern, NL-Not Listed, NT- Near Threatened, VU- Vulnerable

Habitat Profile:

Natural habitats refer to regions characterized by viable communities of predominantly native plant and/or animal species, as well as areas where human intervention has not significantly altered the fundamental ecological functions and species diversity. According to PS6 guidelines, in natural habitat areas, mitigation strategies should be implemented to ensure that there is no net loss of biodiversity whenever possible. In contrast, modified habitats are regions that may feature a significant number of non-native plant and/or animal species, and where human activities have considerably changed the primary ecological functions and species composition. Such modified habitats can include agricultural lands, forest plantations, reclaimed coastal areas, and restored wetlands. Under PS6¹ guidance, clients are encouraged to minimize their impact on biodiversity in these modified habitats and to adopt appropriate mitigation measures.

The habitat-profile of the Study Area is a mix of aquatic and terrestrial habitats; the later being majorly dominated by modified habitat intermixed with natural and near natural habitat. The structure of the terrestrial habitat is partially modified and intact.

Natural and near-natural habitats mainly comprise of aquatic habitats and terrestrial habitats like scrub land and forest habitats which suffer from anthropogenic pressure. Areas of modified habitat mainly include the rural establishment, cleared tea garden, arable land, plantations, and artificial-aquatic habitats (lakes and ponds). The terrestrial natural habitats of the Study Area consist of natural patches of various forests types discussed earlier section of the report.

The modified environments within the Study Area include former tea gardens, cultivated fields, plantations, residential areas, ponds, and paved roads. The artificial water bodies create the man-made aquatic habitats in the Study Area.

Critical Habitats:

According to the IFC PS6 Critical Habitat Criteria 1, 2, and 3, habitats—whether natural or altered—that are essential for the survival of species classified as globally threatened by the IUCN Red List, as well as endemic or species with restricted ranges and migratory or congregatory species, may serve as potential triggers for CH. Furthermore, under IFC PS6 CH Criteria 4 and 5, ecosystems that are highly threatened or unique, along with spatial features that facilitate important evolutionary processes, are also considered potential triggers for CH.

CH Screening: The species within the Study Area were evaluated according to CH Criteria 1, 2, and 3, whereas the habitats in the Study Area were assessed based on Criteria 4 and 5.

CH Criterion 1 - Globally Threatened Species: Globally Threatened Species are classified by the IUCN Red List into three categories: Critically Endangered (CR), Endangered (EN), and Vulnerable (VU). According to CH Criterion 1, an area that harbours a significant concentration of either a CR or EN species, as well as an area that sustains a significant concentration of a VU species—whose loss would result in the species being reclassified as EN or CR—are both considered potential Conservation Habitats (CH).

Thresholds stipulated for triggering CH Criterion 1 are: Areas that sustain significant global populations of an IUCN Red-listed Critically Endangered (CR) or Endangered (EN) species, specifically those comprising 0.5% of the total global population and including five reproductive units of a CR or EN species; Regions that maintain globally significant populations of an IUCN Red-listed Vulnerable (VU) species, the decline of which would lead to a reclassification on the IUCN Red List to Endangered (EN) or Critically Endangered (CR), and that fulfil the criteria outlined in (a); Additionally, regions that encompass nationally or regionally significant populations of an IUCN Red-listed CR or EN species.

A total of at least 44 species, encompassing both terrestrial and aquatic categories, were assessed for their potential as CH triggers. These species are classified as globally threatened according to the IUCN Red List and have geographic distributions that intersect with the Study Area. Among them, five species are categorized as Critically Endangered (CR), thirteen as Endangered (EN), and twenty-six as Vulnerable (VU). Of the forty-four species evaluated, seven are identified as freshwater fish (one Endangered and six Vulnerable), while the remaining thirty-seven species consist of terrestrial organisms, including mammals, birds, and reptiles.

The proposed airport project is entirely land-based, ensuring that no infrastructure or construction activities will occur within aquatic habitats. According to the information provided, there will be no discharge of wastewater or treated effluent into any nearby

water bodies, including Doloo Lake. Furthermore, no supply chain routes are planned to traverse adjacent aquatic areas, thereby preventing any disruption to the natural aquatic environment. Additionally, there are no river systems flowing through the project site, which suggests that the impact on aquatic biodiversity will be limited or minimal due to the project's terrestrial focus. Consequently, the aquatic and riparian zones have been excluded from the Critical Habitat Assessment process, while no terrestrial species has been identified as a potential critical habitat trigger and will undergo further evaluation.

The project is anticipated to have a negligible or minimal effect on aquatic biodiversity, given its primarily terrestrial focus. Consequently, the seven aquatic species have been excluded from the Critical Habitat Assessment, while the twenty-three terrestrial species have been identified as potential triggers for Critical Habitat and will undergo further evaluation.

21 species are identified as potential triggers for CH in relation to the Study Area, in accordance with CH Criterion 1.

CH Criterion 2 – Endemic/ Restricted Range Species: Species that are found in a confined geographical area are classified as Endemic or Restricted Range species. The species identified within the Study Area have been initially assessed as endemic or restricted range species according to their extent of occurrence (EEO), which is detailed as follows: a) For terrestrial vertebrates and plants, a restricted-range species is defined as those species that have an EEO less than 50,000 km²; b) For marine systems, restricted-range species are provisionally being considered those with an EEO of less than 100,000 km²; (c) For riverine, and other aquatic species in habitats that do not exceed 200 km width at any point (e.g., rivers), restricted range is defined as having a global range less than or equal to 500 km linear geographic span (i.e., the distance between occupied locations farthest apart).

As discussed above in CH Criterion 1, limited or minimal impact on the aquatic biodiversity is envisioned due to the terrestrial nature of the project and hence all aquatic species have been scoped out of the Critical Habitat Assessment process.

Based on review of secondary literature, amongst the 37 terrestrial species, no species is considered endemic to the area and has a reported range that includes the Study Area. Therefore, no species, qualifies as potential CH trigger species with respect to the Study Area as per CH Criterion 2b.

CH Criterion 3 – Migratory and/or Congregatory Species: Migratory Species are defined as species of which a significant proportion of its members cyclically and predictably move from one geographical area to another, including within the same ecosystem. No migratory species that are globally threatened have been identified within the Study Area.

Thresholds stipulated for triggering CH Criterion 3 are areas known to sustain, on a cyclical or otherwise regular basis, ≥ 1 percent of the global population of a migratory or congregatory species at any point of the species' lifecycle; and areas that predictably support ≥ 10 percent of the global population of a species during periods of environmental stress.

The entire Indian subcontinent, including the Study Area, falls within the limits of the Central Asian Flyway (CAF), a major global flyway. The CAF connects a large swathe of the Palaearctic region with the Indian subcontinent and contains several well-established routes along which several bird-species migrate annually. This flyway covers a large part of the continental area of Eurasia and includes the whole of the Indian sub-continent. Thus, the Study Area is very likely to be situated in the annual cyclical flightpaths of the various winter, summer and passage visitor birds migrating either to or through the region in which it is situated.

Based on secondary research and the consultation held with the local Forest Department office, it is reported that there is no significant presence of migratory and/or congregatory sites for avifauna in the Study Area. Further, the Project Site as well as the study area is majorly composed of modified habitats which makes them unsuitable resting grounds for migratory birds. The globally threatened species avifaunal species have large geographic ranges and due to the limited availability of suitable habitat types within the Study Area, it is unlikely that the Study Area contains Critical Habitat with respect to any of them.

Therefore, no species qualify as potential CH trigger species with respect to the Study Area as per CH Criterion 3.

CH Criterion 4 - Highly Threatened and/or Unique Ecosystems: Assessment of the Study Area towards Criterion 4 is based on national/regional level assessments carried out by governmental bodies, recognized academic institutions and/or internationally recognized NGOs. Thresholds stipulated for triggering CH Criterion 4 are: areas representing $\geq 5\%$ of the global extent of an ecosystem-type meeting the criteria for IUCN status of CR or EN; or areas not yet assessed by IUCN but determined to be of high priority for conservation by regional or national systematic conservation planning.

No part of the Study Area is assessed by IUCN towards the IUCN Red List of Ecosystems. Much of the Study Area is dominated by natural and near-natural habitats such as forests, arable lands, monoculture plantations, rivers and wetlands and urban areas. Patches of natural habitat include reserve forests and inland wetlands. While these habitats support biodiversity, potentially including globally threatened, migratory and/or congregatory species, these habitats are not determined to be of high priority for conservation.

The buffer zone of the study area comprised of Barail Wildlife Sanctuary (WLS) and Barail Range Forests that are designated Important Bird Areas (IBAs) identified by Bird

Life International. Barail WLS is qualified A1 (Globally Threatened Species), A2 (Restricted-range species) and A3 (Biome-restricted species) criteria of IBA.

Hence, the Barail WLS in the buffer zone qualifies as potential CH trigger as per CH Criterion 4.

CH Criterion 5 – Key Evolutionary Processes: Assessment of the Study Area towards CH Criterion 5 is based on structural attributes such as topography, geology, soil, temperature and vegetation or combinations of these variables, which can influence evolutionary processes that give rise to regional species-configurations or ecological properties. The overall aim of evaluating the Study Area against this criterion is to conserve genetic and species diversity, as also, processes which drive speciation, for the purpose of ensuring evolutionary flexibility in a rapidly changing climate. Features associated with key evolutionary processes include landscapes with high spatial heterogeneity, which drive speciation; Ecotones, which aid speciation and are associated with high species and genetic diversity; Edaphic interfaces, which drive formation of unique plant communities characterized by endemism and rarity; Connectivity between habitats, which facilitates migration and gene flow, aiding conservation of meta populations in fragmented habitats.

The Study Area is not known to contain isolated sub-populations of any species. No key evolution process has been observed or reported from the Study Area. Hence, the Study Area does not qualify as potential CH trigger with respect to CH Criterion 5.

Legally Protected or Internationally Recognized Areas: Assessment of the Study Area towards this criterion is based on overlap of the Project Site with a Legally Protected Area (LPA) or Internationally Recognized Area (IRA). As per PS6 Point 20, if a proposed project is located within an LPA or IRA, it would need to meet PS6 requirements for CH, depending on the qualifying biodiversity values present in the concerned LPA (including areas officially proposed for protection) or IRA.

For an area to be considered as an LPA towards this assessment, it must meet the IUCN definition: “A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long-term conservation of nature with associated ecosystem services and cultural values.” Areas proposed by governments for such designation must also be treated as LPAs. LPAs that meet the criteria of the IUCN’s Protected Area Categories Ia, Ib and II are more likely to qualify as potential CH.

For the purposes of this assessment, an IRA is exclusively defined as a UNESCO Natural World Heritage Site, UNESCO Man and the Biosphere Reserve, Key Biodiversity Area and/or wetland designated under the Convention on Wetlands of International Importance (the Ramsar Convention).

Thus, project sites that are located fully or partially within nationally and/or internationally designated areas of high biodiversity value qualify as potential CH.

As per the IBAT result, the study area comes under Indo-Burma region (This region in northeastern India is home to lush tropical forests and many species that are unique to the area) biodiversity hot spot.

Table 3-29: Protected Areas and Key Biodiversity Areas situated within 10 km of the Project Site

Sl. No.	Protected Areas	Number of protected areas
Protected Areas		
1	International	01 (The Indo-Burma region Biodiversity Hot Spot)
2	National	01 (Barail Wildlife Sanctuary)
3	Regional Seas	Nil
4	World Heritage	Nil
5	Ramsar	Nil
6	MAB	Nil
Key Biodiversity Areas		
1	Important Bird and Biodiversity Areas	03 (Barail WLS-Important Bird Area/Barail Range Forests- Important Bird Area/Indo-Burma region hotspot- Important Biodiversity Areas)
2	Alliance for Zero Extinction Sites	Nil
3	Others	Nil

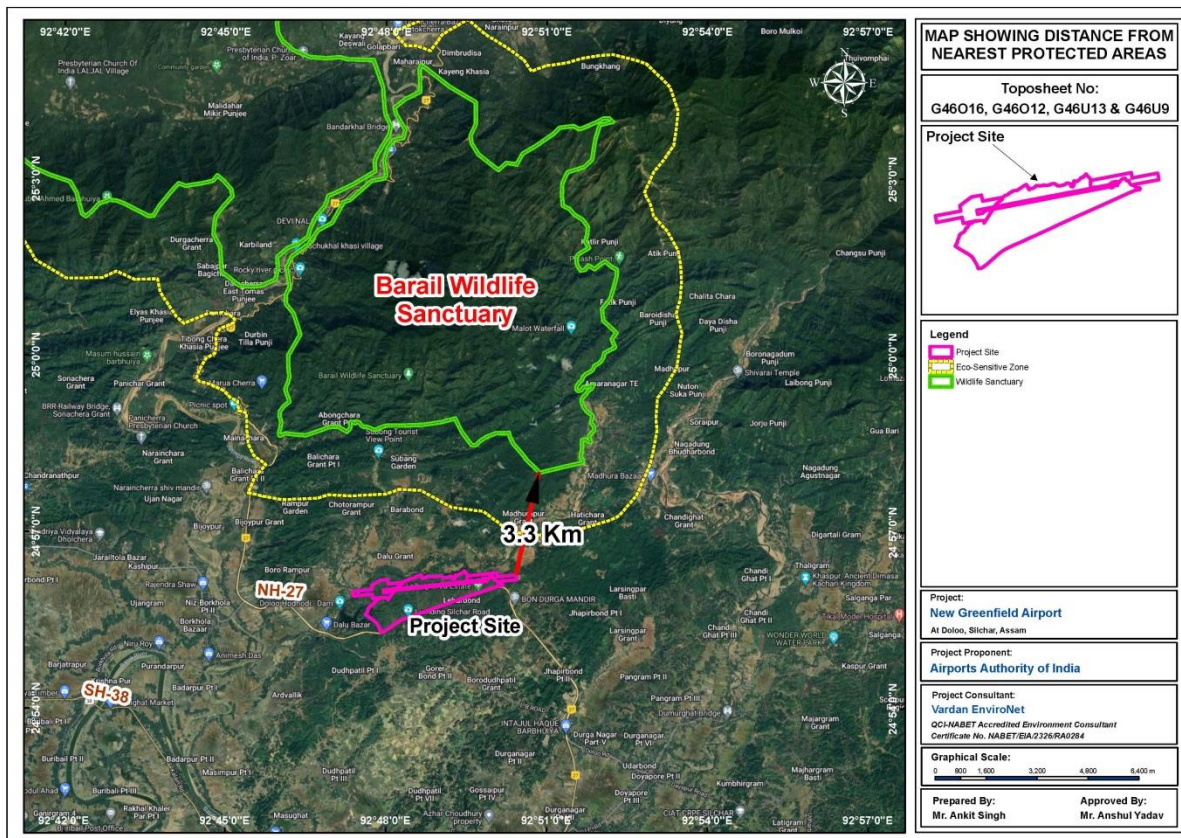


Figure 3-21: Distance of Protected Area (Barail Wildlife Sanctuary) from core zone of project

Thus, potential CH triggers identified with respect to the Study Area consist of 44 potential CH trigger species and 03 habitats.

Table 3-30: Potential CH Trigger Species

Sl. No.	Scientific Name	Common Name	Migratory/ Non-Migratory	IUCN Status (Global)	Suitable Types	Habitat	Elevation Range (Above Sea Level)
1.	<i>Aonyx cinerea</i>	Asian Small-clawed Otter	Non-Migratory	VU	Streams, Rice Fields, Lakes/ponds, Banks	River	Upto 2000 M
2.	<i>Ursus thibetanus thibetanus</i>	Asiatic Black Bear	Migrates between upper and lower elevations	VU	Moist Forests, Thick Vegetation, Steep Mountains		0-3600 M
3.	<i>Nycticebas bengalensis</i>	Bengal Slow Loris	Non-Migratory	EN	High Canopy Cover, Forest Edges, Forests		0-2400 M
4.	<i>Arctictis binturong</i>	Binturong	Non-Migratory	VU	Dense Forests, Shrubs		0-650 M
5.	<i>Trachypithecus pileatus</i>	Capped-Langur	Non-Migratory	EN	Dense Forests, Shrubs		0-650 M
6.	<i>Neofelis nebulosa</i>	Clouded Leopard	Non-Migratory	VU	Wet Forests,	Evergreen temperate	100-2000 M

Sl. No.	Scientific Name	Common Name	Migratory/ Non-Migratory	IUCN Status (Global)	Suitable Habitat Types	Elevation Range (Above Sea Level)
					forests	
7.	<i>Hoolock hoolock</i>	Hoolock gibbon	Non-Migratory	EN	Dipterocarp Forests, Mountainous Terrain, Contiguous Canopy	100-1300M
8.	<i>Capricornis sp</i>	Serow	Non-Migratory	VU	Hilly Forests,	Upto 3000 M
9.	<i>Melursus ursinus</i>	Sloth Bear	Non-Migratory	VU	Moist Forests, Tall Grasslands, Scattered Shrubs and Tree Areas Dry Riverbeds, Rocky Plateaus, Near Fruiting Trees or Trees with Beehives	
10.	<i>Macaca arctoides</i>	Stump-tailed macaque	Non-Migratory	VU	Open Degraded & Closed Forests	Upto 2700 M
11.	<i>Helarctos malayanus</i>	Sun Bear	Non-Migratory	VU	Undisturbed Forests, Bamboo Forests and Tropical Semi-evergreen Forests	501-1000 M
12.	<i>Axis porcinus</i>	Hog Deer	Non-Migratory	EN	Himalayan Foothills, tall grassland, and forest swamps	Upto 1100 M
13.	<i>Prionailurus viverrinus</i>	Fishing Cat	Non-Migratory	VU	Himalayan forests	Upto 1600 M
14.	<i>Trachypithecus phayrei</i>	Leaf Monkey	Non-Migratory	EN	Primary and secondary evergreen and semi-evergreen forest, mixed moist deciduous forest, but is also found in bamboo-dominated areas	Upto 800 M
15.	<i>Panthera pardus</i>	Leopard	Migratory	VU	All variety of forests, tropical rain forests, Deciduous forests, coniferous forests, temperate forests	Upto 3400 M
16.	<i>Manis pentadactyla</i>	Chinese Pangolin	Non-Migratory	CR	Tropical and subtropical rainforests, Bamboo forests, Limestone forests, Mixed coniferous forests, and Broadleaf forests	Upto 3000 M
17.	<i>Rusa unicolor</i>	Sambar Deer	Non-Migratory	VU	Tropical rainforests, Dry Deciduous forests, Mixed Forests, Swamp Forests, Open Scrub	Upto 3500 M
18.	<i>Chloropsis cochinchinensis</i>	Blue-Winged Leafbird	Non-Migratory	EN	Forests, Plantations, Rural Gardens	Upto 3400 M

Sl. No.	Scientific Name	Common Name	Migratory/ Non-Migratory	IUCN Status (Global)	Suitable Habitat Types	Elevation Range (Above Sea Level)
19.	<i>Mulleripicus pulverulentus</i>	Great Slaty Woodpecker	Non-Migratory	VU	Dense Old Growth Forests, Broadleaved Forests, Primary Forests	Upto 1100 M
20.	<i>Sterna aurantia</i>	River Tern	Non-Migratory	VU	Fresh Water Bodies, Inland Wetland, River Banks	Upto 600 M
21.	<i>Haliaeetus leucoryphus</i>	Fish Eagle	Migratory	EN	River, lakes, wetlands, arid area, high plateau, valleys	Upto 5000 M
22.	<i>Tropidophorus assamensis</i>	North-eastern Water Skink	Non-Migratory	VU	Dry Stream Beds, Tropical Evergreen Forests	Not Known
23.	<i>Python molurus</i>	Python	Non-Migratory	VU	Tropical Forests, Grasslands, Marshes, Swamps, and River Valleys, Rocky Foothills and Semi-rocky Hills, Cultivated Sites and Suburbs	Upto 2000 M
24.	<i>Ophiophagus hannah</i>	King Cobra	Non-Migratory	VU	Dense or Open Forests, Rainforests, and Scrub Forests, Adjacent to Agricultural Areas, Bamboo Thickets, grassland, Near Streams, Palm Oil Plantations	Upto 2400 M
25.	<i>Manouria emys</i>	Asian Giant Tortoise	Non-Migratory	CR	Evergreen Forests, Bamboo Forests, Stream Courses, Swampy Stream Edges, Upland Mesic Habitats	Upto 1500 M
26.	<i>Cuora mouhotii</i>	Keeled-box Turtle	Non-Migratory	EN	Moist Evergreen Forests and Lowland Swamps, Caves in Rocky Areas	Upto 1000 M
27.	<i>Pangshura sylhetensis</i>	Assam Roofed Turtle	Non-Migratory	CR	Foothillas areas	Upto 200 M
28.	<i>Chitra indica</i>	Softshell Turtle	Non-Migratory	EN	Widely distributed throughout India	-
29.	<i>Hardella thurjii</i>	River Turtle	Non-Migratory	EN	Lentic and lotic Water	Upto 600 M
30.	<i>Dipterocarpus turbinatus</i>	Garjan	-	VU	Tropical Semievergreen, Tropical Wet Evergreen, and Tropical Moist Deciduous Forests	Upto 300 M

Sl. No.	Scientific Name	Common Name	Migratory/ Non-Migratory	IUCN Status (Global)	Suitable Habitat Types	Elevation Range (Above Sea Level)
31.	<i>Saraca asoca</i>	Ashok	-	VU	Foothills, Rain Forests	Upto 750 M
32.	<i>Tectona grandis</i>	Teak	-	EN	Moist Deciduous Forests, Arid Areas, Sal Forests	Upto 1200 M
33.	<i>Alseodaphne owdenii</i>	Tilsundi/ Sundi	-	VU	Wet Tropical Biome	Upto 800 M
34.	<i>Aquilaria agallocha</i>	Agar	-	CR	Evergreen/Semi-evergreen Forests	Upto 800 M
35.	<i>Mesua ferrea</i>	Nageswar	-	VU	Tropical tree of Eastern Himalaya	Upto 1000 M
36.	<i>Phoebe hainesiana</i>	Bonsum	-	EN	Tropical and subtropical evergreen forests	1400-2100 M
37.	<i>Vatica lanceifolia</i>	Mahal	-	CR	Tropical wet evergreen forests	Low-mid Altitude
38.	<i>Bagarius bagarius</i>	-	-	VU	Fast flowing rivers and streama	-
39.	<i>Barilius dogarsinghi</i>	-	-	VU	Barak River Basin	-
40.	<i>Botia rostrata</i>	-	-	VU	Highland Streams	-
41.	<i>Cirrhinus cirrhosus</i>	-	-	VU	Lentic and lotic water bodies	-
42.	<i>Devario naganensis</i>	-	-	VU	Fresh Water Bodies	-
43.	<i>Tor putitora</i>	Mahasheer	-	EN	Rapid streams, pools and lakes	
44.	<i>Wallago attu</i>	-	-	VU	Freshwater and brackish environments	-

The CH screening process was based on evaluation of the known attributes of each potential CH trigger species, namely its geographical range or extent of occurrence, global population, suitable habitat types and elevation range, against the attributes of the Study Area. Mammalian species like Asian Small-clawed Otter was screened out as minimal or no impact is envisioned on the aquatic habitat due to the project. Another species Serow is reported present in the Barail Wildlife Sanctuary and don't have much evidence of the presence of this species.

Other fifteen (15) mammalian species were screened in due to their confirmed presence in the district and forest division. The presence of these species has been majorly reported from Barail WLS area and Reserve Forests located in the northern part of the buffer zone of study area. It is expected that these mammalian species will not experience any considerable effects, given their extensive distribution, habitat located at high elevations, and greater presence within the project's buffer zone.

Five (05) globally threatened avian species have direct reported range overlap and might have presence within the study area. Amongst the 5 species, two (02) species namely, Blue-Winged Leafbird (EN), and Great Slaty Woodpecker (VU) are majorly associated with forest ecosystem. Other species River tern (VU), North-eastern Water Skink (VU) and Fish eagle are associated with inland wetlands. All the species except River Tern are high elevation dwellers, therefore no significant impact is anticipated on avian fauna due to project activities.

Eight (08) species of Plant have been reported as globally threatened namely Garjan (VU), Ashok (VU), Tilsundi/ Sundi (VU), Agar (CR), Nageswar (VU), Bonsum (EN), Mahal (CR), and Teak (EN). Amongst the the 8 species, 3 species (Garjan and Ashok) are majority associated with Barail Wildlife Sanctury. Other species are present in the forest division. All these threatened species are restricted in the buffer zone of the project therefore; no significant impact is anticipated of the project activities on these species.

The documented instances of threatened turtles are linked to the buffer zone, indicating that no adverse effects on these species are expected. Likewise, while threatened fish species have been identified within the district and forest division, there is no recorded evidence of these nektonic organisms within the project's core zone, leading to the conclusion that no impact on nektones is anticipated.

The King Cobra and Python are both integral components of the forest ecosystem. Conflicts may arise between these snakes and the surrounding villages, particularly in the context of the conversion of forested land for airport development. However, there is no concern regarding the thriving of these snake species within the dense forest areas located in the project's buffer zone.

Ecosystem Services:

This section offers a comprehensive summary of the essential ecosystem services that the ecosystems within the Study Area deliver to the local community, primarily focusing on priority provisioning services, which are elaborated upon herein. In addition to these, the ecosystems in the Study Area also contribute standard regulating and supporting services, including groundwater recharge, surface water purification, soil erosion control, temperature regulation, soil replenishment, primary production, pollination, and pest management.

Provisioning Services:

The provisioning ecosystem services provided by the Study Area include water, as well as, wild or cultivated species that provide food, medicine, fodder, fuel, fertilizer, fibre, and timber to the local community.

Water: The groundwater reserves and surface water in the form of river, ponds of the Study Area provide the freshwater requirements of the local community. Groundwater is accessed through tube-wells. Most of the water bodies (Rivers and Ponds) are

perennial while some waterbodies get recharged during the monsoon rainy season and dry up during the dry seasons. The water bodies are being used by people during agricultural operations or while grazing animals as well.

The southern buffer zone of the project includes several rivers: The Barak River (6.6 kilometers to the southwest), Jatinga River (3.1 kilometers), Badri Nala (5.4 kilometers), Araia Nala (5.9 kilometers), Madhura River (7.4 kilometers), and Tikal Nala (8.0 kilometers).

Cultivated Species (Agriculture): As per inputs received from the local community, the soils of the Study Area are cultivated to grow food, fodder and fuelwood species. The local community uses the soils of the Study Area to cultivate the paddy, maize, jute, pulses, vegetables, sugarcane, pineapple, fruit trees, banana, papaya, orange, Jute, cotton, and mesta. Planted horticulture crops include tea, rubber, cashew, coffee, areca nut, coconut, and patchouli.

Wild Species: Wild plant, fungi and animal species of the Study Area provide food to the local communities. The vegetation of the Study Area, especially the herbaceous species regenerating across all open lands over each monsoon and post monsoon season, provide highly valued fodder for the local livestock, including goats, sheep, and cattles. The Study Area is also likely to be providing fuel wood and timber to the local community through social or community forestry plantations of various species.

Animal Grazing: The study area also serves pastureland and free ranging cattle (cattles, sheeps, goats etc) were observed in the project area during the site visit.

Regulating Services:

The Study Area provides regulating services to the local community in the form of groundwater recharge, surface water purification, soil-erosion control, pollination and pest control.

Ground Water Recharge: The water-flows in the Study Area contribute to the recharge of wells and ponds of the area, which fulfils the various needs of the local communities. The vegetation of the Study Area slows down surface run-off, which increases percolation of water into sub-surface layers, thereby promoting groundwater recharge.

Soil Erosion Control: The vegetation of the Study Area anchors soil-particles, lowering the rate of soil erosion by water and wind. Grasses, in particular, provide ground cover and anchorage to the erosion-prone sandy soil. A vast area of forests provides a suitable niche for soil erosion control.

Pollination and Pest Control: The vegetation of the Study Area provides habitats to pollinator species, such as, pollen or nectar feeding insects and birds, as well as, insectivorous species, including frogs, lizards, birds and a large population of bats. By harbouring these species, the Study Area provides pollinator-services and pest-control services to natural, as well as agricultural plants.

Supporting Services:



The Study Area provides supporting ecosystem services to the local community in the form of capture and recycling of nutrients, as well as primary production.

Primary Production: The photosynthetic organisms of the Study Area produce food that directly or indirectly supports the consumer organisms of the area, including the local human communities.

Nutrient Capture and Recycling: The food-chains constituted by the organisms of the Study Area capture, transfer and recycle the macro and micronutrients in the soil, water and air, making them available in the nutrient-sinks of the local ecosystems.

Impact Analysis:

Following criteria has been adopted for analysis of the impacts of present project on biodiversity:

Table 3-31: Impact Assessment Criteria

Criteria	Sub-classification	Defining Limit
Spread: Refers to area of direct influence from the impact of a particular project activity.	Local	Impact is restricted within the footprints of the Project boundary
	Medium	Impact is spread up to 02 km around the project area
	High	Impact is spread beyond 02 km from footprint boundary of the Project
Duration: Based on duration of impact and time taken by an environmental aspect to recover to its original state	Short	When impact is likely to be restricted for a duration up to construction period
	Medium	When impact extends up to 02 years after construction period.
	Long	When impact extends beyond 02 years after construction period.
Intensity: Defines the magnitude of impact	Low	When changes in the prevailing (baseline) environmental conditions does not exceed 20%
	Moderate	When changes in the prevailing (baseline) environmental conditions does not exceed 30%
	High	When changes in the prevailing (baseline) environmental conditions exceeds 30%
Nature: Refers to whether the effect is considered beneficial or adverse	Beneficial	Useful to Environment and Community
	Adverse	Harmful to Environment and Community

Impact Significance Matrix applied in order to assess the overall significance of the impacts appraised as per the Impact Assessment Criteria outlined in **Table below**.

Table 3-32: Impact Significance Matrix

Spread	Duration	Intensity	Overall Significance	
			Adverse	Beneficial
Local	Short	Low	Insignificant	Insignificant
Local	Short	Medium	Minor	Minor
Local	Medium	Low	Minor	Minor
Local	Medium	Medium	Minor	Minor
Medium	Short	Low	Minor	Minor
Local	Long	Low	Minor	Minor
Local	Short	High	Moderate	Moderate
Local	Medium	High	Moderate	Moderate
Local	Long	Medium	Moderate	Moderate
Medium	Short	Medium	Moderate	Moderate
Medium	Medium	Low	Moderate	Moderate
Medium	Medium	Medium	Moderate	Moderate
Medium	Long	Low	Moderate	Moderate
Medium	Long	Medium	Moderate	Moderate
High	Short	Low	Moderate	Moderate
High	Short	Medium	Moderate	Moderate
High	Medium	Low	Moderate	Moderate
High	Medium	Medium	Moderate	Moderate
High	Long	Low	Moderate	Moderate
Local	Long	High	Major	Major
Medium	Short	High	Major	Major
Medium	Long	High	Major	Major
High	Short	High	Major	Major
High	Medium	High	Major	Major
High	Long	Medium	Major	Major
High	Low	Low	Major	Major
High	Low	High	Major	Major

Impact Identification:

Below Table presents the Activity-Impact Interaction matrix for pre-construction, construction, operation, and decommissioning phases of the project based on environmental, social, and ecological variables. Each of the impacts identified has been further discussed and corresponding mitigation measures have been proposed.

Table 3-33: Activity- Impact Interaction Matrix (Biological Environment) - Pre-Construction, Construction, Operation and Maintenance Phase

Sl. No.	Main Activities	Habitat	Flora & Fauna	Eco-sensitive Areas	Ecosystem Services
Pre-construction Activities					
1.	Survey Work	NIL			
2.	Land Acquisition				
3.	Design & Approval				
Construction Activities					
1.	Site Clearance	Yes	Yes	Yes	Yes
2.	Cutting of Trees/ shrubs	Yes	Yes	Yes	Yes
3.	Construction of Access Road	NIL			
4.	Site Levelling and Grading	NIL			
5.	Sourcing and Transportation of Construction Materials etc.	Yes	Yes	Yes	Yes
6.	Storage and handling of construction material etc.	NIL			
7.	Transportation of mech. & elec. equipment	NIL			
8.	Establishment of Site Office and labour accommodation	NIL			
9.	Employment of Workers	NIL			
10.	Waste handling and Disposal	NIL			
11.	Sewage Generation	NIL			
12.	Civil Works: Runway, Taxiway, Apron, etc.	Yes	Yes	Yes	Yes
13.	Construction of Terminal Building	Yes	Yes	Yes	Yes
14.	Electrical works & Other Equipment and services	NIL			
15.	Admin & Control Building	NIL			
16.	Roads & Drains Construction	NIL			
Operation Phase					
1.	Operation of Aircraft	NIL			
2.	Fuel Storage				
3.	Heat & Power Supply				
4.	Aircraft Maintenance				
5.	Firefighting Activities				
6.	Generation of Wastewater				
7.	Handling of Hazardous Chemicals				
8.	Solid & Hazardous waste Disposal				
Decommissioning Phase after Construction					
1.	Dismantling of campsites and construction equipment	NIL			

Ecological Impacts and Mitigation Measures

The primary direct ecological effects expected from the Project include the loss or deterioration of both modified and natural habitats within the Project Site, as well as disturbances to wildlife caused by noise and light pollution. Additionally, there will be a reduction in ecosystem Services. The anticipated significance of these impacts is classified as Low, primarily due to the availability of stronger alternative natural habitats and provisioning services in the surrounding areas. According to the relevant reference frameworks, significant conversion or degradation of natural habitats is permissible only under the following conditions:

- There are no viable alternatives
- The overall advantages of the project are projected to considerably exceed its environmental costs
- The conversion or degradation is effectively mitigated.
- According to the IFC Performance Standard 6 and its relevant frameworks, projects located in areas of altered habitats (converted from tea gardens) that possess significant biodiversity value, as identified through the risk and impact assessment process, are required to minimize their effects on such biodiversity and to implement suitable mitigation strategies. Given that the anticipated impacts of the Project are assessed to be of moderate significance, it can be argued that the advantages of the Project outweigh its environmental costs. Efforts will be made to appropriately mitigate the unavoidable conversion or degradation of natural habitats at the Project Site, thereby reducing impacts on biodiversity and implementing necessary mitigation measures. Additionally, steps will be taken to offset any potential loss of ecosystem services that benefit the local community.
- The subsequent sections outline the expected ecological effects arising directly from the Project, organized by phase, and include relevant mitigation strategies informed by international best practices in the industry.

Mitigation Measures:

To offset the loss of natural vegetation from the Project Site, it is suggested that a larger quantity of comparable species be planted either on or near the Project Site.

- It is advisable to choose a diverse range of native plant species for the establishment of green spaces within the project. The selected plantings should reflect the species typical of the natural forest types present in the Study Area, as outlined in the baseline data. Furthermore, engaging with the local forest department office is suggested, as they can provide valuable insights and supply saplings of indigenous species suitable for planting.

- The construction plans should aim to maintain the natural topography of the Project Site by integrating the existing topographical elements to the greatest extent possible.
- It is advisable to decrease both the number and the width of all internal roads designed for the passage of heavy vehicles.
- It is crucial for all vehicles and machinery employed in construction operations to comply with the designated emission standards. It is essential to restrict the movement of vehicles associated with construction activities, especially heavy machinery, to specific designated pathways only.
- It is advisable to restrict construction activities that require substantial lighting to daylight hours whenever possible, to minimize disruption to the natural nighttime environment resulting from artificial illumination. In instances where nighttime lighting is unavoidable, it should be limited to the Project Site, directed inward, employ low-intensity lighting, and be equipped with downward-facing shields to mitigate light spill into adjacent habitats.
- It is advisable to cultivate native plant species that can achieve significant heights at suitable intervals around the boundaries of the Project Site, whenever feasible. This strategy aims to create a visual shield from adjacent wildlife habitats and human communities. Additionally, such vegetation plays a crucial role in reducing noise and light pollution, acting as green buffers that absorb and redirect the sound and light produced by the site.
- To alleviate the noise generated by construction activities, it is advisable to utilize noise reduction blankets or temporary acoustic barriers around the construction site. In compliance with the National Building Code 2005, a noise barrier measuring approximately 2.5 meters in height, made from galvanized iron sheets, will be erected along the perimeter of the construction area. This temporary installation is anticipated to diminish the noise impact by roughly 10 dB(A).
- It is crucial to ensure that all electrical components are adequately insulated to prevent the potential risk of electrocution to wildlife resulting from accidental contact with project installations.
- To minimize the use of artificial lighting during nighttime hours is advisable.
- A comprehensive management strategy should be formulated and implemented to effectively tackle the issues arising from human-animal conflict related to venomous snakes.
- It is essential to conduct regular inspections of the site and remove any carcasses to deter scavenging raptors from being drawn to the project area.
- To create a thorough long-term program focused on monitoring the activities of birds and bats, it is essential to reduce the presence of avian species at the project site. Furthermore, it is advisable to introduce a logbook to systematically record any occurrences of wildlife mortality observed within the project area.

- It is crucial to restore the soil and reinstate the natural vegetation along any roads built during the operational phase that are considered unnecessary for carrying out operational or maintenance tasks, and consequently, are not needed during the operation and maintenance phase.
- It is recommended that the use of herbicides be prohibited within the facility, and that manual weeding be adopted as the primary method for controlling or managing plant growth in the project site area.
- No Bentonite shall be allowed to be spilled or stacked in open area during construction phase.
- Waste stacking or storage near water bodies and adjacent areas of the Dolo lack is strictly prohibited.
- Raise awareness among stakeholders to encourage joint efforts in protecting natural habitats; as well as enhancing the capacity of local communities in understanding the importance of biodiversity and their ecological significance.
- Formulate and execute extensive training initiatives and operational guidelines aimed at preventing the discharge of hazardous substances. Create strong containment strategies to ensure that any unintentional spills do not penetrate the adjacent environment.

Table 3-34: Impact Significance–Ecological Impacts during construction Phase

Aspect	Degradation of Habitats		Fragmentation of Habitats		Loss of Ecosystem Services	
	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation	Without Mitigation	With Mitigation
Spread	Local	Local	Medium	Local	Medium	Medium
Duration	Long	Medium	Long	Long	Long	Medium
Intensity	Moderate	Low	Moderate	Low	Moderate	Low
Nature	Adverse	Adverse	Adverse	Adverse	Adverse	Adverse
Significance	Moderate	Minor	Moderate	Minor	Moderate	Minor

3.12 SOCIO-ECONOMIC ENVIRONMENT

For any development initiatives, socio-economic assessment plays an important role to ensure community participation and acceptance of the development activities. It also helps in planning the activities for local area development. To map the socioeconomic conditions of the people, the villages falling within the study area of 10 km radius of the proposed development is considered for the socioeconomic study.

The study of socio-economic component of environment is incorporating various facets, viz. demographic structure, availability of basic amenities such as housing, education, health and medical services, occupation, water supply, sanitation, communication and

power supply, prevailing diseases in the region as well as features such as places of tourist attraction and monuments of archaeological importance. The study of these parameters helps in identifying predicting and evaluating the likely impacts due to project activity in the surrounding region.

Baseline data such as demographic pattern, occupational status, educational, health and other amenities as existing in the study area have been studied.

3.12.1 Baseline Status

For evaluating the baseline socio-economic condition, the available data has been compiled of the study area. Information on socio-economic profile was collected from the Census of India and from primary sample survey in the study area.

3.12.2 Village

The basic unit for rural areas is the revenue village which has definite surveyed boundaries. The revenue village may comprise of one or more hamlets but the entire village is treated as one unit for presentation of data.

3.12.3 Study Area

The study area is defined as an area within 10 km radius around the project site which includes total 112 habitations including villages (107) and urban areas (05) that are from Silchar and Udarbond Tehsil of Cachar district in the state of Assam.

The Socio-Economic Status of the study areas is mentioned below and the villages surveyed are enlisted in Table 3.37.

Table 3-35: List of the Villages Surveyed for Socio-Economic Study

S. No.	Name of Village	S. No.	Name of Village
1	Lalbag (project affected villages)	8	Dolu Gram
2	Dolu Grant (project affected village)	9	Lobarbond
3	Subong	10	Chhota Dudpatil (part-8)
4	Borbond	11	Japhirbond
5	Chhota Rampur	12	Hathichora
6	Rampur	13	Maynagarh
7	Rampur T.G.	14	Ardvalik

3.12.4 Demographic Structure

Demographic structure of the study area was estimated for the selected parameters as households, population, sex ratio, scheduled caste, scheduled tribes, literates, working and non-working population etc. The summarized demographic structure of the study area is presented in Table below while the details of the parameters of demographic structure village wise within the 10 km radius is given in the report.

Table 3-36: Summarized Demographic Structure of the Study Area

S.No.	Parameter	Details
1.	No. of Villages & Urban Areas	112
2.	Households	43504
3.	Average Household Size	4
4.	Total Population	195491
5.	Male Population	100718 (51.52%)
6.	Female Population	94773 (48.48%)
7.	Population (0-6 Years) %	28335 (14.49%)
8.	Sex Ratio	941
9.	Child Sex Ratio	965
10.	Scheduled Caste %	19707 (10.08%)
11.	Scheduled Tribes %	1521 (0.78%)
12.	Literates %	131605 (67.32%)
13.	Male Literates%	72649 (55.20%)
14.	Female Literates%	58956 (44.80%)
15.	Total Workers%	70901(36.27%)
16.	Total Male Workers%	54044(76.22%)
17.	Total Female Workers%	16857(23.78%)
18.	Main Workers %	54870(77.39%)
19.	Marginal Workers %	16031(22.61%)
	➤ Total Cultivators	8591(12.12%)
	➤ Total Agriculture Labourers	4540(6.40%)
	➤ Total Household Labourers	2949 (4.16%)
	➤ Total Other Workers	54821(77.32%)
20.	Non-Workers %	124590(63.73%)

Table 3-37: Demographic Structure of the Study Area

S.No.	Urban Area & Villages	Households	Total Population	Male Population	Female Population	Population 0-6 Years	Scheduled Caste	Scheduled Tribes	Literates	Male Literates	Female Literates
Assam State											
Silchar District											
Silchar Tehsil											
1)	Tibong Chera Khasia Punjee	33	126	65	61	21	0	0	34	22	12
2)	Durgacharra Punjee	16	99	42	57	22	0	0	33	14	19
3)	Durbin Tilla Punji	44	174	88	86	32	0	0	89	48	41
4)	Bandar Khal Punjee	57	226	113	113	29	1	0	152	81	71
5)	Panichar Grant	42	223	123	100	49	0	0	84	49	35
6)	Dhalchara Grant	942	4199	2270	1929	610	440	7	2768	1642	1126
7)	Harinchara Grant	111	409	214	195	65	16	0	171	95	76
8)	Narainchara Grant	243	1118	559	559	221	54	8	580	309	271
9)	Narainchara Grant	243	1118	559	559	221	54	8	580	309	271
10)	Kachari Gaon	148	580	295	285	116	0	103	325	190	135
11)	Balichara Grant Pt II	335	1549	779	770	298	0	4	572	354	218
12)	Mainachara (Moirachara)	92	472	248	224	88	0	72	200	114	86
13)	Balichara Grant Pt I	128	589	291	298	93	2	12	367	203	164
14)	Abongchara Grant Pt II	67	265	132	133	54	0	1	57	47	10
15)	Subang Garden	570	2307	1194	1113	398	20	0	741	470	271
16)	Madhurapur Grant	107	512	250	262	87	29	25	319	170	149
17)	Hatichara Grant	1004	4289	2218	2071	694	170	18	2116	1250	866
18)	Barabond	167	758	368	390	86	6	330	584	295	289
19)	Chotorampur Grant	68	291	151	140	45	13	0	117	86	31
20)	Abongchara Grant Pt I	122	476	260	216	61	0	0	257	169	88
21)	Rampur Garden	143	533	256	277	73	21	0	281	158	123
22)	Bijoypur Grant	160	623	323	300	88	3	0	251	155	96
23)	Bijoypur	238	1159	593	566	206	28	172	687	365	322

24)	Anwarpur	64	324	156	168	77	0	0	202	103	99
25)	Ujan Nagar	325	1443	746	697	261	53	75	936	511	425
26)	Niz-Borkhola Pt I	767	3234	1641	1593	373	667	0	2609	1369	1240
27)	Bhitor Gangapur Pt I	559	2362	1200	1162	278	242	0	1731	913	818
28)	Jarailtala	464	2157	1111	1046	328	0	0	1650	895	755
29)	Bhitor Gangapur Pt II	146	570	286	284	61	58	0	472	250	222
30)	Durgapur	450	2038	1064	974	292	0	0	1437	790	647
31)	Raninagar	45	170	82	88	22	91	0	143	74	69
32)	Chutra Sangan	74	330	165	165	53	320	0	249	125	124
33)	Ujan Gram	432	1996	1013	983	359	0	0	1402	760	642
34)	Kashipur	206	964	483	481	136	179	0	760	393	367
35)	Chesri	452	2084	1084	1000	318	253	0	1553	868	685
36)	Niz-Borkhola Pt II	553	2668	1364	1304	407	213	4	2124	1111	1013
37)	Rampur	183	881	443	438	123	488	26	585	290	295
38)	Boro Rampur	355	1457	710	747	142	52	7	1231	618	613
39)	Dalu Gram	162	713	342	371	68	0	0	583	285	298
40)	Dalu Grant	1872	7955	3995	3960	1120	124	19	3992	2286	1706
41)	Boro Rampur Garden	414	1636	813	823	191	40	0	1010	587	423
42)	Kalinagar Garden	216	812	411	401	138	9	0	248	165	83
43)	Kalinagar Pt I	364	1554	783	771	176	736	0	1235	648	587
44)	Kalinagar Pt II	131	626	333	293	85	509	0	475	260	215
45)	Badarpur Pt I	462	2102	1068	1034	333	149	0	1568	819	749
46)	Bhairab Nagar	685	2703	1395	1308	328	304	0	1900	1068	832
47)	Krishna Pur	604	2429	1247	1182	371	0	0	1873	990	883
48)	Sarail	243	993	516	477	150	0	0	760	410	350
49)	Dubag	228	943	491	452	153	0	0	704	375	329
50)	Peladahar	271	1117	599	518	155	0	0	820	473	347
51)	Raipur	193	832	455	377	125	0	0	636	373	263
52)	Niz-Joynagar	571	2671	1364	1307	394	546	4	1912	1011	901

53)	Badarpur Pt II	355	1803	928	875	331	38	0	1196	640	556
54)	Masimpur Grant	317	1771	1193	578	212	47	19	1380	1012	368
55)	Masimpur Bagicha	255	1089	559	530	191	94	0	746	430	316
56)	Masimpur Pt II	460	2364	1450	914	287	70	0	1893	1263	630
57)	Ardvallik	163	789	421	368	125	549	0	540	309	231
58)	Kharil Bagicha	313	1140	621	519	157	31	0	567	360	207
59)	Mulidahar Grant	259	1157	609	548	166	438	17	673	406	267
60)	Leburbond	207	849	418	431	114	194	72	604	324	280
61)	Borodudhpatil Grant	858	3657	1883	1774	636	143	0	1807	1078	729
62)	Gorer Bond Pt II	381	1728	914	814	247	743	35	1100	625	475
63)	Gorer Bond Pt I	327	1333	655	678	240	1243	75	579	299	280
64)	Dudhpatil Pt I	193	929	482	447	161	908	0	647	360	287
65)	Dudhpatil Pt II	49	179	95	84	28	57	0	141	78	63
66)	Dudhpatil Pt III	119	527	259	268	88	435	0	400	214	186
67)	Masughat	408	1734	862	872	178	712	0	1485	764	721
68)	Balighat	618	2765	1391	1374	354	259	0	2066	1115	951
69)	Masimpur Pt I (Maohimpur)	558	2873	1697	1176	478	539	1	2027	1313	714
70)	Ujangram	567	2341	1161	1180	370	30	0	1778	927	851
71)	Kumarpara	525	2302	1185	1117	249	413	1	1965	1037	928
72)	Purandarpur	287	1223	609	614	157	283	0	925	485	440
73)	Rakhal Khaler Par Pt I	597	2682	1404	1278	319	1021	0	2224	1198	1026
74)	Rakhalkhalerpar Pt II	274	1367	700	667	236	0	0	972	530	442
75)	Rongpur Pt I	558	2743	1359	1384	398	209	1	1936	1027	909
76)	Rongpur Pt II	455	2145	1071	1074	242	51	0	1701	897	804
77)	Rongpur Pt IV	592	2962	1520	1442	433	716	13	2140	1154	986
78)	Tupkhana Pt I (CT)	989	4640	2369	2271	617	113	9	3491	1897	1594
79)	Tarapur VII (CT)	1651	6977	3506	3471	609	839	46	6101	3112	2989
80)	Tarapur Pt VI (CT)	1862	8753	4392	4361	1059	1691	11	6575	3426	3149
81)	Dudhpatil Pt VI (CT)	1215	5083	2573	2510	824	172	0	3561	1886	1675

82)	Dudhpatil Pt V (CT)	919	4121	2092	2029	449	3	0	3441	1778	1663
Total		32902	145885	75129	70756	20629	17931	1195	100826	55359	45467
Udarbond Tehsil											
83)	Indragram Pt II	126	570	288	282	113	0	0	299	175	124
84)	Indragram Pt I	48	233	127	106	29	15	86	157	86	71
85)	Amaranagar T.E.	195	791	397	394	123	0	0	342	223	119
86)	Madhupur (Madhvpur)	504	2348	1219	1129	476	633	34	1481	802	679
87)	Nayagram	186	748	402	346	55	1	92	467	263	204
88)	Siberbond	252	1031	499	532	122	16	93	636	342	294
89)	Chandi Ghat Pt I	226	1100	528	572	152	0	0	584	344	240
90)	Chandi Ghat Pt II	102	448	227	221	74	0	0	192	116	76
91)	Chandi Ghat Pt III	300	1348	685	663	174	49	1	772	445	327
92)	Pangram Pt I	637	3162	1595	1567	655	0	0	1812	963	849
93)	Larsingpar Grant	819	3726	1879	1847	546	49	0	1539	950	589
94)	Larsingpar Basti	99	458	239	219	49	0	0	320	187	133
95)	Jhapirbond Pt I	245	1139	572	567	129	0	0	665	391	274
96)	Jhapirbond Pt II	237	1184	611	573	242	0	0	604	328	276
97)	Pangram Pt II	406	1870	958	912	244	45	8	1410	769	641
98)	Pangram Pt III	767	3636	1892	1744	575	134	4	2576	1396	1180
99)	Arunabond T.E.	466	2028	1047	981	284	241	0	1228	722	506
100)	Doyapore Grant	932	4202	2324	1878	586	182	7	1974	1326	648
101)	Doyapore Pt I	421	2136	1086	1050	387	11	0	1337	729	608
102)	Durganagar Pt VI	387	1967	1020	947	304	0	0	1333	740	593
103)	Durganagar Pt IV	363	1711	903	808	178	75	0	1436	785	651
104)	Latigram (Lathigram)	488	2513	1316	1197	463	0	1	1615	885	730
105)	Chalita Kandi	140	680	346	334	136	0	0	367	211	156
106)	Durganagar Pt I	189	968	511	457	177	55	0	634	367	267
107)	Durganagar Pt II	173	831	426	405	103	0	0	580	327	253
108)	Gossaiपुर Pt IV	235	1052	534	518	180	0	0	777	422	355

09)	Gossaipur Pt V	383	1410	725	685	182	41	0	898	468	430
10)	Bahadurpur	332	1631	817	814	194	51	0	1302	682	620
11)	Gossaipur Pt III	538	2586	1307	1279	422	178	0	1947	1022	925
12)	Gossaipur Pt II	406	2099	1109	990	352	0	0	1495	824	671
Total		10602	49606	25589	24017	7706	1776	326	30779	17290	13489
Grand Total		43504	195491	100718	94773	28335	19707	1521	131605	72649	58956

3.12.5 Demographic Profile of the Study Area

i. Household And Population

Total number of households in the study area is about 43504 with total population of about 195491 with male population about 100718 (51.52%) and female population is 94773 (48.48%) and is represented in below Figure.

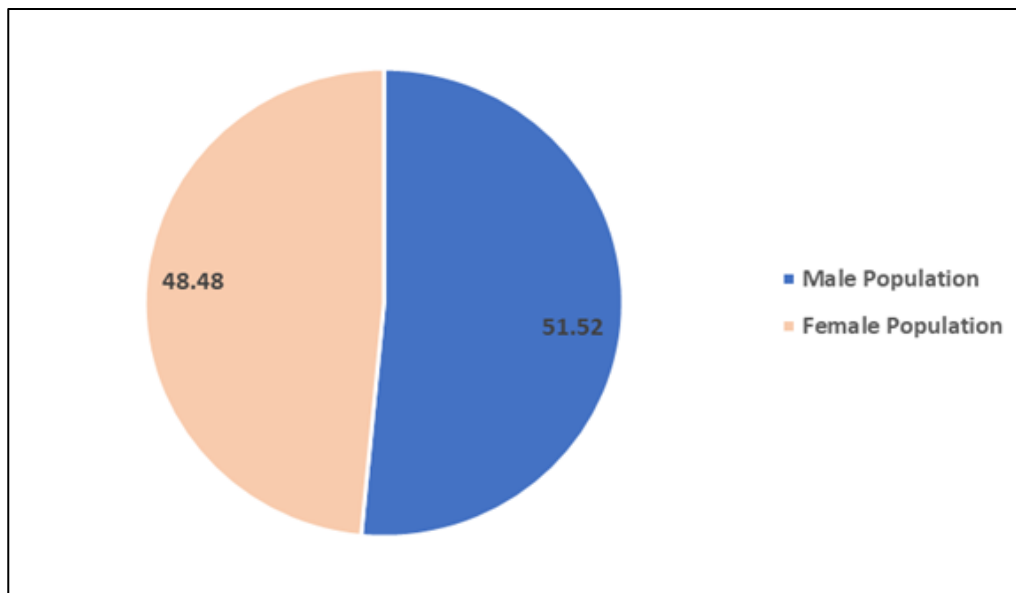


Figure 3-22: Male- Female Population Data in the Study Area

Average Household Size- The average household size i.e. persons per family is about 4 in the study area.

Population Age-Group (0-6yrs)- Out of the total population, the child population of 0-6 age-group in study area is about 28335 (14.49%).

Sex Ratio & Child Sex Ratio- The overall Sex ratio (No. of females per 1000 males) in the study area is 941 which is less than the district and state sex ratio which is 959 and 958 respectively.

The child sex ratio in the study area is 965 girls per 1000 boys in the 0-6 age group.

The graphical presentation of the distribution of population is given in Figure 2 below:

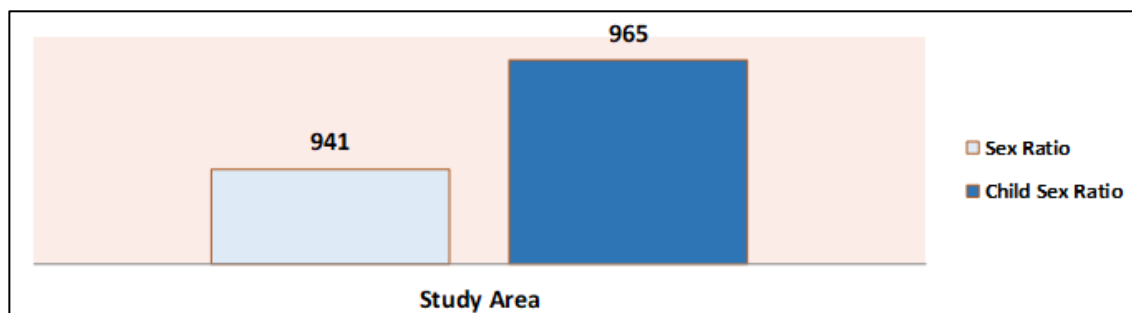


Figure 3-23: Sex Ratio and Child Sex Ratio in the Study Area

ii. Scheduled Caste and Scheduled Tribe Population in the Study Area

Scheduled caste population in study area is about 19,707 i.e. 10.08% of total population while the Scheduled tribe population is only about 1521 (0.78%) which is presented in Fig.3.

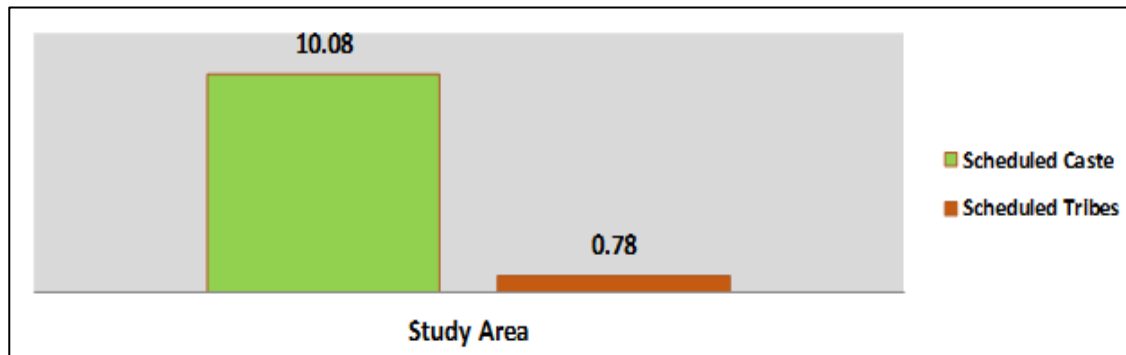


Figure 3-24: Scheduled Caste and Scheduled Tribes Population in the Study Area

iii. Literacy Rate in The Study Area

Out of the total population, 131605 i.e. 67.32% people are literates. Out of that, male literates are about 72649 (55.20%) and that of female is about 58956 (44.80%).

The literacy rate in the study area is estimated as 78.73%; however, male, and female literacy rate is estimated as 84.19% and 72.91% respectively which creates a gender gap of 11.28% in the literacy rate. It indicates that there is a huge scope of improvement in education sector uplift the literacy level of male and female, emphasizing additional efforts towards girl/women education to minimize the gap in literacy within both the genders.

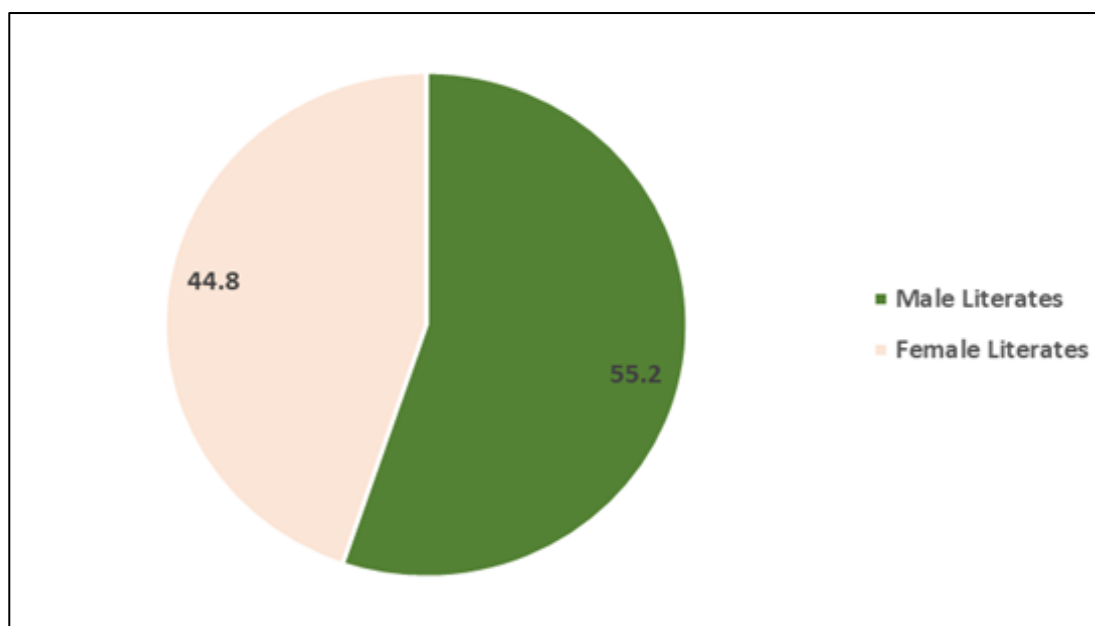


Figure 3-25: Male Literates and Female Literates in the Study Area

iv. Occupational Pattern/ Economic Resource Base

Occupational pattern of the villages and urban area falling within 10 km radius is estimated from Census of India. Occupational pattern of any region mainly depends upon its economically active group i.e. the working populations involved in different economically productive activities. The total workers further categorized as main worker and marginal workers.

The workers coming under the main and marginal workers category are cultivators, agricultural labors and those engaged in live stock, forestry, fishing, hunting, and plantations, orchards and allied activities, mining and quarrying, manufacturing, processing, servicing and repairs in household industry, construction trade and commerce, transport, storage & communication, and other services.

TOTAL WORKERS:

The number of total workers out the total population is 70901 i.e 36.27% of which 54044 (76.22%) are male workers and 16857 (23.78%) are female workers. Distribution of working population in different categories is classified as follows:

A. Main Workers

Main workers are those who have worked for a major part of the year (i.e. at least six months or 183 days). Main activity of a person who was engaged in more than one activity was reckoned in terms of time disposition Out of the total population 54870 (77.39%) comes under the main workers category.

B. Marginal Workers

Marginal workers are those who have worked any time in the year for less than six months or 183 days but have not worked for a major part of the year. The population of marginal workers within the study area comprises of about 16031 (22.61%).

Cultivators:

The person who is engaged either as employer, single worker or family worker in cultivation of land is recognized as a cultivator. Out of the total working population, the total cultivator population in study area is about 8591 (12.12%).

Agricultural Laborers:

Persons working on land owned by others for wages or share in the yield have been treated as agricultural laborers. Out of the total working population the agricultural laborer's population in the study area is about 4540 (6.40%).

Laborers in Household Industry:

The laborers engaged in household Industrial activity are quite low in the study area which is about 2949 (4.16%).

Other Workers:

The other worker category out of the total working population can be seen higher in study area that is about 54821 (77.32%).

C. Non-Workers

Non-Workers are those who have not worked any time at all in the year. Non-workers constitute householders, students, dependents, retired persons etc. The non-worker population is observed to be almost about 124590 (63.73%) in the study area.



Figure 3-26: Occupational Structure of the Study Area

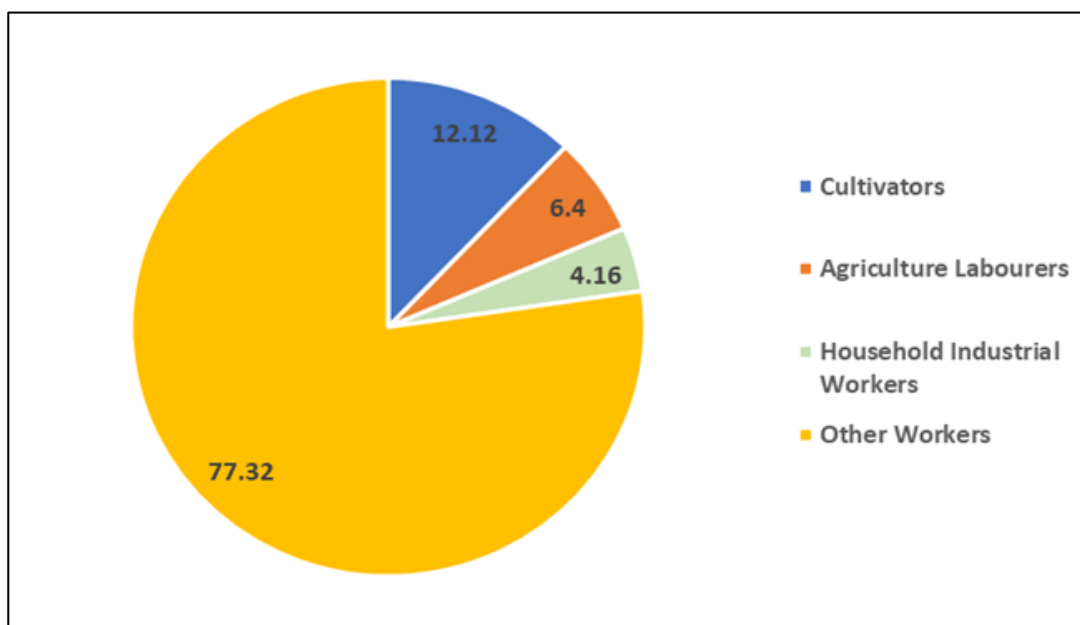


Figure 3-27: Category of Workers in the Study Area

3.12.6 Infrastructure Resource Base in the Villages of the Study Area

The details of infrastructure resources base of the study area with reference to education, medical facility, water supply, post and telegraph, transportation, communication facility, power supply, existence of nearest town etc. are given in **Table 2** and discussed as below:

Educational Facility:

There are 34 government pre-primary schools, 22 private pre-primary schools, 170 primary government school, 15 private primary schools, 88 government middle schools, 6 private middle schools in (Ujan Gram, Dalu Grant, Rongpur Pt.I, 2 schools in Rongpur Pt. IV, and 1 in Pangram Pt. III) 15 Secondary schools, 4 private secondary schools are in Dalu Grant which 2 are in Rongpur Pt. IV and 1 in Pangram Pt III) 3 Senior secondary schools in and 1 Senior secondary school in Rongpur Pt. IV and Degree college in Panagram Pt III, Borkhola College. Nearest college is in Cachar which is above 10 kms from the project site.



Figure 3-28: Schools in the study area

Drinking Water Facility:

As per the census data the major source of drinking water in the study area was through tap water in 82 villages, untreated tap water in 64 villages, covered well in 67 villages, uncovered wells in 85 villages, Hand Pump facility in 50 villages, tube wells in 56 villages and tank water facility in 88 villages.



Figure 3-29: Drinking Water Facilities in the study area

Jal Jeevan Mission in Cachar District, Assam:

As per the Jal Jeevan mission the total number of Households (HHs) registered in Cachar district as on 2019 was about 4,04,372 of which with tap water connections was provided in 2019 to 29,219 households i.e only about 7.23% while as on date about 3,49,805 (86.51%) households are provided with tap water connection. While that in Silchar tehsil the water connections were provided to 6,226 i.e 19.02% households in 2019 which has now increased upto 28,157 i.e 86.01% and in Udarbond tehsil the water 41,349 houses were registered in 2019 and only 2,672 houses were provided with water supply which has now increased upto 36,722 with 88.81%.

Sanitation & Drainage Facility:

Sanitation and drainage system are poor in the villages. Closed drainage system is in only 2 villages (Gossaipur Pt III and Gossaipur Pt II) and 8 villages have open drainage system.

Communication Facility:

Mobile phones are available with mostly 100% people in the study area. Post office in the study area is available in Bhitor Gangapur Pt.I, Niz Joynagar, Kharil Bagicha, Rongpur Pt.II, Pangram Pt.III, Gossaipur Pt.V, Gossaipur Pt.III, Dalu Post Office, Subong Post Office, Borkhola Sub Post office and in Post Office, Udharbond.

Transportation Facility:

The major transportation facility is available through public bus service available in 57 villages and private bus service available in 61 villages.

Approach Road:

About 105 villages in the study area have kuccha roads, while Pucca roads are available in 55 villages. This shows that the approach roads condition in the villages is mostly in poor condition which makes causes difficulty to the villagers to travel long distances.

Power Supply:

Electricity is available for domestic purpose in 104 villages for about 10-12 hours a day while 35 villages have power supply for agriculture purpose in the study area.



Figure 3-30: Electric Supply Facility in the Study Area

Health Status:

Primary Health centre in the study area is in Dhalchara Grant, Leurbond Barbond PHC, Borkhola Primary Health Centre and Udharbond Block Primary Health Centre. Primary Health Sub-centre is in 16 villages, Maternal and Child Welfare centre in 2 villages, Dispensary in only one village. It is attributed from the data that different health problems are reported which could be attributed to improper sanitation, lack of health awareness among the people and lack of health-related infrastructure facilities.



Figure 3-31: Health facilities in the Study Area

Cultural and Aesthetic Attributes:

Doloo Lake is just one of the perfect Silchar tourist places. The lake is best known for its beautiful surroundings offering mental peace to visitors. The place literally elevates during the winter and monsoon season.

3.12.7 Economic Resource Base

Udharbond is a town, Encompassed by Tea Gardens. Larsing, Chandighat, Arunaband, Dayapore, Majhergram, Thaligram, Tikal, Kumbha, Kumbhirgram, Haticherra and Patimara Tea estates are extremely beautiful and people in large number visit them often.

Economy of Silchar:

Factors like poor communication, geographical remoteness, lack of proper infrastructural facilities are the some of the causes behind the low level of economic growth of Silchar. However, the town, over the past few years, has seen an influx of people from neighbouring places due to increase in prospects and other developments in the field of healthcare, and job opportunities. Recently, the town is getting over crowded due to the booming real estate market and other commercial enterprises. On the otherhand horticulture, agriculture, forestry is forming the important economic sectors of Silchar. Agriculture contributes largely to the economy of Silchar. Majority of the people of the area are dependent upon agriculture. The tribal people of the area practice a distinctive feature of agriculture known as the Jhum Cultivation. During the autumn season the cultivation is normally done either as a single crop or as mixed crop along with ginger, Maize, chillies

turmeric and other vegetables. Some horticultural crops cultivation, such as orange, pineapple, banana and papaya occupy an important role in the agricultural economy of the area. The agro climatic conditions of Silchar are conducive for different agricultural activities such as development of the plantation crops like rubber, tea, coffee, cashew, coconut, areca nut and also aromatic plant like Patchouli. Livestock and poultry also contribute to the economic growth of Silchar. They hold an important position in the rural economy. The most common livestock animals are Buffalo and pig while duck and hen consist the poultry birds. The Forest products comprise of bamboo, cane, and timber.

Table 3-38: Infrastructure Resource Base of the Study Area

S.No.	Amenities	Availability in Number
1.	Education Facility	PreP (34), Pre-P (22), P (170), PvtP (15), M(88), PvtM (6),S(17), Pvt.S(4),Ssc(3), Pvt.Ssc(1),C(1)
2.	Medical Facility	PHC (3), PHS (16), MCW (2), D (1), FCW (6), MHC (1)
3.	Drinking Water Facility	T (82), UnT (64), CW (67), UCW (85), HP (50), TW (56), TK (88)
4.	Drainage Facility	OD (8), CD (2)
5.	Communication Facility	PO (7), Sub-PO (21), M (76)
6.	Transportation Facility	BS (57), Pvt BS (61)
7.	Approach Road	KR (105), PR (55)
8.	Power Supply	ED (104),EAG (35)

Source: Village amenities 2011, Assam State

Abbreviations:

Educational Institutions		Medical Facilities		Drinking Water Supply		Communication	
P	: Primary School	PHC	: Primary health Centre	T	: Tap Water	PO	: Post Office
M	: Middle School	PHS	: Primary health sub centre	CW	: Covered Well Water	PH	: Phone connections
S	: Secondary School	D	: Dispensary	UCW	: Uncovered Well Water	Drainage Facility	
				HP	: Hand pump	OD	: Open Drainage
						CD	: Covered Drainage
Power Supply		Approach Road		Transportation			
ED	: Electricity for domestic purpose	PR	: Pucca Road	BS	: Bus		
		KR	: Kuccha road	RS	: Railway Station		

3.12.8 Socio-Economic Survey

To access and evaluate likely impacts arising due to the development project on socio-economic environment, it is necessary to gauge the apprehensions of people from the areas.

Methodology applied for selection of sample & data collection:

The methodology which is applied for primary source of data collection i.e. gathering data through field survey for socio-economic environment is depicted below:

A: Sampling Method

A judgmental and purposive sampling method was used for choosing respondents of various sections of the society i.e. Sarpanch, adult males and females, teachers, medical practitioners, businessmen, agriculture laborers, unemployed group etc. Judgmental and purposive sampling method includes the right cases from the total population that helps to fulfill the purpose of research needs.

B: Data Collection Method

For the process of data collection through primary source certain methods are used among that are:

Primary Survey conducted in the Sample Villages of Study Area:

Socio-economic survey was carried out from 19th December 2024 to 22nd December 2024 in the project affected villages and other sample villages located within the study areas in different directions with reference to the project site using structured questionnaire by interacting with project affected people who are likely to displace from the project affected villages to another location, representatives from the villages, government officials, school teachers, healthcare officials, tea garden workers etc.

During the survey total 14 villages were covered, including the project affected villages/areas.

Interview Method:

Structured interview method is used to collect data regarding the awareness and opinion from the samples selected of the various socio- economic sections of the community. Structured interviews involve the use of a set of predetermined questions that includes fixed and alternative questions. The questionnaire mainly highlights the parameters such as income, employment and working conditions, housing, food, water supply, sanitation, health, energy, transportation and communication, education, environment and pollution to assess the standard of living of that particular region and general awareness, opinion and expectation of the respondents about the proposed project. Interview method helps to collect more correct and accurate information as the interviewer is present during the field survey.



Figure 3-32: Interaction with the Project Affected Families and Villagers

Key Findings & Observation of Primary Social Survey in the Study Area:

The salient findings & observations recorded during socio economic survey in the project affected villages and other sample villages surveyed are depicted in the **Table 4** below:

Table 3-39: Summary of Key Findings & Observations of Primary Social Study

Key Concerns	Observations
Main Occupation & Sources of Income	<ul style="list-style-type: none"> Tea Garden Workers, Agriculture, Animal Husbandry, Jobs in Govt. & Private Sectors were found as the main occupation & sources of income for the villagers. In many of the villages nearby the Tea Gardens in the study area like Lalbag, Dolu Grant, Rampur T.G., Subong, Hathichora Tea estate etc., a huge number of migrant people from other states are residing since very long time and working in the Tea Gardens as a major source of their livelihood. The workers of Tea Garden have provided agriculture land by the Tea Garden Owners for farming.
Main Agricultural Crops Grown	<ul style="list-style-type: none"> Rice, Potato, Beans etc.
Irrigation Facility	<ul style="list-style-type: none"> Irrigation is mainly dependent on rain water. Some of the farmers have facility of borewell/ tubewell for irrigation.
Self-Help Groups	<ul style="list-style-type: none"> During the public interaction people from the villages reported that SHGs are running and headed by women. These SHGs are running with limited resources to provide social or financial support to the needy villagers. Need of financial support from the Banks and Government. The women of SHGs showed their desire to get some skill development training.
Water for Drinking &	<ul style="list-style-type: none"> Bore well, overhead tank, river water (through pipeline to

Domestic uses	overhead tank), Tap, installed by the panchayat, water supply through the Jal Jeevan Mission are the main sources of drinking water.
Sanitation Facility	<ul style="list-style-type: none"> • Most of houses (70-80%) having in-door or out-door toilet & sanitation facility. • People reported that there are some houses in villages using open defecation; some of them have the sanitation facility in their houses, but they are used to go for open defecation.
Waste Management	<ul style="list-style-type: none"> • Open drainage facility is available in the villages. • In some cases people reported that there is not a better arrangement of waste management from the local authority. • In some villages there is community dust-bins for storing the waste materials at a common point from where trolley/vehicle arranged by the local panchayat collect the waste materials for further disposed.
Education Facilities	<ul style="list-style-type: none"> • In most of the villages, basic education facility at Primary & Middle level is available. In some cases, schools are available at Secondary & Sr. Secondary Level. • But, in the villages where such facility is not available for Secondary, Sr. Secondary or college level education, students are going at nearby villages or Silchar city. • As reported by the villagers, there are school dropout cases; especially in case of girls, mainly because of financial reason, secondly due to distance of educational institutions from their villages and due to shortage of transportation facilities from their village to school/college. • It was reported that, generally students dropped out their further education after 10th or 12th standard of schooling, because for collage study they have to travel more outside their villages. • In order to motivate female literacy, adequate infrastructure provisions must be extended such as roads, transport facilities and access to schools in the area.
Health Facility	<ul style="list-style-type: none"> • It was observed that there is scope of improvement in health facilities in the villages. • There is Government Hospital in Doloo T.G. and Rampore T.E. under the National Health Mission, Assam. • Also, there is Mobile Medical Unit under the National Health Mission, Assam. • A well established Hospital is available in Chhota Dudpatil (part-8) village. • It was reported that Health Sub Centre is available in

	<p>village Borbond.</p> <ul style="list-style-type: none"> • In villages where no such health facilities available, people are travel to nearby villages and Silchar city in case of major issues. • In case of Delivery cases, people usually visit the Government Hospital in Borkhala village. • It was reported by the villages that the basic health facilities should be improved and be available 24x7 at village level for all.
Road Network	<ul style="list-style-type: none"> • All the villages are connected by the road networks and having paved roads. • But, it is observed & reported by the villagers that the village roads need to repair and widening.
Power/Electricity Supply	<ul style="list-style-type: none"> • All the villages have electricity supply for domestic uses. • But, in many villages people reported that hanging electricity wires by the electric poles are a major safety concern for the villagers as they live in fear during high speed wind & heavy rainy days due to expected accident of breaking electric wire.
Banking Facility	<ul style="list-style-type: none"> • Banking facilities are available only in some cases. Rest of the villages is bounded to travel in nearby area Silchar city.
Women Participation	<ul style="list-style-type: none"> • It was reported by the women that they are also participating in income related activities, SHGs etc. • In general, people said that they preferably do marriage of girls after attaining the age of 18 years. • Women/Girls seeking some skill development trainings (tailoring, computer training, typing etc) so that they can enhance their skills and become self dependent get better job opportunities and add income to their families.
Awareness and Opinion about the Project	<ul style="list-style-type: none"> • While discussion with the villagers from the study area it was obtained that respondents are aware about the project but are not aware about the commissioning of the project. Villagers opined that the proposed project will bring new job opportunities in the village (Doloo, Leburbond, Boro Rampur) as the transportation facilities in the area will increase, demand of taxis, travel services in the area will increase. Also, the hospitality services in the area will increase with the proposed Airport project.

3.12.9 Corporate Social Responsibility (CSR)

Based on the Social and need based studies conducted in the sample villages of the study area, the following development activities can be proposed for the local community:



Table 3-40: Proposed Activities under CSR/CER

S. No.	Proposed Activities under CSR/CER	
1.	Health facility	<ul style="list-style-type: none"> • Donation of sanitizers, Masks, bathroom and floor cleaners, soaps, hand washes, health kits to the hospitals and underprivileged persons. • Focus on disadvantaged sections of society like the ones serving the hearing impaired, visually impaired, orphans and old age-elderly.
2.	Infrastructural development	<ul style="list-style-type: none"> • Installation of water purifier in villages and Government schools • Providing Smart Classes facility in government schools available in villages. • The company should contribute under CSR activity by contributing fund and initiating action for water supply scheme and other rural development projects through state administration, development of community hall with toilet and kitchen • Construction, repair, and development of nearby village roads • Installation of street lights.
3.	Sanitation and hygiene	<ul style="list-style-type: none"> • Construction of Nallas for proper drainage system • Distributions of Dust Bins and arrangement of Garbage disposal
4.	Afforestation programs	<ul style="list-style-type: none"> • Plantation of trees at road side of project site and in the villages near the project site.

CSR Activities Undertaken in the Cachar District by Airport Authority of India:

S. No.	Name of the Development Activity	Sanctioned Amount (In Cr.)	Amount spent till date	Current Status	Year of Completion
01	Support for establishing nuclear medicine facility at Cachar Cancer Hospital & Research Centre, Silchar.	11.14	10.69	Work Completed	2022
02	Provision of Pathological Laboratory Equipment to Cachar	0.76	0.76	Work completed	2018-19

	Cancer Hospital, Silchar				
03	Provided financial assistance for procurement of Ambulance for Cachar Cancer Hospital, Silchar	0.13	0.13	Work completed	2020
04	Supply of Rice during COVID'19	0.02	0.02	Work completed	2020

CSR Activities Undertaken by Airport Authority of India in Different Parts of Assam:

Airport authority of India has been carried out various CSR activities in different part of Assam for the welfare of community.

- **CSR activities during COVID-19 carried out by Dibrugarh Airport, Assam**

To support the Dibrugarh District Administration in the fight against COVID-19, Airports Authority of India, Dibrugarh provided funds amounting Rs. 8.00 lakhs under CSR scheme, to procure various materials for combating COVID-19. The same is being utilised to procure protective materials for Police personnel.

- **CSR activities during COVID-19 at LGBI Airport, Guwahati, Assam**

Stitching of over 25000 masks was done from the unused fabric of AAI's staff uniform. The stitching work was provided to the economically needy people residing at places nearby the Airport. The masks were distributed to the local population, security personnel, contract labourers etc.

- **CSR activities during COVID-19 at Jorhat Airport, Assam**

Jorhat airport provided financial support of Rs. 9.81 Lakhs to Jorhat Medical College and Hospital through a cheque handed over to DC, Jorhat. 50,000 masks were also procured under CSR from Rural Woman self-help group, 'Kaliapani, Teok', a project of Assam Government through DC Office for a cost of Rs. 75,000.

3.12.10 Rehabilitation & Resettlement (R&R) Plan of the Proposed Greenfiled Airport in Doloo

Due to the proposed project, it is estimated that almost 173 numbers of labour houses will be affected and have to rehabilitated at new location.

A total land area of 997.4 acres has been earmarked for the development of the Doloo greenfield Airport. 826.60 acres of land has been acquired by the state government. Additional 170.8 acres of land acquisition is in process by State Government.

The additional land has been relinquished by the Doloo Tea Estate and the process of handing over the land to the Govt. of Assam is going on.

All the affected families and people will be compensated and taken care as per the applicable laws of National and State level R&R Policies.

A public consultation meeting conducted by the concerned district authority was held on different instances at the site for acquisition to obtain the views & suggestions regarding the proposed project. Consultation has provided input towards mitigation of impacts of the dwellers of the region.

Accordingly, to ensure that the R&R is carried out smoothly in the interest of the public, the following arrangements and initiatives have been put in place:

- 1296 labour families have been paid with an amount of Rs. 1 Lakh each as a one time goodwill gesture from the Government of Assam to support the labour force.
- Doloo TE Company has allotted 50 Bighas of land for construction of 173 nos. of Labour Houses and other related activities at Dag No. 281, Patta No. Redeem Lease 39/95 at Mauza Doloo Grant under Silchar Revenue Circle.
- For Rehabilitation of all the affected houses, 173 numbers of houses are proposed with a plinth area of 399 sq. feet. The construction for 145 numbers of houses is going on and construction of remaining units has also been approved to be executed.
- Keeping in view the R&R, the Government of Assam had also planned to establish a new School in the rehabilitation locality which is currently under process.
- For the well taken care of Tea Garden Workers likely to be affected due to the proposed project, the Memorandum of Understanding (MoU) that took place between Doloo Tea Company India Limited and Barak Cha Shramik Union and Akhil Bharatiya Chah Mazdoor Sangha and Barak Valley Cha Mazdoor Sangh clearly had the following key provisions:
 - The Company assures the 'Union' that it will not retrench or layoff any worker from its payroll in spite of reduction in area under tea plantation.
 - Many workers would be deployed in new development activities like new plantation, infilling, drainage etc.
 - As discussed in the meeting in ALC office, held on dated 5th March, 2022, total virgin land available in the garden in 101 Ha, which will be taken up for extension planting and on the other hand uprooting and replanting, rejuvenation and infilling will be done in balance 508 Ha land in a span of 7-8 years keeping in mind the industry norms, so that Doloo Tea Estate can become a 609 Ha fully consolidated tea estate within the next 7-8 years.
- The Company assures the 'Union' that the new water arrangements will be made for the worker families of Lalbag division since it would lose the current water pumping station.

- The Company assures the Union that it will develop pathways/road to the workers from Lalbag division to that they can commute conventionally to the place of work.
- The Company assures the 'Union' that it will be slowly convert all the Katchcha houses into Pucca houses as per specification laid down vide Govt. Notification No GLR(RC)41/96/171, dtd 22.08.2003 @8% of the resident workers annually by providing CGI roofing sheet every year to 80 houses in addition to repair work of labour quarters and also undertake repair works in allocated staff quarters. However, once a Katchcha house is given CGI roofing sheets, the Company will not spend any money on repair of the same house for the next 5 years.
- The Company assures the 'Union' that it will invest in development of infrastructure of the tea estate like labour quarter, internal roads, drinking water etc. Company also invest in some ancilliary development works like providing of Ambulance to Hospital, restructuring of Football ground and some aid to local schools etc. as requested by the 'Union'.

The above key arrangements and provisions would ensure that the affected families are rehabilitated and resettled properly in the process of development of the proposed project which is utmost importance for the region.



Figure 3-33: Houses under construction at Rehabilitation Site

Source: Primary Survey

Table 3-41: Occupational Structure of the Study Area

S.No.	Urban Area & Villages	Total Workers	Main Workers	Marginal Workers	Category of Workers				Non-Workers
					Cultivators	Agriculture Labourers	Household Industries Workers	Other Workers	
Assam State									
Silchar District									
Silchar Tehsil									
1.	Tibong Chera Khasia Punjee	70	60	10	58	12	0	0	56
2.	Durgacharra Punjee	50	49	1	50	0	0	0	49
3.	Durbin Tilla Punji	70	69	1	0	0	0	70	104
4.	Bandar Khal Punjee	62	61	1	28	0	0	34	164
5.	Panichar Grant	80	79	1	40	15	0	25	143
6.	Dhalchara Grant	1549	1262	287	77	51	71	1350	2650
7.	Harinchara Grant	229	101	128	29	3	7	190	180
8.	Narainchara Grant	527	446	81	155	114	23	235	591
9.	Narainchara Grant	527	446	81	155	114	23	235	591
10.	Kachari Gaon	174	160	14	35	21	1	117	406
11.	Balichara Grant Pt II	555	333	222	26	7	3	519	994
12.	Mainachara (Moirachara)	188	133	55	112	58	8	10	284
13.	Balichara Grant Pt I	360	304	56	51	18	5	286	229
14.	Abongchara Grant Pt II	134	127	7	70	0	0	64	131
15.	Subang Garden	1000	861	139	15	50	8	927	1307
16.	Madhurapur Grant	188	185	3	60	17	8	103	324
17.	Hatichara Grant	1883	1326	557	161	174	17	1531	2406
18.	Barabond	375	274	101	95	43	8	229	383
19.	Chotorampur Grant	150	72	78	3	54	0	93	141
20.	Abongchara Grant Pt I	278	130	148	4	20	7	247	198
21.	Rampur Garden	308	246	62	8	1	18	281	225
22.	Bijoypur Grant	284	265	19	4	2	0	278	339
23.	Bijoypur	327	302	25	60	2	0	265	832

24.	Anwarpur	83	62	21	59	16	7	1	241
25.	Ujan Nagar	554	241	313	144	80	6	324	889
26.	Niz-Borkhola Pt I	1092	843	249	150	97	105	740	2142
27.	Bhitor Gangapur Pt I	681	471	210	20	14	13	634	1681
28.	Jarailtala	903	441	462	202	121	31	549	1254
29.	Bhitor Gangapur Pt II	168	157	11	27	11	5	125	402
30.	Durgapur	784	333	451	176	141	11	456	1254
31.	Raninagar	46	39	7	17	0	2	27	124
32.	Chutra Sangan	97	94	3	21	27	18	31	233
33.	Ujan Gram	642	436	45	200	129	24	128	1515
34.	Kashipur	367	290	51	100	7	62	172	623
35.	Chesri	685	616	136	274	86	143	249	1332
36.	Niz-Borkhola Pt II	1013	733	122	192	48	70	545	1813
37.	Rampur	295	167	95	146	3	8	105	619
38.	Boro Rampur	613	350	112	118	8	8	328	995
39.	Dalu Gram	298	154	164	103	10	43	162	395
40.	Dalu Grant	1706	2131	1737	56	60	34	3718	4087
41.	Boro Rampur Garden	423	631	35	10	1	3	652	970
42.	Kalinagar Garden	83	370	41	14	9	2	386	401
43.	Kalinagar Pt I	587	476	178	180	18	36	420	900
44.	Kalinagar Pt II	215	130	83	16	0	4	193	413
45.	Badarpur Pt I	749	494	238	111	56	223	342	1370
46.	Bhairab Nagar	832	706	281	245	23	229	490	1716
47.	Krishna Pur	883	605	107	205	60	37	410	1717
48.	Sarail	350	280	9	39	13	7	230	704
49.	Dubag	289	261	28	90	28	5	166	654
50.	Peladahar	452	428	24	121	25	71	235	665
51.	Raipur	296	215	81	195	41	3	57	536
52.	Niz-Joynagar	869	539	330	74	8	10	777	1802
53.	Badarpur Pt II	522	373	149	129	55	55	283	1281
54.	Masimpur Grant	1038	872	166	4	128	0	906	733
55.	Masimpur Bagicha	320	241	79	41	16	17	246	769



56.	Masimpur Pt II	1142	1000	142	66	11	11	1054	1222
57.	Ardvallik	234	215	19	6	4	1	223	555
58.	Kharil Bagicha	570	341	229	77	15	15	463	570
59.	Mulidahar Grant	601	314	287	34	4	7	556	556
60.	Leburbond	293	66	227	18	20	6	249	556
61.	Borodudhpatil Grant	1381	1077	304	193	210	26	952	2276
62.	Gorer Bond Pt II	524	432	92	320	7	8	189	1204
63.	Gorer Bond Pt I	465	320	145	112	139	5	209	868
64.	Dudhpatil Pt I	246	246	0	2	196	0	48	683
65.	Dudhpatil Pt II	57	30	27	13	15	0	29	122
66.	Dudhpatil Pt III	143	126	17	37	4	40	62	384
67.	Masughat	442	420	22	106	4	16	316	1292
68.	Balighat	829	766	63	17	9	19	784	1936
69.	Masimpur Pt I (Maohimpur)	1188	1063	125	55	1	61	1071	1685
70.	Ujangram	632	520	112	56	3	21	552	1709
71.	Kumarpara	795	730	65	72	4	8	711	1507
72.	Purandarpur	483	288	195	105	151	9	218	740
73.	Rakhhal Khaler Par Pt I	803	691	112	112	45	29	617	1879
74.	Rakhalkhalerpar Pt II	470	286	184	62	98	7	303	897
75.	Rongpur Pt I	992	754	238	112	148	77	655	1751
76.	Rongpur Pt II	802	630	172	61	33	112	596	1343
77.	Rongpur Pt IV	902	765	137	45	6	18	833	2060
78.	Tupkhana Pt I (CT)	1255	1143	112	23	20	47	1165	3385
79.	Tarapur VII (CT)	2310	2199	111	20	7	32	2251	4667
80.	Tarapur Pt VI (CT)	2733	2523	210	55	45	68	2565	6020
81.	Dudhpatil Pt VI (CT)	1459	1281	178	51	22	58	1328	3624
82.	Dudhpatil Pt V (CT)	1298	1047	251	87	30	22	1159	2823
Total		52614	40743	11871	6692	3366	2222	40334	93271
Udarbond Tehsil									
83.	Indragram Pt II	208	177	31	58	137	2	11	362
84.	Indragram Pt I	91	75	16	6	68	0	17	142
85.	Amaranagar T.E.	423	217	206	81	1	0	341	368

86.	Madhupur (Madhvpur)	702	659	43	37	16	4	645	1646
87.	Nayagram	300	220	80	41	2	0	257	448
88.	Siberbond	406	376	30	25	2	1	378	625
89.	Chandi Ghat Pt I	467	415	52	9	7	11	440	633
90.	Chandi Ghat Pt II	145	135	10	7	10	6	122	303
91.	Chandi Ghat Pt III	500	419	81	57	49	5	389	848
92.	Pangram Pt I	893	732	161	95	22	17	759	2269
93.	Larsingpar Grant	1881	1364	517	47	215	5	1614	1845
94.	Larsingpar Basti	210	138	72	21	101	69	19	248
95.	Jhapirbond Pt I	538	345	193	104	52	52	330	601
96.	Jhapirbond Pt II	337	179	158	26	1	6	304	847
97.	Pangram Pt II	941	561	380	156	53	122	610	929
98.	Pangram Pt III	1348	842	506	102	48	50	1148	2288
99.	Arunabond T.E.	923	739	184	30	10	10	873	1105
100.	Doyapore Grant	1983	1477	506	55	69	22	1837	2219
101.	Doyapore Pt I	588	527	61	82	21	11	474	1548
102.	Durganagar Pt VI	595	505	90	80	0	3	512	1372
103.	Durganagar Pt IV	520	440	80	51	17	17	435	1191
104.	Latigram (Lathigram)	650	559	91	117	15	59	459	1863
105.	Chalita Kandi	217	131	86	5	49	3	160	463
106.	Durganagar Pt I	310	187	123	42	26	55	187	658
107.	Durganagar Pt II	252	209	43	136	17	20	79	579
108.	Gossaipur Pt IV	444	407	37	153	63	85	143	608
109.	Gossaipur Pt V	480	429	51	87	48	2	343	930
110.	Bahadurpur	598	515	83	72	17	30	479	1033
111.	Gossaipur Pt III	794	620	174	57	24	56	657	1792
112.	Gossaipur Pt II	543	528	15	60	14	4	465	1556
Total		18287	14127	4160	1899	1174	727	14487	31319
Grand Total		70901	54870	16031	8591	4540	2949	54821	124590

CHAPTER 4: ANTICIPATED ENVIRONMENT IMPACT AND MITIGATION MEASURES

4.1 INTRODUCTION

Environmental impact in the study area is any alteration of environmental conditions or creation of new set of environmental conditions, adverse or beneficial, caused or induced by impact of the project. Prediction involving identification and assessment of potential impacts of the project on surrounding environment is a significant component of EIA studies. The likely impacts of various activities of the proposed project on the environment were identified. These impacts were assessed for their significance based on the background environmental quality in the area and the magnitude of the impact. All components of the environment were considered and wherever possible impacts were evaluated in quantitative/qualitative terms.

Several scientific methods are available to qualify and predict the impact of project on environmental attributes such as water, air, noise, land ecological socio-economic. Such predictions are superimposed over baseline environmental status to derive post project scenario with respect to air, water and soil quality, traffic assessment, Eco-biological and socio-economic parameters of the project location.

The resultant (post-project) quality of environmental parameters is reviewed with respect to the permissible limits. Based on the impacts thus predicted, preventive and mitigation measures were formulated and incorporated in the environmental management plan to minimize adverse impacts on environmental quality during and after project execution.

The environmental impacts can be categorized as primary and secondary. Primary are those which are directly attributed to the project and secondary impacts are those which are indirectly induced due to primary impacts and include those associated with investment and socio-economic status. The projected impact may be broadly divided into two phases:

- During the construction phase which may be regarded as temporary or short term; and
- During the operation phase which would have long term effects.

The impact prediction is always carried out under worst possible conditions to mitigate or to eliminate the environmental hazards. The main steps are summarized as follows:

➤ **Identification**

This step involves identification of the major activities, the environmental attributes, the impacts of the activities on the environmental attributes and formulation of cause & effect' matrix.

➤ **Prediction**

This involves prediction of the nature, magnitude, and significance of the impacts. It also includes analysis of the possibilities and/or probabilities of occurrence of the impacts.

➤ **Evaluation**

This involves assessment and designation of the significance to the impacts, formulation of the assessment matrix and helps deriving decision on implementation of the mitigation measures for the anticipated impacts due to the Project.

4.2 IMPACT IDENTIFICATION

Environmental impacts could be positive or negative, direct, or indirect, local, or regional and reversible or irreversible. The primary function of an environment impact assessment study is to predict and quantify the magnitude of these impacts, evaluate, and assess the importance of the identified changes, present information and monitor actual changes. Considering that, an attempt has been made here using "Activity Effect" matrix.

Table 4-1: Impact Identification Matrix during Construction

Activities	Environmental Attributes										
	Air	Water	Soil	Noise	LU/LC	Hydrogeology	Geology	SHW	Risk Hazards	Ecology and Biodiversity	Socio Economic
During Construction Phase											
Excavation	✓	-	✓	✓	✓	-	✓	✓	-	✓	✓
Transportation of materials	✓	-	-	✓	✓	-	-	✓	-	✓	-
Storage of material	-	-	-	-	-	-	-	-	-	-	-
Loading & Unloading of Materials	✓	-	-	✓	-	-	-	-	-	-	-
Construction of Super structure, paved area, development of green,	✓	✓	✓	✓	✓	-	-	✓	-	✓	-
Installation of MEP and other utilities	✓	-	-	✓	-	-	-	✓	-	✓	-
Movement of construction vehicles/machinery/equipment	✓	-	-	✓	✓	-	-	✓	-	✓	-



Construction of domestic waste storage and handling	-	✓	✓	✓	-	-	-	✓	-	-	✓
Construction labour Accommodation	✓	-	-	-	-	-	-	✓	-	-	✓
Waste Handling	✓	✓	✓	✓	-	-	-	✓	✓	✓	✓
Spillage of oil and construction materials or chemicals or paints	✓	✓	✓	-	-	-	-	✓	✓	✓	✓
Washing & Cleaning of construction equipment/ machinery	-	✓	✓	-	-	-	-	✓	✓	✓	✓
Finishing	✓	✓	✓	-	-	-	-	✓	-	-	-
During Operation Phase											
Operation of Airport	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Operation of Aircrafts, vehicular movement and GSE	✓	✓	✓	✓	✓	✓	-	✓	✓	✓	✓
Operation of other utility machinery	✓	✓	✓	✓	✓	✓	-	✓	✓	-	-
Passenger handling and cargo handling	✓	-	-	✓	✓	✓	-	✓	-	-	-
Waste Handling	✓	✓	✓	✓	✓	✓	-	✓	-	-	-
Washing and cleaning	✓	✓	✓	✓	✓	-	-	-	-	-	-
Spillage of Oil, lubricant, and maintenance of machineries	✓	✓	✓	✓	✓	-	-	✓	✓	-	-
Maintenance of Aircraft	✓	✓	✓	✓	✓	-	-	✓	-	-	-

4.3 ASSESSMENT OF SIGNIFICANCE OF IMPACTS (CRITERIA FOR DETERMINING SIGNIFICANCE, ASSIGNING SIGNIFICANCE) & MITIGATION MEASURES

This section is devoted to the assessment of impacts due to the proposed industrial project, which are the most important components of EIA. Assessment involves determination of nature and extent of impacts due to the industrial activities or the actions involved. Here it is determined whether the environmental impacts will be:

1. Direct or Indirect
2. Impact of low, medium, or high significance

Based on Environmental Impact Analysis, the Environmental Impacts under this step are quantitatively and qualitatively assessed.

Quantitative assessment with the help of a mathematical model has been done wherever possible. In other cases, the impact assessment has been qualitative which is based on available scientific knowledge and judgement. The mathematical model used for

assessment in the present study includes “AERMOD” Dispersion Model for air quality. For other cases i.e., Water, Noise, Land/Soil, Ecology, Socio-economic etc., the available scientific knowledge and judgements have been used.

4.4 ANTICIPATED ENVIRONMENTAL IMPACTS

4.4.1 Air Environment

➤ Construction Phase

Aspects:

- During construction phase, suspended particulate matter will be the main pollutant, which will be generated due to the site development activities and vehicular movement, because of vehicular traffic there may be a marginal increase in the concentrations of NO_x and SO₂.
- Fumes and gases near the work area due to welding & cutting activities.
- Dust emission due to removal of scrap materials, remaining and waste construction materials, construction machinery, dismantling and removal of temporary structures, site cleaning and disposal of these materials.

Impacts:

- Increase in suspended particulate matter leads to reduction in visibility and choking of lungs, breathing problems.
- Short-term exposure to air pollutants is closely related to COPD (Chronic Obstructive Pulmonary Disease), cough, shortness of breath, wheezing, asthma, respiratory disease, and high rates of hospitalization (a measurement of morbidity).

➤ Operation Phase

Aspects:

- Main sources of air emission will be from DG set and vehicular emissions. PM 10, SO₂, NO_x, CO will be released.
- Spillage of Diesel used oil, chemicals may result in emission of VOCs in the air environment.
- Aircraft engine tests, baggage tractors, belt loaders, cabin service trucks, Airport facility boilers, heaters, and generators
- the intermittent air emissions are expected to be from aircraft engines during approach, landing, taxiing, take-off and initial climb and approach, which is termed as reference Landing and Take-off Cycle (LTO cycle)

Impacts:

- Short-term exposure to air pollutants is closely related to COPD (Chronic Obstructive Pulmonary Disease), cough, shortness of breath, wheezing, asthma, respiratory disease, and high rates of hospitalization (a measurement of morbidity).
- The long-term effects associated with air pollution are chronic asthma, pulmonary insufficiency, cardiovascular diseases, and cardiovascular mortality.
- VOCs may generate from fueling which may degrade the ambient air quality and also cause eyes irritation, acute respiratory disorders and may also affect the immune system of the people living nearby and also of the workers.
- The air pollutants of concern from the aircrafts emissions are Sulphur Dioxide (SO₂), un-burnt Carbon Monoxide (CO) and Oxides of Nitrogen (NO₂) as per ICAO guidelines.

4.4.2 Water Environment

➤ Construction Phase

Aspects:

- Release of domestic sewage in stream
- Run off storm water

Impacts:

- Increase in the water requirement for construction and domestic purpose may lead to stress on water availability.
- Discharge of sewerage from the temporary labour may contaminate the nearby surface water bodies and also leach to pollute ground water if proper mitigation measures are not taken.

➤ Operation Phase

Aspects:

- Discharge of sewage and rain water runoff.

Impacts:

- During operation, rainwater that falls on parking lots, building roofs, aprons and taxiways, and other areas with hard surfaces will run off either into drains or (if good drains are not in place) into nearby water bodies or ground water. Due to increase in paved areas due to airport development, there will be increase in the run-off quantity. This will increase the quantity of storm water, which may contain

dirt, oil, and grease materials. This water which used to naturally flow into the ground will be channelized through storm water drains.

- Airports create a range of potential pollutants that accumulate during maintenance, from paint chemicals, testing of fire equipment, and fuel leakage and spillage from refueling and storage. These can either leached into ground water or can contaminate storm water run-off which can pollute nearby water sources.

4.4.3 Land Environment

➤ Construction Phase

Aspects:

- Civil works removes the top soil
- Contamination of land due to spill of construction material may impact the land to some extent.
- There will be generation of garbage and sewage by the worker and other staff involved during construction phase.

Impacts:

- Change in soil properties ultimately affects the living organisms present in the soil like loss of their habitation,
- Top soil is very fertile, its loss can lead to the loss of vegetation,
- Untreated sewage and garbage disposal on land might pollute the land which may change physical and chemical properties of soil. Open dumping or improper disposal of sewage and garbage provides breeding ground for pathogenic bacteria and other creatures which may spread diseases like Diarrhea, Infections with intestinal helminthes (worms), Malaria, Typhoid, and other infectious diseases.

➤ Operation Phase

Aspects:

- Contamination of land to some extent.

Impacts:

- No impact is anticipated on land use & topography during operation phase. After Development, land will be well leveled, and landscaping will be done to improve aesthetics of the area. Effective land use planning around the airports will be done in cooperation with Development Agencies, Authorities, Public Transport Departments with a focus on enhanced connectivity to Airport and dedicated services to airport which will enable smooth airport operations with reduced environmental footprints and will be beneficial for sustainable aviation.

4.4.4 Noise Environment

➤ Construction Phase

Aspects:

- Predicted noise pollution sources and its impacts during the construction phase:
- Operation of construction machineries, equipment and associated mechanical works will generate the noise.
- Noise from Vehicular movement.

Impacts:

- Noise from construction activities disturbs the nearby habitats.
- Noise pollution can cause harmful effects on human health as Hearing Impairment, Negative Social Behavior and Annoyance, Interference with Spoken Communication, Sleep Disturbance.

➤ Operation Phase

Aspects:

- The impact of other source of noise pollution like DG sets, motors, GSE, etc is limited to the premises only. Noise from aircraft depends upon type of aircraft, daily air traffic, meteorology of the area, technique of landing & takeoff (LTO) cycle, etc.
- Operation of equipment's, equipment and associated mechanical works will generate the noise.
- Noise from Vehicular movement.

Impacts:

- Noise pollution can cause harmful effects on human health as Hearing Impairment, Negative Social Behaviour and Annoyance, Interference with Spoken Communication, Sleep Disturbance, Cardio vascular disease.

4.4.5 Occupational Health & Safety

➤ Construction Phase

Impacts:

- Accident may occur due to operation of equipment, vehicular movement, construction activities etc.

➤ Operation Phase

Impacts:



- It is envisaged that occupational health hazards shall be associated with operational activities such as spillage and exposure to the chemical, mechanical hazards like cuts and hits and electrical shocks.
- Accident due to fall from height, burn injury and trap in the machine or motors

4.4.6 Solid and Other Waste Management

➤ Construction Phase

- Solid waste expected to be generated during construction phase will comprise of excavated materials, used bags, bricks, concrete, MS rods, tiles, wood etc. Apart from this some quantity of municipal waste may also generate from labour camps. 30 kg/day solid waste generated from construction labours. This waste is required to be collected segregated and disposed in manner that it does not mixes or polluting air, water, and soiling environment.
- The C&D wastes generated during construction phase are listed under following category

Table 4-2: Typical composition of Indian C & D waste (TIFAC, 2001)

Material	Composition
Soil, Sand & Gravel	36%
Brick & Masonary	31%
Concrete	23%
Metals	5%
Bitumen	2%
Wood	2%
Others	1%

Source: Guidelines on Environmental Management of C & D Wastes (CPCB, 2017)

The waste listed as above will have an impact on surrounding land-use and soil quality if not disposed-off appropriately.

➤ Operation Phase

The total solid waste generation from the project will be 1095 kg/day. Out of total, 500 kg/day Biodegradable waste will be treated in Organic Waste Convertor to get converted into manure. Manure will be used for landscaping purposes. 5 kg/day STP Sludge will also be used as manure in green area. 495 kg/day of recyclable waste will be given to authorized vendors. Solid Waste Management Rules, 2016 shall be followed.

4.4.7 Biological Environment

➤ Construction Phase



Removal of Vegetation (Loss of Habitat): The removal of natural vegetation to prepare the Project Site for construction will lead to the degradation of both modified and near-natural habitats. This loss of habitat will have a direct effect on local wildlife and will reduce the availability of ecosystem services, especially those related to wild food sources and fodder. Additionally, the elimination of vegetation will leave the soil vulnerable to drying from wind and sunlight, jeopardize its stability, and increase the likelihood of erosion caused by both wind and water. These alterations will disrupt the soil dynamics and result in a decline in the associated ecosystem services. The Project Site is predominantly characterized by modified habitats, with only a small fraction of natural and near-natural habitats. Therefore, the impact of habitat loss is assessed as moderate, considering the limited extent of such habitats on-site and the presence of alternative comparable habitats in the vicinity.

Levelling or Grading of Land: The procedure of land leveling or grading entails altering the current topography of the Project Site, which features uneven terrain and secondary grassland vegetation on land that was previously cultivated. Such modifications can have a profound effect on the natural landscape, resulting in alterations to drainage patterns and the distribution of habitats. The excavation and filling processes involved in leveling and grading can disrupt the natural soil profile, thereby affecting soil properties and disturbing sub-soil ecosystems. This disruption may impede the natural percolation of rainwater into deeper soil layers, consequently impacting groundwater recharge and compromising vital ecosystem services. Furthermore, these activities can lead to changes in the existing natural drainage system. The impact of the loss of natural and near-natural habitats at the Project Site is assessed as moderate, mainly due to the presence of alternative comparable habitats in the vicinity.

Laying of roads and paving of surfaces: The development of roadways or the surfacing of areas within the Project Site will hinder the absorption of rainwater into the ground. This limitation will cause a reduction in groundwater replenishment and an escalation in surface runoff, potentially resulting in the deterioration or loss of soil and sub-soil ecosystems, along with their corresponding regulatory and supportive functions. Nevertheless, this effect is deemed to be of relatively minor importance, given the already modified state of the habitat and the availability of extensive similar alternative habitats and ecosystem services nearby the Project Site.

Movement of vehicles and heavy machinery: The operation of vehicles and construction machinery would introduce emissions into the natural environment, alongside increased levels of dust, noise, light, and vibrations. Such activities are likely to lead to the pollution of natural resources and may contaminate food webs. Moreover, they would contribute to the compaction of soil substrates, potentially harming or even killing soil organisms and terrestrial wildlife. This disruption would also impede the percolation of rainwater into

deeper soil layers, resulting in heightened surface runoff, which could adversely impact the natural groundwater recharge process and the ecosystem services it supports. Although the significance of this impact is deemed moderate due to the already altered condition of the habitat, the presence of natural and near-natural habitats within the Study Area would still experience negative effects.

Artificial Illumination: The introduction of artificial lighting to illuminate the Project Site at night will create an unnatural level of brightness in the area during hours typically characterized by darkness. Furthermore, nighttime vehicle operations may further enhance this artificial light. The interference of natural nighttime conditions by artificial illumination is acknowledged to disrupt the biological rhythms of numerous plant and animal species. Nevertheless, it is anticipated that the light will not impact aquatic biodiversity during the construction phase, given the considerable distance from various aquatic water bodies.

Noise pollution due to use of vehicles and equipments: Noise pollution generated by vehicles and machinery during construction activities produces substantial sound levels. The operation of heavy equipment and other high-decibel activities contributes significantly to this issue. Studies have shown that such noise pollution can disrupt the behavior and physiological processes of invertebrates, potentially heightening their vulnerability to infections and influencing their reproductive behaviors (Newport, Jenny et al., 2014). Furthermore, there is clear evidence illustrating the harmful impacts of noise pollution on ecosystems, including a noticeable decrease in songbird populations in urban settings. Many animal species depend on auditory cues for critical functions such as navigation, foraging, attracting mates, and evading predators. The interference caused by noise pollution can severely hinder these essential activities, ultimately threatening their survival. Nevertheless, it is expected that the construction phase will not significantly affect aquatic biodiversity, as the water bodies are far away from the project site, providing a buffer against potential disturbances

➤ Operation Phase

Physical Obstruction Caused by Ground-Based Installations: The construction of the airport and its related facilities would hinder the movement of wildlife throughout the region, thereby affecting their ability to access vital habitats and resources. Species that navigate aerial environments, such as insects, birds, and bats, may unintentionally collide with aircraft, power lines, or other elevated structures linked to the project, leading to possible injuries or fatalities. Additionally, the ongoing human presence at the airport is expected to deter raptors, which could result in a shift in the avian population dynamics in the nearby areas. Alterations in land use are also likely to affect the existing soil moisture

levels. Measures taken to reduce bird activity in and around the airport will further change the wildlife composition in the vicinity. Collectively, these effects would contribute to the degradation or transformation of the current plant life in the impacted area, thereby affecting its primary productivity and the ecosystem services it offers. This scenario would impede wildlife access to essential habitats and resources, including roosting sites, feeding grounds, nesting areas, and materials necessary for nesting beyond the solar project.

The importance of this impact is regarded as moderate, mainly because the composition of the Project Site is predominantly made up of modified habitats, with only a limited occurrence of natural and near-natural environments. Additionally, there are other habitats of similar quality located nearby the Project Site.

Project-related Traffic: The movement of aircraft, vehicles, and personnel to and from the Airport, as well as within its vicinity, is expected to increase the levels of vehicular emissions, dust, noise, vibrations, and artificial lighting around the project area. As a result, this will contribute to the degradation of the natural environment. Additionally, the introduction of artificial lighting during nighttime is acknowledged to disrupt the biological rhythms of local plant and animal life. This effect is deemed to hold moderate significance, particularly as the Project Site is located in a modified habitat that exhibits a limited degree of notable biodiversity linked to natural and near-natural environments.

Project Site Illumination: The interference of artificial light with the natural nocturnal cycle is acknowledged to disrupt the biological rhythms of a wide array of plant and animal species. Light pollution can also alter the behavioral patterns related to activity, rest, and hibernation in various wildlife (Rich and Longcore, 2006). The use of artificial lighting to illuminate airports and their associated facilities during nighttime creates an unnatural luminescence in the surrounding area. This light pollution, originating from airports and roadways, has the potential to attract animals, either directly or indirectly, by drawing in insect prey that subsequently entices bats and birds, along with their predators. Such a phenomenon can interfere with migration routes, leading animals to stray from their intended paths due to the attraction of light. Upon arrival at the light source, birds may engage in circling behavior, resulting in disorientation and exhaustion, which heightens the risk of collisions with structures or other bewildered birds.

Bird Collision: Bird strikes occur when aircraft come into contact with birds during take-off and landing phases. It is estimated that around 85% of these occurrences take place when aircraft are flying at altitudes below 800 feet, with nearly 40% of such incidents happening beyond the airport's perimeter (CAA, 2001). The rate of bird strikes at any given airport is affected by a variety of factors that include:

- **The density of avian populations in proximity to an airport:** airports situated in regions with a high concentration of birds are more prone to experiencing bird strikes compared to those located in areas with lower bird populations. The

proximity of significant habitats, such as Reserve Forests and Barail Wildlife Sanctuary, contributes to a notably fair concentration of bird species in the region. The movement of these species is directed towards forest patches, as there are no significant bodies of water, with the exception of Dolo Lake, located near the area of activity. Consequently, a moderate impact is anticipated.

- **The species of birds present near the airport:** The likelihood of a bird encountering a collision with an aircraft is affected by its flying altitude and behavioral patterns. Certain species, such as waterfowl, gulls, raptors, doves and pigeons, barn owls, red-wattled lapwings, little swifts, and black kites, face a considerably greater risk of being hit by an aircraft compared to pheasants and herons. Presence of doves, pigeons, owls, bats, and raptors has been observed in the baseline study, indicating that the there is a potential for collision is present.
- **The frequency of aircraft operations at the airport:** an increase in the number of aircraft takeoffs and landings correlates with a heightened risk of bird strikes.
- **Habitat Features:** The prime attraction site for birds is dolo lake, other attraction features like trees, shrubs, roosting sites are not significantly present within activity area.
- **Migration Path:** Carefull examination of the project area revealed that there is no notified migratory path of bird is present within and nearby activity area.
- **Agricultural Activity:** The project area is located within low agricultural area zone that reduces the chance of bird attractions.
- **Landfill, Waste Disposal Sites:** There are no landfill or waste disposal sites located within or in proximity to the activity area. Additionally, there are no reported waste disposal sites associated with slaughterhouses, as the nearest city or town is situated at a considerable distance from the project site. The lack of these facilities diminishes the likelihood of attracting birds to the area.

Birds present a significant hazard to aviation, leading to the establishment of various control strategies at many airports aimed at reducing the frequency of bird strikes. These strategies encompass a range of interventions:

- It is essential to incorporate landscaping approaches that exclude the cultivation of fruit-bearing trees
- Effective waste management strategies
- The deployment of noise devices and flare guns, as well as the utilization of falcons.

The main aim of these interventions is to relocate birds, thus ensuring their absence in the vicinity of the airport. The implications of this action are substantial, as it could lead to lasting alterations in the ecological features of the study area due to the strategies employed to discourage bird presence in the region. These strategies will cause the avian

population to steer clear of the habitat, ultimately resulting in a reduction of bird numbers both within the Project Site and its adjacent areas.

Roadkills: Roadkill occurs when animals are hit by vehicles, especially on access routes to airports. The increase in vehicular traffic resulting from the construction of an airport can heighten the likelihood of accidental deaths among wildlife in surrounding regions. The impact of this phenomenon is considered moderate, as instances of roadkill are linked to altered habitats and the presence of significant biodiversity in both natural and semi-natural settings.

The Project will involve the enclosure of the area, which will consequently limit the movement of larger wildlife from the surrounding habitats.

Impact of Noise: Noise pollution presents considerable health hazards to both humans and wildlife, impacting ecosystems in terrestrial and aquatic settings. It interferes with the reproductive and foraging activities of bird species and causes animals to expend unnecessary energy as they move toward or away from noise sources, thereby increasing their susceptibility to predators (White Young Green Planning, 2006). Certain species, such as bats and owls, rely on auditory signals for hunting, while others use sound to detect potential dangers. Studies have shown that noise pollution can modify the behavior and physiological responses of invertebrates, which may elevate the risk of infections and alter spawning behaviors. Major sources of noise pollution include aircraft operations and road traffic linked to airports. Aircraft noise is generated from both engine and airframe activities, especially during takeoff and landing, as well as along commonly used flight paths. Other contributors to noise include reverse-thrust operations during landings, engine testing, ground vehicle movements, and construction work near airport facilities. There is growing evidence concerning the impact of noise pollution on ecosystems, exemplified by the reduction in songbird populations in urban environments.

The significance of this impact is substantial, given the Project Site's nearness to natural habitats that encompass regions inhabited by species that are globally threatened, in addition to those classified as Schedule-I species under the IWPA-1972 (revised 2022).

4.4.8 Socio Economic Environment

Impact on Socio-Economic Environment:

Critically analyzing the existing environmental status of the socio-economic profile and visualizing the scenario with the project, the impacts of the project would be varied and will generate both positive and negative impacts of the proposed project in the region are stated below.

Positive Impacts:

- There may be a growth in direct & indirect jobs and business opportunities for the local population due to the project related works. Surrounding people may get jobs such as contractors, transporters, and raw material suppliers etc. due to the proposed development activities in the area.
- The proposed Airport will lead to increase the number of flights in the region which will be helpful for the beneficiaries in transport longer distance at shorter duration.
- The advantages of the proposed airport are that it will supply a number of jobs for the local community. This will be because builders, plumbers, electricians etc will be needed for the building of the airport, and then staff will be needed for the different shops/cafes/services. This will cause an increase in employment of the primary, secondary and tertiary sectors, an increase in the local economy and a positive multiplier effect. Another advantage is that local services, such a hotels and transport links will most likely also be improved.
- The establishment of Terminal Building will significantly enhance the capacity of the Airport in handling traffic, which will further boost tourism, economy and generate employment opportunities.

Adverse Impacts on Socio-Economic Condition:

- The major adverse impact due to the proposed project would be displacement of approx. 173 houses and the families at a new location.
- The transport of construction materials to the project site will result in increased traffic in the impact area.
- Noise from aircraft can also be a problem to the local residents of Doloo, Boro Rampur and Leburond villages and the excessive noise can disrupt sleep, hinder cognitive development in children, and lead to hypertension.
- Due to the frequent moving of the trucks at the site during construction the temporary traffic impacts like risks of accidents in the area will increase.
- Vehicular pollution will increase with the movement of trucks and vehicles with the transportation of material during the construction phase.

4.5 AMBIENT AIR QUALITY MODELING

4.5.1 Air Quality Modelling

The Gaussian Dispersion Modelling (GDM) is used for prediction of dispersion of air emission and the computation of Ground Level Concentration (GLC) up to a specified distance from source. The fundamental model is given below:

$$c(x, y, z) = \frac{Q}{2\pi\sigma_y\sigma_z u} \exp\left(\frac{-y^2}{2\sigma_y^2}\right) \left[\exp\left(\frac{-(z-h)^2}{2\sigma_z^2}\right) + \exp\left(\frac{-(z+h)^2}{2\sigma_z^2}\right) \right]$$

Where c is a concentration at a given position, Q is the source term, x is the downwind, y is the crosswind and z is the vertical direction and u is the wind speed at the h height of the release. The σ_y, σ_z deviations describe the crosswind and vertical mixing of the pollutant. The above equation describes a mixing process that results in a Gaussian concentration distribution both in crosswind and in vertical direction, centered at the line downwind from the source. Gravitational settling and chemical or radioactive decays are neglected.

AERMOD VIEW: AERMOD is an air dispersion-modelling package, which seamlessly incorporates the popular USEPA Model AERMOD into one interface without any modifications to the models. These models are used extensively to assess pollution concentration and deposition from a wide variety of sources.

AERMET: To carry out the air dispersion modelling project using the AERMOD, it is necessary to process the meteorological data of study area being modelled. The collected meteorological data has been pre-processed using AERMET program. The AERMET Program is a meteorological pre-processor, which prepares hourly surface data and upper air data for use in the AERMOD air quality dispersion model.

Table 4-3: Air modelling software details

Parameter	Details
Model name	AERMOD
Version	9.5.0
Model type	Gaussian plume air dispersion model
Topography	Undulated
Averaging time	24 hours
Source type	Point source
Boundary limits	10 km
Co-ordinate system	Uniform grid
Surface meteorological data	Site specific data processed by AERMET

4.5.2 Air Emission Source

During the operational phase of the proposed Airport, the intermittent air emissions are expected to be from aircraft engines during approach, landing, taxiing, take-off, and initial climb, which is termed as reference Landing and Take-off Cycle (LTO cycle). The air pollutants of concern from the aircrafts emissions are Sulphur Dioxide (SO₂), un-burnt Carbon Monoxide (CO) and Oxides of Nitrogen (NO₂) as per ICAO guidelines. The emission sources during operation phase can be divided into three categories:

- ✓ Aircraft emissions; and
- ✓ DG set emission
- ✓ Vehicular emission

Aircraft produces the similar types of emissions as automobiles. Aircraft jet engines, like many other vehicle engines, produce carbon dioxide (CO₂), water vapor (H₂O), nitrogen dioxide (NO₂), carbon monoxide (CO), Sulphur dioxide (SO₂), unburned or partially combusted hydrocarbons (also known as volatile organic compounds (VOCs), particulates, and other trace compounds. A small subset of the VOCs and particulates are considered hazardous air pollutants (HAPs).

Aircraft engine emissions are roughly composed of about 70% CO₂, a little less than 30% H₂O, and less than 1 percent each of NO₂, SO₂, CO, VOC, particulates, and other trace components including HAPs. Aircraft emissions, depending on whether they occur near the ground or at very low altitude, are primarily considered local air quality pollutants. The entire CO₂ eq is considered as greenhouse gas. About 10% of aircraft emissions of all types, except hydrocarbons and CO, are produced during airport ground level operations and during landing and take-off. The bulk of aircraft emissions (90%) occur at higher altitudes. For CO, the split is closer to 30% ground level emissions and 70% at higher altitude.

Airport Air Quality manual 2011 of International Civil Aviation Organization (ICAO) has been referred for the aircraft emissions which states emissions for various types of aircraft based on one LTO cycle for SO₂, NO₂ and CO pollutants. It is during LTO cycle that emissions create high ground level concentrations due to its low emission height. The referred emission rates for one LTO have been converted to g/sec based on the duration of one LTO cycle in seconds. As per International Civil Aviation Organization (ICAO), time and thrust setting for Reference LTO Cycle is 32.9 minutes (1974 seconds). For aircraft emissions estimation purpose, LTO cycle emission from A 321 type of aircrafts has been considered. It has then been converted to g/s/m² after considering its time of release and area over which it will occur and then provided as input to a Gaussian Area Source.

Presently there are provisions of DG sets of 3 x1250 kVA capacity which will also serve the purpose of power back-up in future. Pollution load has been calculated assuming that DG sets will be operated for 4 hours per day and low Sulphur content diesel will be used as

fuel. Stack height of the DG set has been considered as 30 m as minimum permissible height allowed as per CPCB Standards.

Table 4-4: Emission Details

Source	Emission g/s			
	PM	NO2	SO2	CO
Aircraft Emission	-	0.141169	0.004053	0.063745
GSE	2.22E-06	0.000389	-	0.000167
Vehicular Movements in Parking area	1.11E-06	0.00001	-	5.56E-05
Dg Sets 3x1250KVA	0.0048	0.292	0.1208	0.0636
DG sets 1x1250KVA (Standby)	0.0016	0.0011	0.0403	0.001

4.5.3 Meteorological Data

The meteorology of the project area plays very important role in dispersion of pollutants and buildup of pollution within the atmosphere. In the present study, one season (October 2023 – December 2023) meteorological data has been taken to find the dispersion of pollutant concentration. The mixing height for study period, which is an important parameter to express the dispersive potential of atmosphere, has been taken from the atlas of hourly mixing height and assimilative capacity of atmosphere in India (Attri, S.D. et al., 2008). Windrose diagram of one season meteorological data used for modelling is shown given below in **Figure 4.1**. The wind rose diagram indicates predominant wind direction is from SW to NE:

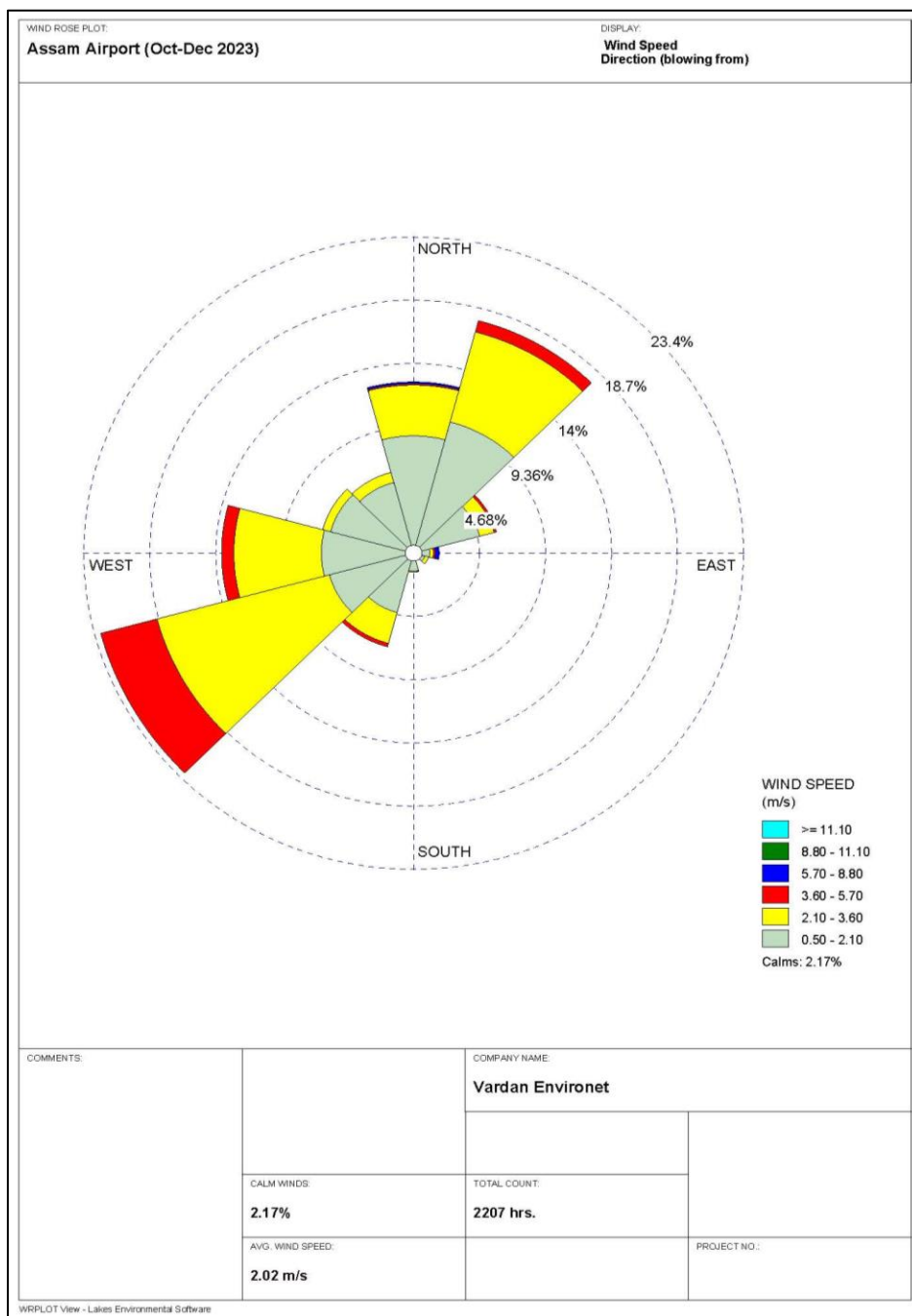


Figure 4-1: Wind Rose Diagram of Study Period: (1st October to 31st December, 2023)

Table 4-5: Predicted GLC at Ambient Air Quality Monitoring Station

Locati on Code	AAQM Location Name	Max Baseline Conc.					Predicted GLC					Cumulative GLC				
		PM10 (µg/m3)	PM2.5 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	CO (mg/m3)	PM10 (µg/m3)	PM2.5 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	CO (mg/m3)	PM10 (µg/m3)	PM2.5 (µg/m3)	SO2 (µg/m3)	NO2 (µg/m3)	CO (mg/m3)
A1	Project Site	45.1	24.3	22.5	13.5	0.83	0.244 25	0.097 47	4.787 71	9.365 57	0.002 82	45.34 425	24.39 747	27.28 771	22.86 557	0.832 82
A2	Madhurapur Grant	39.3	18.5	17.1	6.6	0.5	0.078 17	0.033 23	2.016 43	4.630 57	0.001 63	39.37 817	18.53 323	19.11 643	11.23 057	0.501 63
A3	Dudhpatil Pt.1	39.5	20.7	18.4	8.3	0.56	0.015 06	0.006	0.388 8	0.671 36	0.000 269	39.51 506	20.70 6	18.78 88	8.971 36	0.560 269
A4	Boro Rampur	43.5	23	20.5	12.5	0.78	0.016 05	0.006 38	0.407 46	0.969 78	0.000 336	43.51 605	23.00 638	20.90 746	13.46 978	0.780 336
A5	Chandighat Grant	47	25.8	23.6	15.2	0.93	0.052 64	0.023 22	1.346 64	2.700 03	0.000 864	47.05 264	25.82 322	24.94 664	17.90 003	0.930 864
A6	Subong	46.7	23.6	22.8	14.2	0.89	0.014 63	0.004 91	0.242 73	0.603 93	0.000 157	46.71 463	23.60 491	23.04 273	14.80 393	0.890 157
A7	Dalu Grant	41.7	21.7	19.5	9.1	0.63	0.022 83	0.013 17	0.739 93	1.812 09	0.000 658	41.72 283	21.71 317	20.23 993	10.91 209	0.630 658
A8	Borodudhpa til Grant	41.8	22.4	20.7	11.1	0.71	0.008 19	0.002 93	0.166 36	0.431 19	0.000 163	41.80 819	22.40 293	20.86 636	11.53 119	0.710 163

The contour maps showing the predicted concentration levels of PM₁₀, PM_{2.5}, SO₂, NO₂ and CO of Study area are presented as below figures:

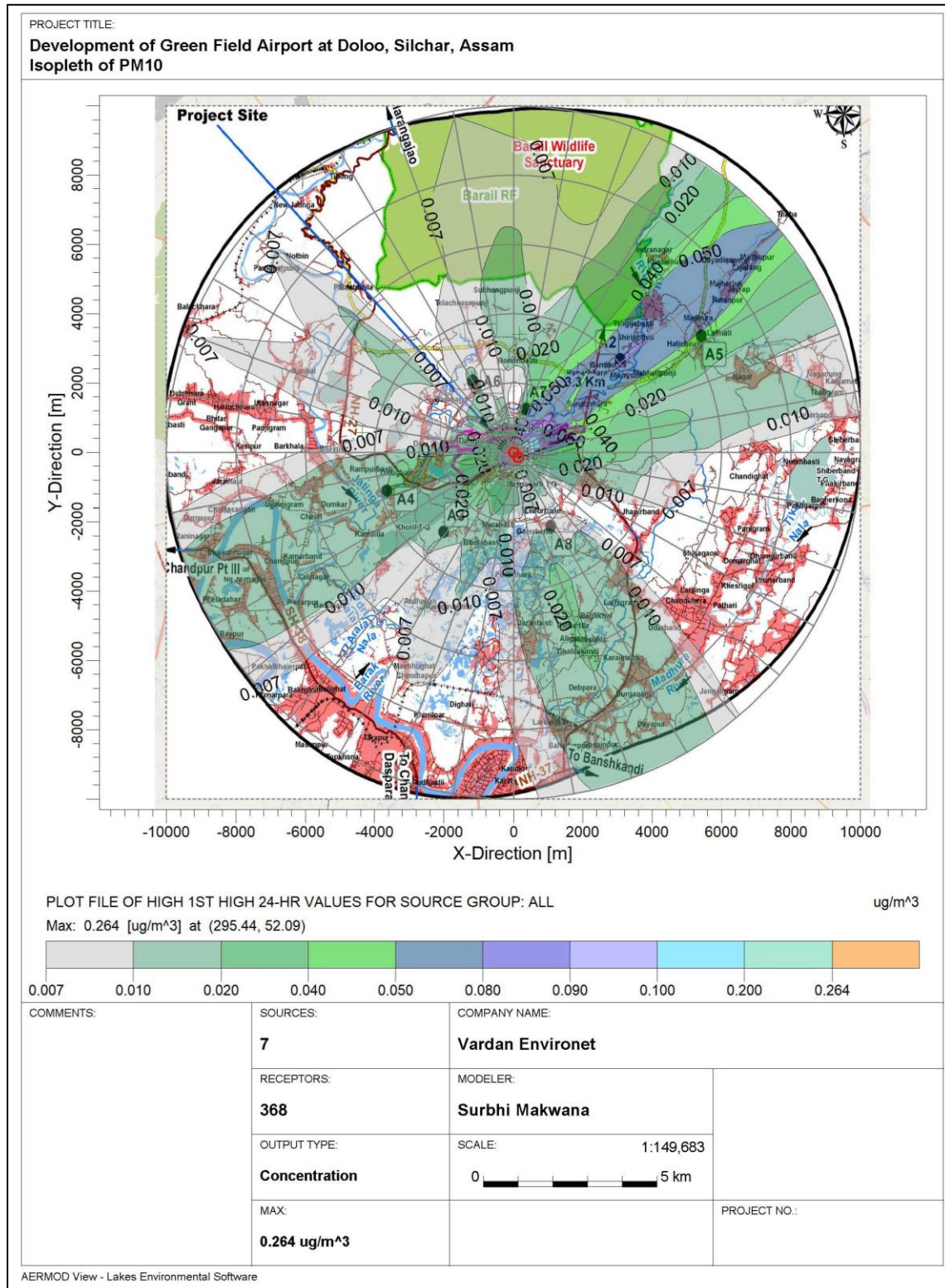


Figure 4-2: Spatial distribution of predicted GLCs of PM10



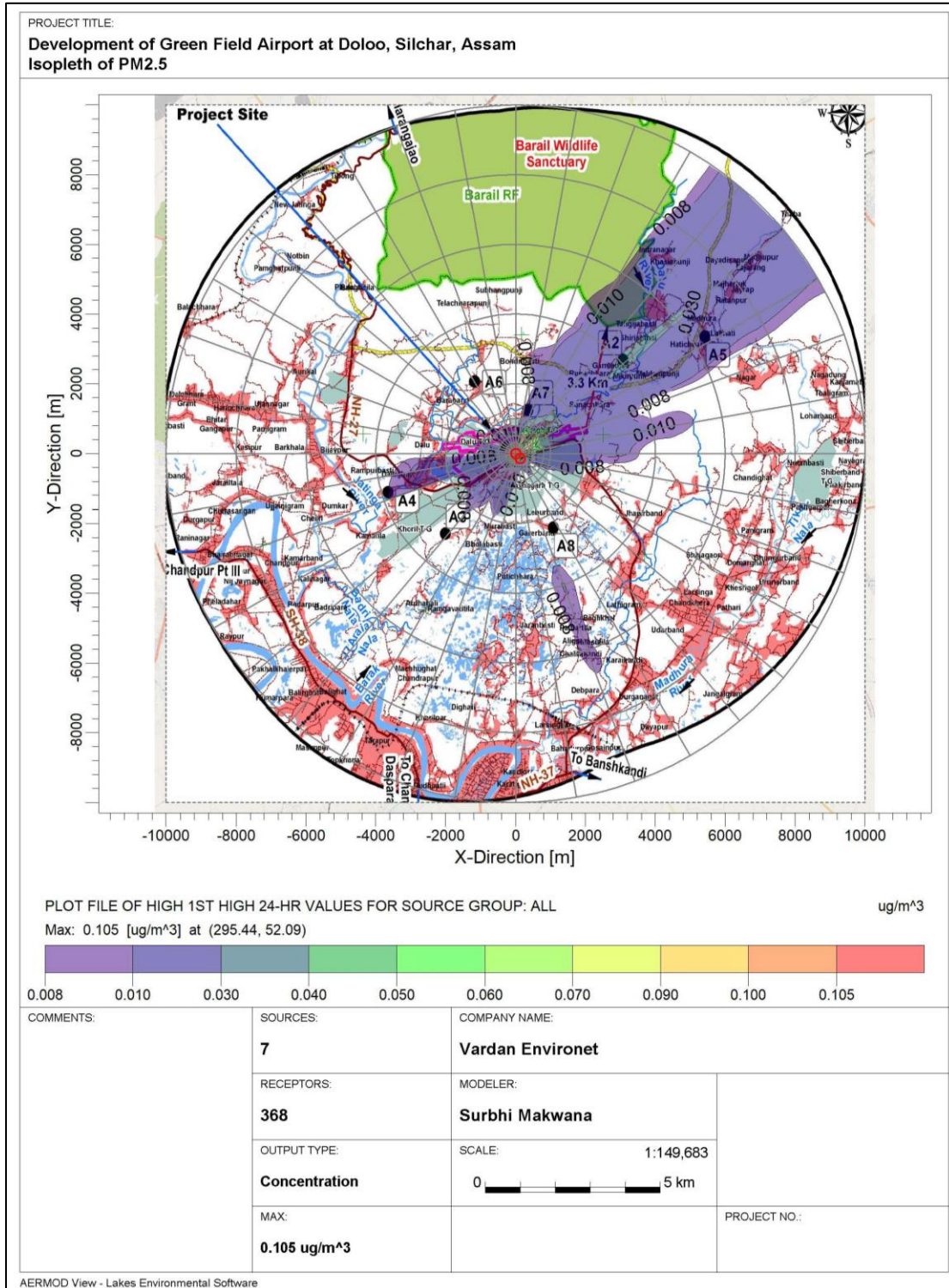


Figure 4-3: Spatial distribution of predicted GLCs of PM2.5

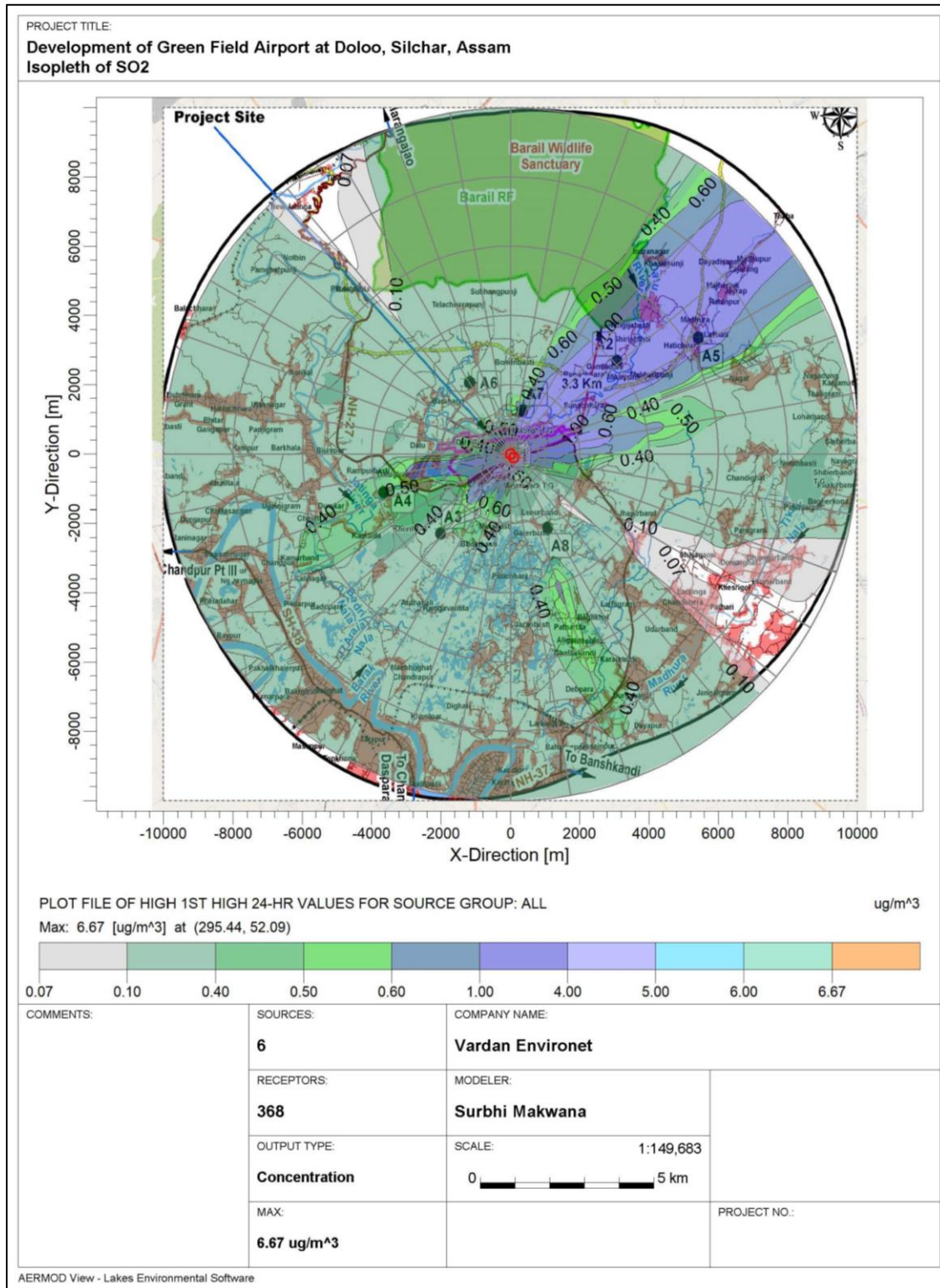


Figure 4-4: Spatial distribution of predicted GLCs of NO₂

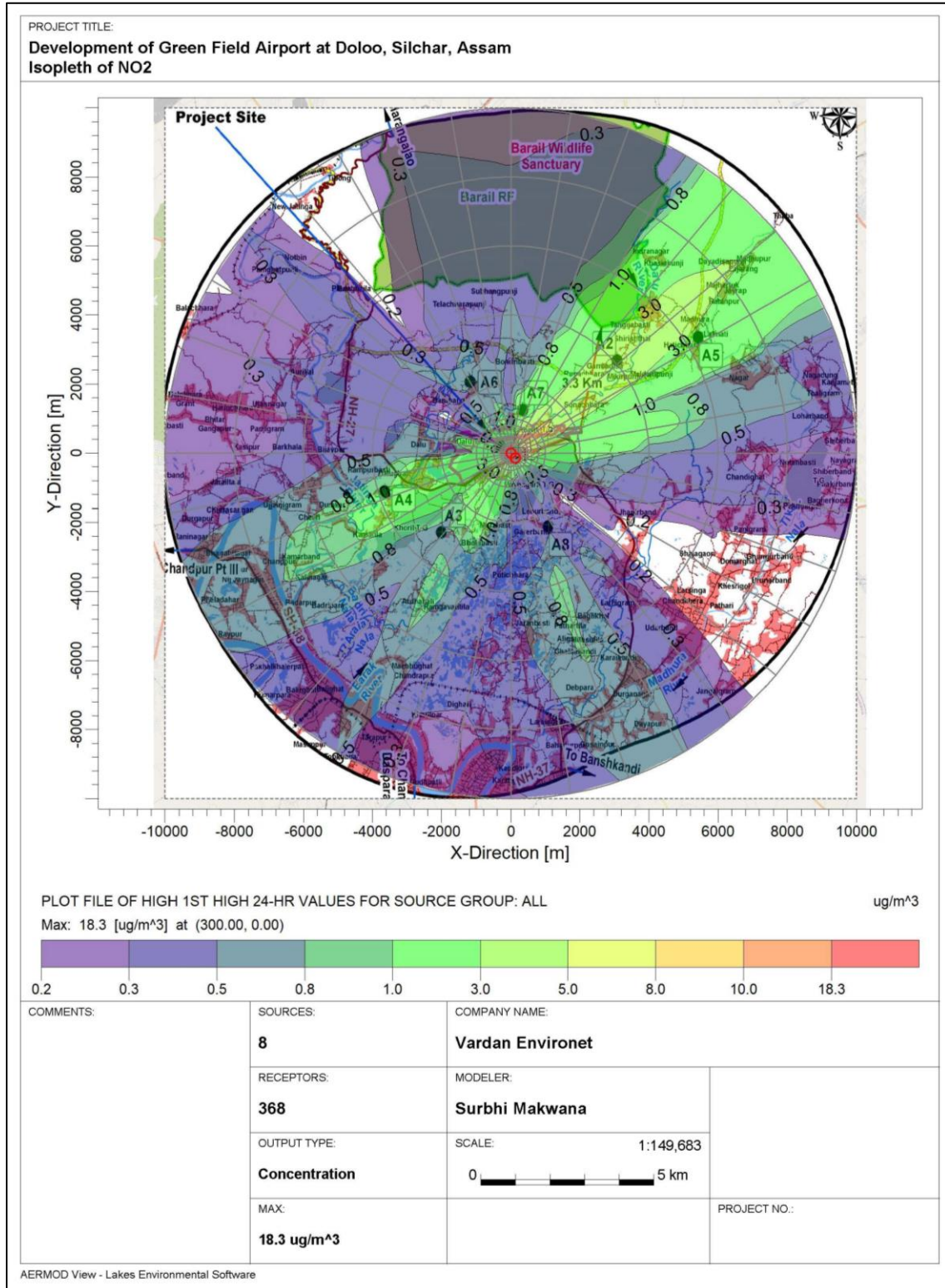


Figure 4-5: Spatial distribution of predicted GLCs of SO2

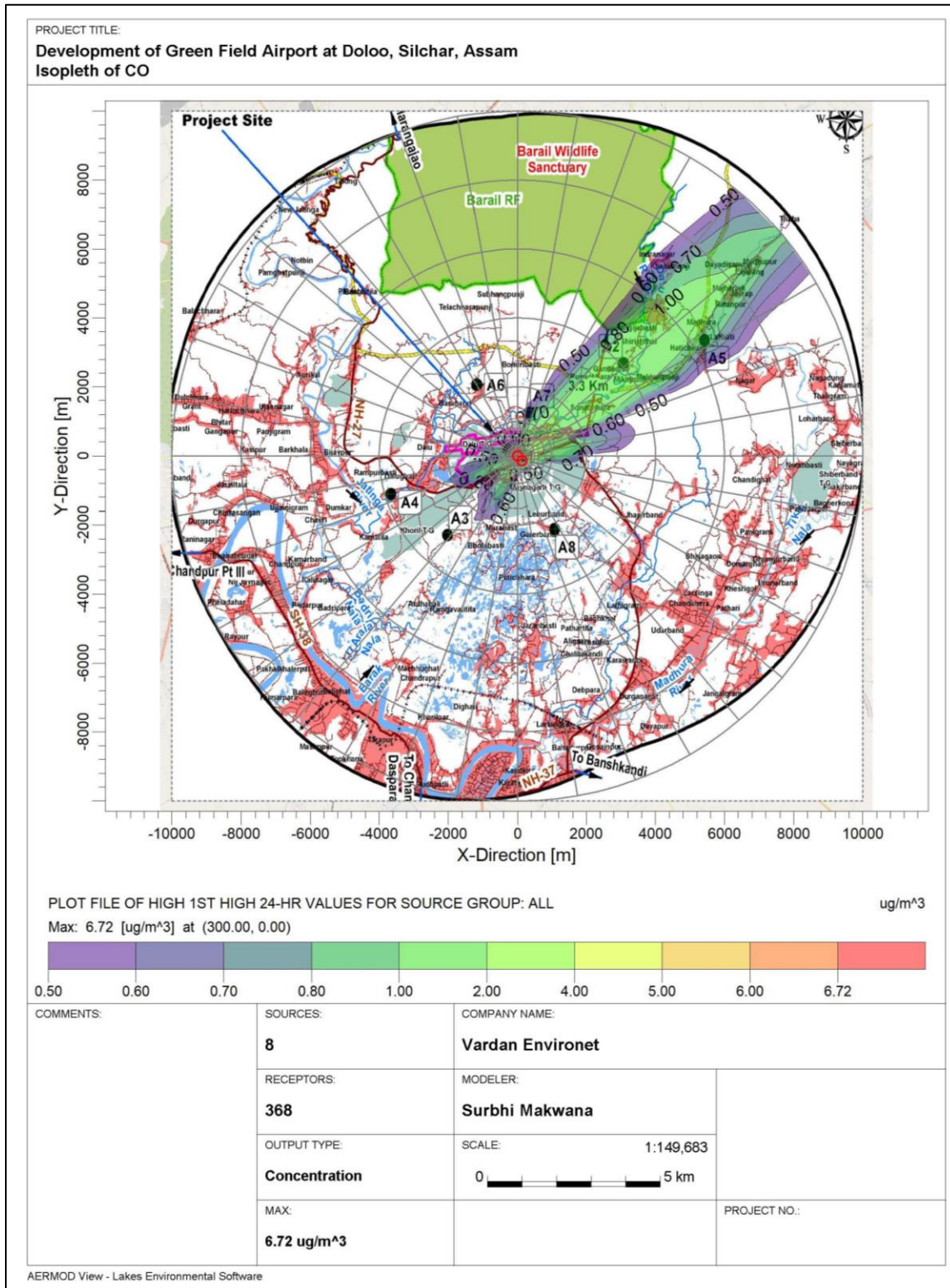


Figure 4-6: Spatial distribution of predicted GLCs of CO

4.5.4 Interpretation of Result

- The maximum cumulative GLC concentration of PM10 is found to be 47.05264 ug/m³ is predicted at Location Village Chandighat Grant (A5) 6.2 km from project site in ENE direction.
- The maximum cumulative GLC concentration of PM2.5 is found to be 25.82322 ug/m³ is predicted at Location Village Chandighat Grant (A5) 6.2 km from project site in ENE direction.
- The maximum cumulative GLC concentration of SO₂ is found to be 27.28771 ug/m³ is predicted at project site (A1).
- The maximum cumulative GLC concentration of NO_x is found to be 22.86557 ug/m³ is predicted at Location project site (A1).
- The maximum cumulative GLC concentration of CO is found to be 0.930864 mg/m³ is predicted at Location Village Chandighat Grant (A5) 6.2 km from project site in ENE direction.

4.6 TRAFFIC STUDY

Traffic study measurements were performed at National Highway-27 to assess impact on local transport infrastructure due to this proposed project. Studies are given in below tables:

Table 4-6: Highway in the Study Area

Name Of National/State Highway	Direction		Ratio In Percentage (%)
	Up	Down	
NH-27	Harangajao	Banshkandi	100

Table 4-7: No. of Vehicles per Day

Type of Vehicles	No. of Vehicles NH-27	Equivalent PCU	PCU/day NH-27	PCU/hr NH-27
Cars	2025	1	2025	84.375
Buses	1385	3	4155	173.125
Trucks	1652	3	4956	206.5
Two wheelers	1650	0.5	825	34.375
Three wheelers	1375	0.75	1031.25	42.96875
Total PCU/day	8087	-	12992.3	541.343

Table 4-8: Existing Traffic Scenario and LOS

Road	V (Volume in PCU/hr)	C (Capacity in PCU/hr)	Existing V/C Ratio	LOS
NH-27	541.34	2400	0.23	B

Note: The existing level may be “Very Good” for NH-27.

Table 4-9: Level of Service Criteria

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

Note: Capacity as per IRC: 64-1990

Table 4-10: Additional Traffic during Operation

S. No.	Type of Vehicle	Additional Vehicle Per day	PCU	Total Number of Vehicle in PCU/day	PCU/Hr
1	Trucks/Buses	37	3	111	4.63
2	2 Wheelers	1032	0.5	516	21.50
3	3 Wheelers	1648	0.75	1236	51.50
4	Cars	2479	1	2479	103.29
Total				4342	180.92

Basis No. of vehicle x 2 (Up and Down)

Table 4-11: Modified Traffic Scenarios and LOS

Highway	Increased PCU's in NH-27	V	C	Modified V/C Ratio	LOS
NH-27	180.92	541.34+180.92=722.26	2400	0.30	B

Conclusion:

The LOS value from the proposed project may be same as earlier value “Very Good” for NH-27. So, the additional load on the carrying capacity of the concern roads is not likely to have any significant adverse effect.

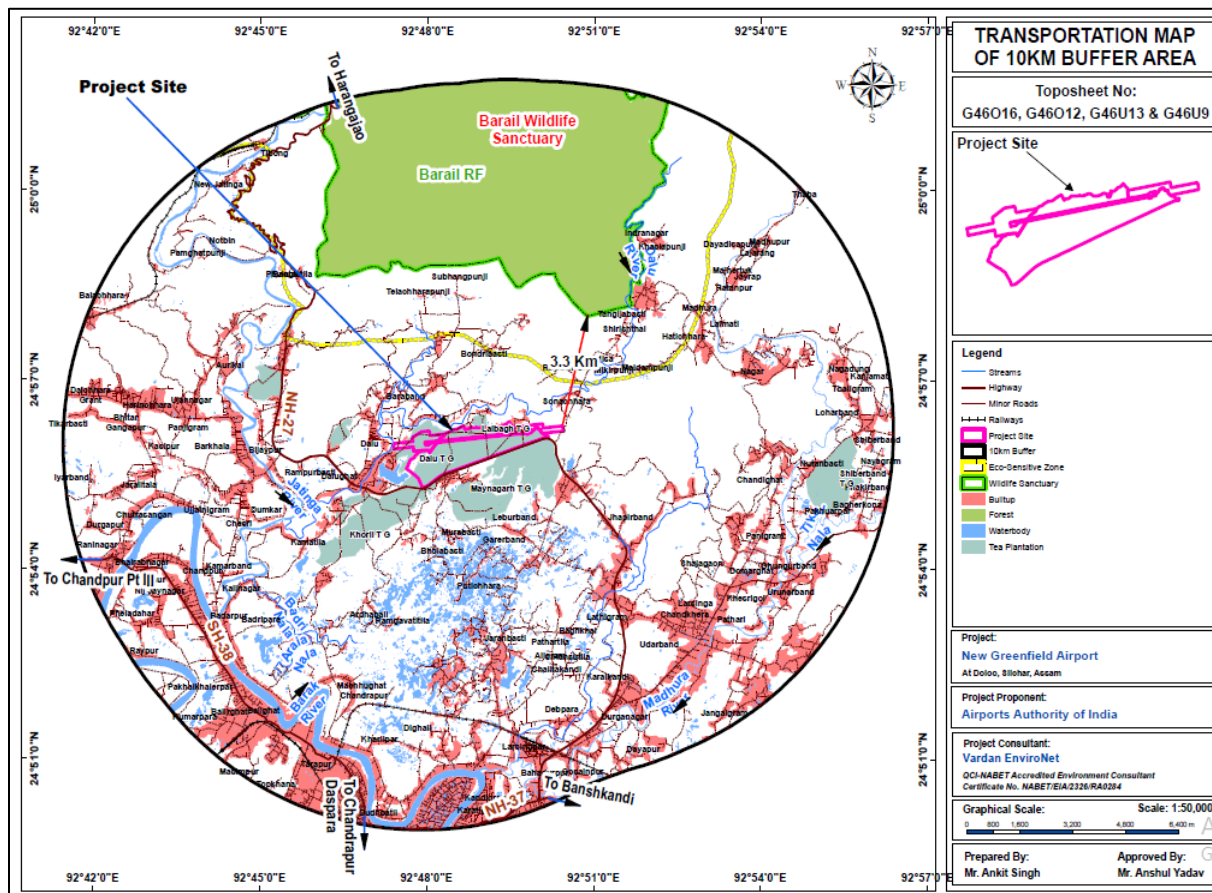


Figure 4-7: Transportation Map of 10 km Buffer Area

4.7 MITIGATION MEASURES FOR ANTICIPATED IMPACTS ON ENVIRONMENT

4.7.1 Air Environment

➤ Construction Phase

- The Transportation of raw material and debris shall be done in vehicles covered with tarpaulin cover and all the vehicles will have PUC certificate.
- Raw materials/debris/excavated muck shall be properly stacked and stored under covered conditions at designated areas/storage yards. Debris/muck will be regularly removed from the site for regular storage/disposal.
- Locally available raw material will be preferably used.
- Temporary connection of electricity will be taken for operation of machinery/equipment and lighting at site and usage of DG sets shall be minimal.

- Low Sulphur diesel only shall be used as fuel in DG sets. DG sets will be provided with the stack height as per CPCB norms. DG sets shall be used only in case of power failure.
- Water sprinkling will be carried out at casting & storage yards, construction site, loading & unloading area, approach road, haulage road, raw material storage area and muck disposal sites. Flow rate of water sprinklers will be maintained to minimize the run-off and for effective results.
- Adequate parking area shall be provided for vehicle for loading & unloading to prevent parking on the road and causing traffic jams and congestion.
- Precautions w.r.t air pollution control as stipulated in IS: 5121 'Safety code for Piling and other Deep Foundation' should be adopted.
- Storage of raw materials like cement, sand, soil, etc. shall be done in covered sheds or should be covered by tarpaulin cover.
- Vehicles and equipment shall be regularly checked for fitness/serviced and maintained.
- Green belt development will be started at the site during construction phase only.
- Construction workers shall be provided with mask.
- Vehicles entering the site shall be checked for PUC certificates.
- Barricading the site shall be done for suppression of dust generation.
- Covering the scaffolding shall be done to minimize dust generation.
- Wheel washing arrangement shall be provided at entry/exit points.
- Temporary road will be constructed and sprinkled with water for dust suppression.
- The hazardous waste generated will be used oil only. Used Oil will be stored in HDPE drums and kept in covered rooms under lock and key and will be sold to authorize vendors only.
- Separate storage area with barricading for C&D waste management will be provided.
- C&D waste will be handled as per the Construction and Demolition (C&D) Waste Management Rules, 2016.

➤ **Operation Phase**

- Regular monitoring of air emissions and ambient air quality will be carried out through MoEF&CC approved laboratories.
- Water sprinkling will be done during unloading/loading of trucks to control fugitive emissions.



- Raw materials & Products will be kept in covered sheds or bunkers & all conveyors will be covered.
- Pucca roads within the premises, water sprinkling in dusty areas and greenbelt/green cover to arrest the fugitive dust emission.

4.7.2 Water Environment

➤ Construction Phase

All identified impacts during construction phase will be negligible, temporary, and restricted to the site boundary. Proper and effective mitigation measures will be implemented to minimize the impact and ensure minimum effect on water resources. Proposed mitigation measures to avoid/ minimized predicted impacts are mentioned below:

- Workers will be educated to use water wisely and do not leave the taps open without use. Written notice will be displayed near the water taps for saving water & closing the taps.
- Wastewater generated will be treated in mobile STP. Treated water from STP will be used for water sprinkling at site to reduce the demand of water
- No excavation works shall be undertaken during monsoon season. Garland drains shall be provided around excavated pits to divert the storm water from nearby area from entering the excavated pit.
- Proper drainage will be provided for collection of wastewaters from construction site, to avoid stagnation of water
- Curing shall be done using the curing compounds and water will not be used for curing.
- Run-off from curing shall be collected through drains into sedimentation tank and should be re-used for curing or washing of vehicle/machinery or for wheel washing.
- Bathrooms and toilets shall be provided for construction labour with proper drainage system at site and labour camp site.
- Site shall be cleaned on daily basis so as mixing of run-off with debris can be prevented.
- Loose Raw material and construction debris shall be stored in covered areas and paved areas to avoid direct exposure and mixing with run-off.

➤ **Operation Phase**

- Proper oil & grease interceptors have been installed at wastewater outlet from the fuel depots, hotels/restaurants and flight catering. The wastewater will be passed through oil and grease interceptors and then routed to STP. Sludge will be removed regularly and after appropriate treatment it will be used as manure.
- Measures shall be taken to prevent their spillage and mechanism for immediate clean-up shall be developed in case of spillage
- Proper drainage will be provided in order to mitigate the impacts which can be due to run-off of the storm water.
- Drains will be provided with the diesel storage area. These drains will be provided with oil interceptor to remove the oil from run-off before discharging.
- No wastewater will be discharge to the water body.
- Oil spill kits shall be provided at the project site for cleaning the spills if any
- Proper waste management system shall be followed at site for municipal waste, hazardous waste and e-waste management.
- Ground water resources are proposed to be augmented by artificially recharging ground water aquifers through collected rainwater from site.

4.7.3 Land Environment

➤ **Construction Phase**

- Excavated earth will be used for filling and leveling of site to maintain the ground level wherever required
- Temporary Drainage shall be provided at the construction site, casting/storage yards, labour camps site as per the natural drainage pattern of the area. These drains shall be provided with the silt trap and oil & grease traps.
- No drain/stream shall be closed during project construction in any case.

➤ **Operation Phase**

- No impact is anticipated on land use & topography during operation phase.

4.7.4 Noise Environment

➤ **Construction Phase**

- Proper maintenance of noise generating transport vehicles.
- Regular noise level monitoring shall be carried out for taking corrective action
- Regular maintenance of heavy earth vehicles may be adopted to reduce noise levels.

- All the construction machinery and equipment used shall be provided with adequate noise mufflers and noise suppression equipment. Proper lubrication and maintenance of the machinery & equipment and vehicle will be carried out to minimize the noise generation due to abrasion
- All noisy activities should be carried out during daytime only (9:00 AM to 10:00 PM). No noisy works shall be undertaken during nighttime
- Casting yards, batching plants etc. will be located away from residential and sensitive areas
- Self-compacting concrete will be used in place of consolidating the concrete by means of vibrators or hand consolidation due to which there will be minimal or negligible noise and vibration generation
- Temporary noise shields shall be provided all around the heavy noise making activities.
- Noise level from loading & unloading of material will be reduced by usage of various types of cranes & placing material on sand or sandy bag beds.
- Noise monitoring shall be carried out to ensure the effectiveness of mitigation measures and develop a mechanism to record and respond to complaints on noise.
- Adequate parking space will be provided at the project site to minimize the honking requirement due to congestion and jams and restricting the speed limits.
- Job rotations will be practiced for workers, working in noisy environment.
- Protection devices (earplugs or earmuffs) shall be provided to those workers who cannot be isolated from the source of noise and reducing the exposure time of workers to the higher noise levels by rotation.
- OSHA's guidelines shall be followed for maintaining noise exposure levels of the construction workers. As per occupation standards, workers' exposure to 90 dB(A) noise level should not be more than 8 hours. OSHA's guidelines are listed in Table below.

Table 4-12: OSHA's Noise Exposure Limits for the Work Environment

Noise Levels in dB(A)	Permissible Exposure (hours & minutes)
85	16 hrs
90	8 hrs
96	3 hrs 30 minutes
102	1 hr 30 minutes
108	40 min
115	15 min
121	6 min
127	3 min
130	1 min

➤ **Operation Phase**

- DGCA/MOEF&CC/ICAO standards and procedure shall be adhered.
- Noise mapping study shall be carried out as per DGCA requirement to assess the existing noise loads and the population affected. Further noise management action plan will be made.
- Planning shall be done to minimize the use of Ground Power Unit (GPU) and Auxiliary Power unit (APU) during aircraft parking at bay.
- Runway orientation is made in such a way that there won't be adverse impact on nearby settlement.
- In the funnel zone area, there is not settlement.
- Restriction to the noisy aircrafts.
- Restriction for use of thrust reverse while landing of aircraft, the flight crew shall have the final authority to decide on use of thrust reverser on case-to-case basis.
- It will be ensured that, engine run-up is done at a specific location only marked by the airport operator.
- It will be ensured that, aircraft operator is following use of noise preferential routes to avoid noise-sensitive areas on departure and arrival.
- Proper scheduling of the aircraft to minimize the noise level.
- Switching off engine during idling.
- DG set will be placed in acoustic enclosure with anti-vibration pads to reduce noise and vibration from DG sets.
- Proper maintenance of Ground support equipment, vehicles.
- Ear plugs/mufflers will be mandatory for workers, working in noisy areas.
- Double Glazed glass will be used in Terminal building to reduce noise
- Sufficient oiling and lubrication will be done to all the parts of the machineries to ensure that minimal noise is generated.
- Continues ambient noise level monitoring system will be installed at the airport
- Proper traffic management plan will be prepared to ensure no traffic congestion at internal terminal road.
- Green belt will be developed around the city side, near terminal building and along the roads. It is also proposed to provide 100 m green belt along the boundary of the Airport.
- Signage for no honking will be displayed.

- Noise adsorption material will be used for construction of terminal building and other development area.
- Noise barrier will be installed wherever possible and required.
- Policy for timely maintenance of aircraft will be given to stakeholders.
- Pumps to be installed with STP, water supply system, sewage system, storm water system etc. shall be provided with noise mufflers so as noise during operation is minimal and shall be enclosed in acoustic enclosure to minimize the noise.
- Regular repair & service of the pumps and machinery to minimize the noise generation.

4.7.5 Occupational Health & Safety

➤ Construction Phase

- PPE like helmets, goggles, safety mask, ear plugs, safety shoes, etc. will be provided to workers.
- Training to worker will help to minimize the probability of accident to large extent. Workers will get training considering their health aspects and hence the occupational health and safety impacts can be controlled.
- Effective implementation of the mitigation measures, proper care and training for the safety aspects will be followed which will controls occupational health or contagious diseases.

➤ Operation Phase

- All safety signs will be placed at proper location.
- First aid kits will be made available at every department.
- Pre-employment Medical check-up and periodical medical check-up shall be undertaken to know the occupational health hazards at the early stage.
- Work permit system will be introduced to avoid the entry or un-authorized working to avoid the incidences which can lead to the accident if proper care is not taken.
- All arrangement required for Fire hydrant system shall made at every vulnerable location to have the firefighting facility.
- Apart from above, all required Fire Extinguishers shall be provided at appropriate locations.
- All staff and workers will be trained in firefighting operations and emergency preparedness plan or to tackle the accident.

- Apart from all engineering control measures, if required necessary PPEs shall be provided as last protection measures to the employees.
- Good housekeeping also plays important role in avoiding the undesirable incidences /accidents, hence good housekeeping practices will be employed throughout the Factory premises.

4.7.6 Solid and Other Waste Management

➤ Construction Phase

- Dustbins shall be provided at site for collection of municipal waste. Municipal waste will be segregated into compostable and recyclable waste. Compostable waste will be disposed off to Municipal Waste Disposal Site and recyclable waste will be given to approved vendor.
- Construction debris is bulky and heavy and re-utilization and recycling is an important strategy for management of such waste. As concrete and masonry constitute the majority of waste generated, recycling of this waste by conversion to aggregate can offer benefits of reduced landfill space and reduced extraction of raw material for new construction activity.
- Construction sites are sources of many toxic substances, such as paints, solvents, wood preservatives, pesticides, adhesives and sealants. Hazardous waste generated during construction phase shall be stored-in sealed containers, labeled, and disposed of as required by the Hazardous Wastes (Management)
- Construction waste will be segregated into inert, recyclable/reusable and discarded material. Majorly waste will be used within the site for site leveling and construction of roads. Recyclable material will be sold to authorize dealers. Re-usable material will be stored under covered conditions at site and reject will be disposed off at the designated locations by local body. C&D waste management rules 2016 will be followed.
- Hazardous waste like used oil from DG sets and machinery shall be stored in sealed containers and shall be disposed off through authorized agencies only
- Waste storage shall be done on paved surface and covered area only
- Waste carrying vehicles shall not be overloaded and shall be always covered
- Construction and Demolition Waste will be reused for backfilling to major extend and rest will be sent to C&D Waste site. Hierarchy showing Disposal of C&D waste is given in Figure below.

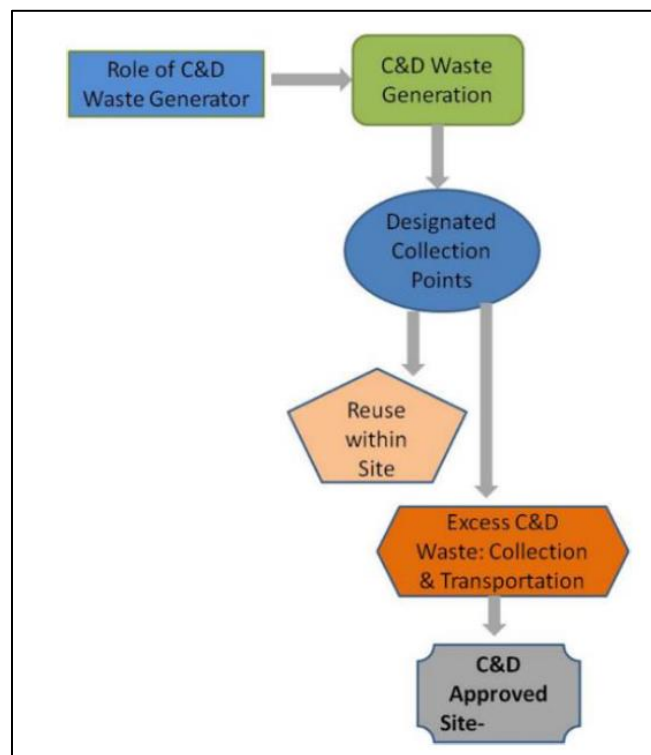


Figure 4-8: Disposal of C&D waste

➤ Operation Phase

- Proper municipal solid waste collection, management, treatment, and disposal system shall be followed for management of solid waste. Municipal waste shall be segregated at source into compostable waste, recyclable waste, and inert waste by provision of three colour bins. A waste storage room for municipal waste shall be provided at site with storage capacity of 2-3 days. Compostable waste shall be treated within the site in organic waste convertor, recyclable waste shall be sold to the vendors and the inert fraction shall be disposed through the local agencies in area on daily basis.
- Deplane waste will be collected in HDPE bags and sent to the in-house solid waste management area for treatment/disposal
- Airport Council International's (ACI) policy and recommended practices Handbook will be followed for waste management at airport which promotes to avoid, to reduce, reuse, to recycle and finally to dispose the waste.
- A separate room shall be provided at site for storage of e-waste and e-waste shall be sold off on regular basis to authorized vendors only
- Training will be provided to the workers
- No use of plastic will be promoted

- Waste audit at airport will be done
- Waste management and reduction plan will be made
- Standard Signage will be provided
- STP sludge will be used as manure in landscaping
- No hazardous substance or waste will be handled in cargo during phase II operation.
- Waste oil, lubricant from machineries, equipment, maintenance yard, DG set shall be stored in HDPE containers and stored in isolated paved areas. It shall be sold to authorized vendors on regular basis.
- Fuel shall be stored in isolated location on paved areas to prevent contamination of soil due to spillage. Drains shall be provided around Fuel storage yards and drains will be fitted with oil interceptors.
- Dyked enclosure will be the component of storage of hazardous material.
- Separate vehicle maintenance area will be demarcated to prevent water or soil contamination.
- Minimum use of hazardous cleaning agent will be done.
- Dry cleaning will be undertaken during spillage of oil or other hazardous waste.
- Standard Signage will be provided.
- Hazardous & Other Waste (Management & Transboundary Movement) Rules, 2016 will be followed.
- E-waste will be stored in separate room and sold to authorized recycler as per E-waste (Management) Rules, 2016
- Battery waste will be handled as per Battery Waste Management Rules, 2016
- Bio-medical Waste (Handling & Management) Rules, 2016 shall be followed.
- There will be very less quantity of C&D waste generation during operation phase, which will be managed as per the C&D waste management rules, 2016.

4.7.7 Biological Environment

➤ Construction Phase

- A detailed Wildlife Conservation Plan for Schedule-I species will be developed to enhance the population of these species within the study area. The various implications and mitigation measures outlined in the Wildlife Conservation Plan for Schedule-I species will be rigorously enforced with the assistance of the Forest Department.

- It is crucial to ensure that all electrical components are adequately insulated to prevent the potential risk of electrocution to wildlife resulting from accidental contact with project installations.
- Maintenance operations should be restricted to daylight hours to enhance efficiency and safety. Whenever possible, the use of artificial lighting in and around the project site should be minimized. Additionally, selecting low-intensity artificial lighting can help decrease the attraction of insects to the airport area.
- Implement modern airport lighting systems by integrating cutting-edge technologies such as dimmers, sensors, and timers, which allow operators to control the brightness of the emitted light. By turning off unnecessary lighting during times of inactivity, it is possible to reduce light pollution at airports. These strategies can greatly lessen the impact of light pollution in these environments.
- Incorporating daylighting into the design approach of airports is essential, as it merges natural light with artificial lighting systems to improve overall brightness. It is advisable to restrict operational or maintenance tasks that require lighting to daylight hours, thereby minimizing the disruption of the natural night environment caused by artificial light sources.
- It is crucial to minimize any unavoidable nighttime illumination within the Project Site. This should be achieved by directing the lighting towards the Project Site, employing low-intensity artificial light sources, and incorporating downward-facing shades to mitigate light spill into adjacent habitats.
- It is imperative that all vehicles and machinery employed at the project site for operational and maintenance tasks comply with the designated emission standards.
- It is crucial to restore the soil and reinstate the natural vegetation along any roads built during the operational phase that are considered unnecessary for carrying out operational or maintenance tasks, and as such, are not needed for ongoing operations and maintenance.
- The use of herbicides within the facility will be explicitly prohibited.
- Formulate and execute extensive training initiatives and operational protocols aimed at mitigating the risk of spills involving hazardous substances. Establish effective containment measures to ensure that any accidental release does not penetrate the surrounding ecosystem.
- A thorough protocol for wildlife management and habitat oversight must be established to guarantee the safety of airport operations. This procedure should encompass the capture and rehabilitation of animals located within the specified Project Boundaries, executed in partnership with the forest department and adjacent wildlife sanctuaries.

- The distribution of aircraft movements has been executed via a mixed-mode operation of the runways, providing benefits in reducing noise levels encountered by particular regions.
- Implement operational protocols designed to reduce aircraft noise, which encompass the utilization of Continuous Climb and Continuous Descent Approach (CDA) techniques.
- It is essential to implement a system for addressing noise complaints at the airport and its associated facilities.
- The implementation of an Aircraft Noise Monitoring terminal, featuring an automated aircraft noise monitoring system, is essential for evaluating noise levels surrounding the airport. This system will be strategically positioned across all runway approaches, enabling the effective identification of aircraft that generate excessive noise.
- It is advisable to implement the growth of native vegetation that reaches significant heights at suitable intervals around the boundaries of the Project Site, wherever practical, to create a visual barrier between adjacent wildlife habitats and human communities. This strategy not only helps to reduce noise and light pollution but also acts as a green buffer, minimizing the transmission of sound and light emanating from the site. Whenever feasible, it is recommended to collaborate with the Forest Department in the planting of native species to ensure the preservation of ecosystem services related to fuelwood, fodder, and wild food resources.
- The installation of bird deflectors and spikes on transmission cables and pylons is designed to reduce the hazards of collision and electrocution for flying wildlife, in alignment with the guidelines set forth by the CEA.
- A comprehensive management of Dolo lake will be ensured such as avoid food sources, maintain growth of grasses, deployment of trained spotters, and use of floating covers.
- Conduct regular monitoring of migratory and resident bird populations to detect any potential disease outbreaks and implement appropriate response measures during operation phase.
- Evaluating the risks faced by birds as a result of feral dogs, in addition to proposing strategies such as fertility control, long-term shelter, and more.
- All occurrences of incidents or bird strikes are required to be recorded, and suitable mitigation measures that are customized to the particular site should be executed

Table 4-13: Biodiversity and Ecosystem Services Management Plan

Aspect	Impact	Impact Intensity without Mitigation	Action Points (Recommendations and Mitigation Measures)	Impact Intensity after Mitigation	Monitoring/Training Requirement	Responsibility
Pre-construction						
Site Clearance	Impact of site clearance on standing plants	Major	<ul style="list-style-type: none"> -The removal of standing plants must be finalized prior to the commencement of construction activities. -The removal operations will be carried out in stages to ensure that the pollinators have sufficient time to relocate. -Relocation will be favored in instances involving the cutting of standing trees. 	Moderate	Cutting or relocation of standing plants will be carried out scientifically	PP
Construction						
Biodiversity and Ecosystem Services	<ul style="list-style-type: none"> -Loss, degradation, and fragmentation of habitat area -Loss of flora/fauna -Loss of or loss of access to priority provisioning ecosystem services 	Moderate	<ul style="list-style-type: none"> -The preservation of traditional land-use practices and the existing vegetation at the Project Site should be maintained to the greatest extent feasible. -The conservation of the natural terrain and the water drainage infrastructure within and adjacent to the Project Site is essential. -The minimization of the number, dimensions, and extent of access roads, coupled with the rehabilitation of any access roads deemed unnecessary following the construction phase, is essential. -The movement of vehicles and the operation of heavy machinery shall be restricted to designated pathways specifically established for such purposes. -Restricting construction operations to daylight hours aims to mitigate the impact on the surrounding ecosystem. -Restricting construction activities to daylight hours is intended to reduce the effects on the adjacent ecosystem. -Employ low-intensity artificial lighting equipped with downward-facing shades to limit the dispersion of light into adjacent areas. Additionally, it is essential to take measures to mitigate construction noise and vibrations as much as possible. -The introduction of a diverse range of native plant species is 	Minor	<ul style="list-style-type: none"> -Preservation of local ecological environment through plantation - Implementation of management plan to counter human-animal conflict with respect to venomous snakes. 	EPC Contractor

Aspect	Impact	Impact Intensity without Mitigation	Action Points (Recommendations and Mitigation Measures)	Impact Intensity after Mitigation	Monitoring/Training Requirement	Responsibility
			<p>intended to offset the loss of vegetation that occurred during the site clearance process, thus alleviating the environmental impacts linked to the project. Given that no specific grazing areas have been impacted, the effects on grazing land are considered to be negligible.</p> <ul style="list-style-type: none"> -The adoption of seamed paving instead of solid concrete surfaces can significantly reduce the hindrance to rainwater absorption. -Implement provisional noise reduction strategies or create temporary sound barriers around the construction area. -To reduce the occurrence of human-snake conflicts within the project site and labor camp, it is advisable to establish a snake deterrent system in locations that experience high levels of foot traffic. -The development of a management strategy focused on mitigating human-animal conflicts related to venomous snakes is essential. -The execution of the Wildlife Conservation Strategy for Schedule-I Species. -Regular surveillance and the prompt disposal of any carcasses located near the airport perimeter should be carried out consistently to deter scavenging raptors from being drawn into the project area. -The cultivation of indigenous floral species or the establishment of developed greenery is essential for sustaining the pollinator population, in accordance with the standard operating procedures set forth by the Airport Authority. -Standard mitigation measures, including the establishment of speed limits, the installation of warning signage, and the construction of speed bumps, will be put into effect to prevent any incidents of roadkill. -Construction workers will be educated about conservation values 			

Aspect	Impact	Impact Intensity without Mitigation	Action Points (Recommendations and Mitigation Measures)	Impact Intensity after Mitigation	Monitoring/Training Requirement	Responsibility
			<p>and ecological roles of floral and faunal species present in the area through organising capacity-building workshops (cbw) to avoid any threats to local biodiversity by the construction workers. These initiatives will also raise awareness regarding fire incidents and the illegal hunting of wildlife.</p> <p>-Numerous threatened species have been documented within the Barail Wildlife Sanctuary, prompting the Project Proponent to arrange a one-time grant aimed at the management of these species. This grant will facilitate the propagation of Bon Semal (<i>Bombax insigne</i>), Garjan (<i>Dipterocarpus turbinatus</i>), Ashok (<i>Saraca asoca</i>), and Teak (<i>Tectona grandis</i>). Additionally, it will support the management of threatened wildlife, including mammals, birds, and reptiles, as well as provide veterinary care for these threatened species when required.</p>			
Operation						
Biodiversity and Ecosystem Services	Bird Aircraft Strike Hazard (BASH)	Major	<p>-PP has created a Bird Aircraft Strike Hazard (BASH) assessment for operational airports and has advised the implementation of the following measures.</p> <p>-Limitation of vehicle movement to specified pathways.</p> <p>-Limiting maintenance activities to daytime hours.</p> <p>-Modern airport lighting systems can be enhanced by incorporating advanced technologies, including dimmers, sensors, and time switches, which enable operators to effectively manage the intensity of the emitted light.</p> <p>-Incorporate the use of natural light as a fundamental element in the design strategy of airports.</p> <p>-Utilize low-intensity artificial lighting that features downward-facing shades to reduce the spread of light into surrounding environments.</p>	Moderate	Maintain records of Bird Aircraft Strike Hazard (BASH)	EHS team (PP)

Aspect	Impact	Impact Intensity without Mitigation	Action Points (Recommendations and Mitigation Measures)	Impact Intensity after Mitigation	Monitoring/Tra ining Requirement	Respons ibility
			<p>-It is essential to verify that all vehicles and machinery utilized at the project site for operational and maintenance tasks adhere to the established emission standards.</p> <p>-It is essential to rehabilitate the soil and reestablish the natural vegetation on any roads created during the construction phase that are not required for ongoing operations and maintenance activities.</p> <p>-Implement operational practices aimed at minimizing aircraft noise, including the adoption of Continuous Climb and Continuous Descent Approach (CDA) techniques. Regulate nighttime flights during the breeding season of Olive Ridley Turtles to the greatest extent feasible.</p> <p>-It is essential to report any occurrences of incidents or bird strikes, and to implement mitigation strategies that are tailored to the specific location.</p>			

Table 4-14: Environmental (Biodiversity) Monitoring Plan

S. No.	Environmental Attribute	Monitoring Parameters	Monitoring Location	Frequency of Monitoring	Responsibility
Construction Phase/Operation Phase					
1.	Biodiversity Monitoring and Evaluation Programme	Biodiversity Management Plan Parameters	Study area (Core & Buffer Zone)	Quarterly	EPC Contractor/ EHS Team
2.	Biodiversity Monitoring and Evaluation Programme	Activities mentioned in the Wildlife Conservation Plan for Schedule-I Species	Study area (Core & Buffer Zone)	Half Yearly	PP with Forest Department

4.7.8 Socio Economic Environment

➤ Construction & Operation Phase

- Proper Rehabilitation & Resettlement Plan for the affected families including the displaced families would be provided. All the displaced families will provide the built-in houses at the new Rehabilitation location with all the needful basic facilities.
- 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 living condition with appropriate facilities for residential labours should be provided
- Proper Training and awareness programme should be carried out so that the workers understand the importance of wearing the personal protective equipments.
- Periodic health checkup camps, distribution of medical aid and medicines shall be organized by project authority for villagers, contract laborers, employees, and their family
- At the work place, first aid facilities shall be maintained at a readily accessible place with necessary appliances including sterilized cotton wool etc.
- Ambulance facility shall also be provided at the project site during emergency at the time of construction period.

4.8 RAIN WATER HARVESTING

Rainwater harvesting is the accumulation and deposition of rainwater for reuse on-site, rather than allowing it to runoff. Rainwater can be collected from surface runoffs or roofs, and in many places the water collected is redirected to a deep pit (well, shaft, or borehole), a reservoir with percolation, or collected from dew or fog with nets or other tools. Its uses include water for domestic use, irrigation purpose, industrial uses etc. The harvested water can also be used as drinking water, longer-term storage and for other purposes such as ground water recharge.

Airport Authority of India (AAI) has proposed a Green Field Airport at Address: Village-Dolu Grant, Block- Borkhola, District- Cachar, Assam- 788111. This RWH proposal has been

prepared to propose the required Rain Water Harvesting Structures in the plant premises as per the latest RWH guidelines of HWRA.

❖ **Advantages of Rain Water Harvesting Structures:**

Rainwater harvesting provides an independent water supply during regional water restrictions and in developed countries is often used to supplement the main supply. It provides water when there is a drought, can help mitigate flooding of low-lying areas, and reduces demand on wells which may enable ground water levels to be sustained. It also helps in the availability of potable water as rainwater is substantially free of salinity and other salts. Application of rainwater harvesting in urban water system provides a substantial benefit for both water supply and wastewater subsystems by reducing the need for clean water in water distribution system, less generated storm water in sewer system, as well as a reduction in storm water runoff polluting freshwater bodies.

There has been a large body of work focused on the development of Life Cycle Assessment and Life Cycle Costing methodologies to assess the level of environmental impacts and money that can be saved by implementing rainwater harvesting systems.

❖ **Designing of Rain Water Harvesting System:**

In designing any rainwater harvesting structure, capturing rainfall and runoff for local use is the key concept. Hard surface such as roof pavements and roads that decrease ground water percolation constitute catchments and generate the high runoff which must be diverted into the storage tank & recharged into ground water regime through simple filtration & injection well system for subsequent extraction by service wells. To improve water availability, rainwater harvesting is the most imminent & long-term solution.

In view of above, rainwater-harvesting structures at this point can serve the purpose of arresting roof top rainwater and runoff generated through roads in the area. The design is based on average annual rainfall, peak rainfall intensity and the intake capacity of the water by the aquifers. To determine intake capacity of water by unsaturated zone & aquifers zone, the recharge tests were carried out in the investigated area.

For good design of rainwater harvesting, following points are to be kept under consideration-

1. Ideal location with good ground slope.
2. The location has adequate subsurface permeability of the aquifer to accommodate maximum recharge of rainwater through injection well.
3. Rate of filtration should exceed average rainfall intensity.



4. Clogging of filtration media should be cleaned periodically.
5. Ground water pollution does not take place.

❖ Design of Rainwater Harvesting Pit:

The important aspects to be investigated for designing the rain water harvesting system to be augment ground water resources are:

1. Hydrogeology of the area including nature and the extent of aquifer, soil cover, topography, depth to water level and chemical quality of water.
2. The availability of source water is one of the prime requisites for ground water recharge, basically assessed in terms of non-committed surplus monsoon runoff.
3. Area contributing runoff like available land use pattern, industrial, green belt, paved areas, roof top area etc.
4. Hydrometeorological characters like rainfall duration, general pattern, and intensity of rainfall.

4.8.1 Data Analysis

Rainwater harvesting is the accumulation and deposition of rainwater for reuse on-site, rather than allowing it to runoff. The calculation of rainwater endowment is presented here which shows the total rainwater harvesting potential of the plant area.

Rainwater Harvesting Calculation as per the latest guidelines of the HWRA:

Table 4-15: Area Break-up

Land Use	Area (in Sq. m.)
Roof Top Area of buildings/sheds	33000
Road/ Paved area	207869
Open land	3695466
Green Belt area	100000
Total Land Area	4036335

Average Annual Rainfall of district Cachar as per India WRIS = 2.304 m

Peak Rainfall/hour in district Cachar = 0.03 m

Table 4-16: Annual Quantum of Runoff Available within premises (Annual Recharge Potential)

S. No	Land Particulars	Area (m ²)	Runoff Coefficient	Average Annual Rainfall (m)	Average Quantum of Runoff Available (m ³ /year)
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1.	Roof Top Area of buildings/sheds	33000	0.85	2.304	64627.2
2.	Road/ Paved area	207869	0.65	2.304	311304.6144
3.	Open land	3695466	0.2	2.304	1702870.733
4.	Green Belt area	100000	0.15	2.304	34560
Total					2113362.55

Table 4-17: Hourly Quantum of Runoff Available within premises

S. No	Land Particulars	Area (m ²)	Runoff Coefficient	Average Annual Rainfall (m)	Average Quantum of Runoff Available (m ³ /year)
1.	Roof Top Area of buildings/sheds	33000	0.85	0.03	841.50
2.	Road/ Paved area	207869	0.65	0.03	4053.45
3.	Open land	3695466	0.2	0.03	22172.80
4.	Green Belt area	100000	0.15	0.03	450.00
Total					27517.74
Rainfall in 20 min					9172.58

Table 4-18: Hourly Recharge Capacity of Rectangular Recharge structures- Proposed

S. No	Free Board				Filled Material					Recharge Well			Hourly Recharge Capacity of Recharge structure (m ³ /hour)
	Length (m)	Breadth (m)	Depth (m)	Capacity (m ³)	Length (m)	Breadth (m)	Depth (m)	Porosity	Capacity	Intake Rate (LPS)	No. of Bores	Intake Capacity	
1	4	4	2	32	4	4	1	0.3	4.8	5	1	18	54.8

Therefore, total required RWH structures = $9172.58/54.8 = 167$

Therefore, in Green Field Airport of AAI at Doloo Site is required **167** nos. of rainwater harvesting pits for recharging the ground water of collected rainwater; as per their given land details.

❖ Design of Rain Water Harvesting Structure

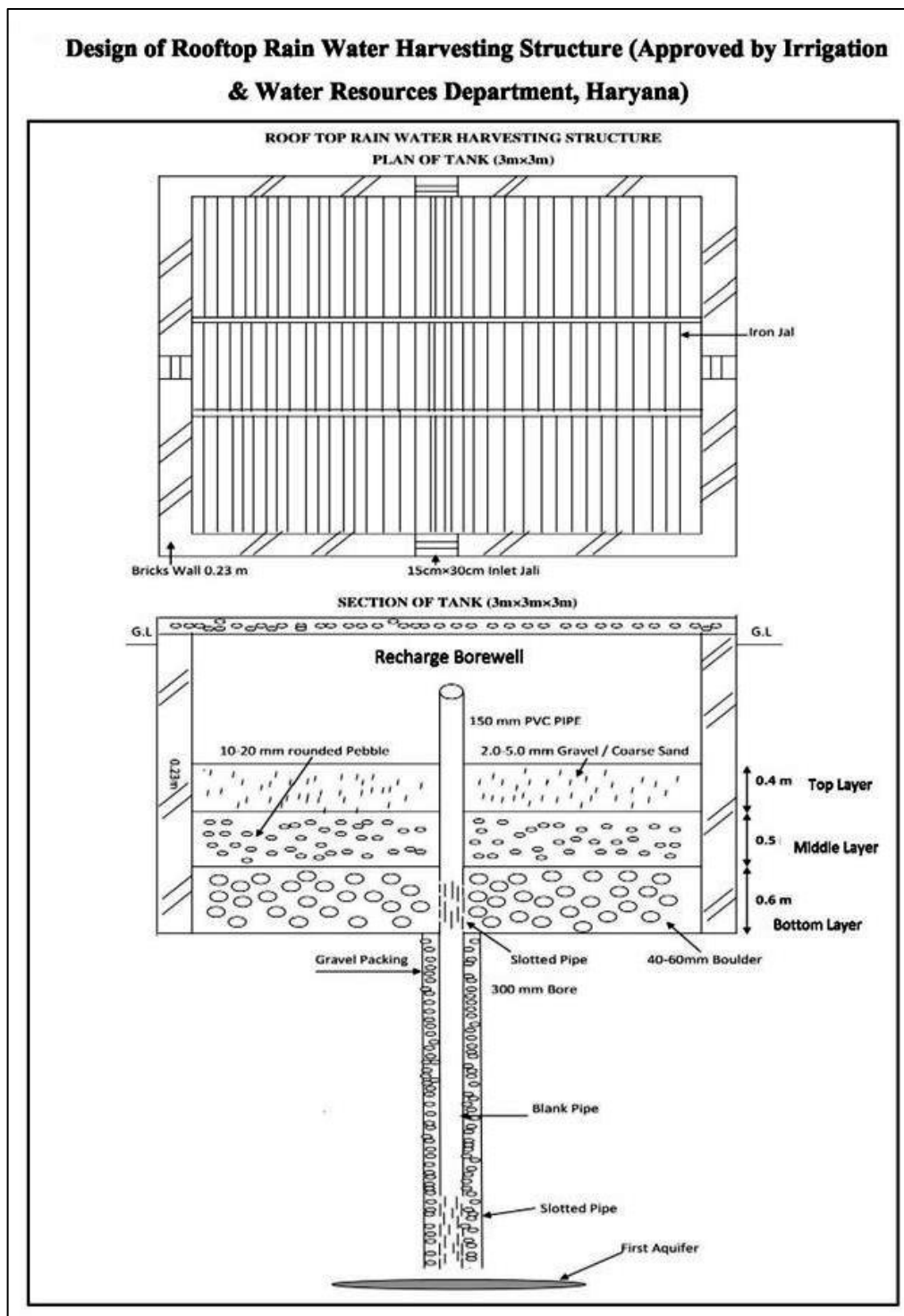


Figure 4-9: Design of Rainwater Harvesting Structure as per IWRD Haryana

❖ **Annual Maintenance Schedule for RWH:**

Table 4-19: Annual Maintenance Schedule for RWH

Parts	Maintenance	Frequency
Roof	Wash off roof with water when dust/dirt accumulates diverting runoff way from tank inlet.	Monthly and especially after a long period of dry weather or heavy wind.
	Sweep off leaf litter.	Regularly, especially after heavy winds and just before the rains set in. Daily checking for leaf litter accumulation during rainy season.
	Trimming and cutting of trees around roof.	When required.
	Fixing damage to roof (broken tiles, cracked water-proofing etc.).	At the earliest and before the rainy season.
	Painting if rust is present using lead-free paint.	At the earliest and before the rainy season.
Gutters and Downpipe	Cleaning and washing out bird droppings, leaves etc., with water	Checking monthly and especially after a long period of dry weather or heavy wind. Checking daily during rainy season.
	Checking and repairing gutters and down take pipes	When required
	Ensuring that gutter / down take pipes are sloped to ensure steady flow and avoid pooling of water, collection of dirt, debris, etc.	During installation and after periods of heavy rain.
	Repairing leaks at elbows.	When required.
Filters	Cleaning.	Before and after rainy season.
First Flush Devices	Checking and cleaning.	Before and after the rainy season and after every rooftop cleaning session.
Sand Filter	Empty the contents of Filter Cleaner into the pump pot and scrapping it off, thereby also charging the filter seasonally.	Monthly clean and changing yearly after consistent use.
Bore Filter	Washing off the recharge bore properly with compressor and removing all the waste around it.	Quarterly and especially after a long period of dirty weather.

4.9 CARBON FOOT PRINT

A carbon footprint measures the total greenhouse gas emissions, particularly carbon dioxide (CO₂), associated with a particular individual, organization, event, or product. It is usually expressed in equivalent tons of CO₂ (CO₂e) over a specific time-period, typically a year.

Components of Carbon Footprint:

1. Direct Emissions: Emissions produced directly by an entity, such as:

- Combustion of fossil fuels for energy (e.g., heating, electricity).
- Transportation emissions from vehicles owned or operated.

2. Indirect Emissions: Emissions resulting from the production and supply of goods and services consumed, including:

- Energy consumption (electricity, gas).
- Manufacturing processes of products and materials.
- Waste disposal and treatment.

To optimize the 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 as recommended in the Energy Conservation Building Code (ECBC) 2017 of the Bureau of Energy Efficiency, Government of India, the following provisions will be adopted:

- (a) Building Envelope:** Opaque construction materials and their thermal properties including thermal conductivity, specific heat, density along with thickness; fenestration U-factors, solar heat gain coefficients (SHGC), visible light transmittance (VLT) and building envelope sealing documentation; overhangs and side fins, building envelope sealing details;
- (b) Heating, Ventilation, and Air Conditioning:** System and equipment types, sizes, efficiencies, and controls; economizers; variable speed drives; piping insulation; duct sealing, insulation, and location; solar water heating system; requirement for balance report;
- (c) Lighting:** Lighting schedule showing type, number, and wattage of lamps and ballasts; automatic lighting shutoff, occupancy sensors, and other lighting controls; lamp efficacy for exterior lamps;
- (d) Electrical Power:** Electric schedule showing transformer losses, motor efficiencies, and power factor correction devices; electric check metering and monitoring system.
- (e) Renewable energy systems:** System peak generation capacity, technical specifications, solar zone area

Reducing carbon footprint in processes and materials involves a combination of strategies across various sectors. Here is a structured approach:

❖ **Renewable Energy Sources**

- **Solar and Wind:** Integrate renewable energy sources like solar panels power operations.
- **Biomass:** Utilize biomass as a renewable energy source for heating or electricity generation.

❖ **Sustainable Materials**

- **Recycled Materials:** Use materials that are recycled or sourced from sustainable practices, such as recycled metals, plastics, and paper.
- **Eco-Friendly Alternatives:** Opt for biodegradable or sustainably sourced materials in packaging and products.

❖ **Energy Efficient appliances**

- **Upgrade Equipment:** Use energy-efficient appliances and machinery that consume less energy such as LED lights having sensors.
- **Smart Technologies:** Implement smart meters and energy management systems to monitor and optimize energy use.
- **Double or Triple Glazing:** These windows provide better insulation and reduce heating and cooling needs.

❖ **Waste Management**

- **Reduce, Reuse, Recycle:** Implement strategies to reduce waste generation, promote reuse, and enhance recycling efforts.
- **Composting:** For organic waste, consider composting to reduce landfill contributions and enhance soil health.

❖ **Water Conservation**

- **Efficient Usage:** Implement water-saving technologies and practices to reduce water consumption, which can indirectly lower energy use associated with water treatment and transport.
- **Low-Flow Showerheads and Faucets:** Aerators to mix air with water, reducing flow rates to about 1.5 gallons per minute (gpm) or less with sensor-activated faucets minimize water waste by only using water when needed.
- **Two Flush Options:** These toilets offer two flush settings—one for liquid waste (usually 0.8 gallons) and another for solid waste (1.6 gallons), significantly reducing water use.

- **Rainwater Harvesting:** Consider systems for capturing and using rainwater for non-potable applications. Some integrated systems/fixtures can be designed to use harvested rainwater.

❖ **Transportation and Logistics**

- **Optimize Logistics:** Use efficient routing and scheduling to reduce fuel consumption in transportation.
- **Electric Vehicles:** Transition to electric or hybrid vehicles for transportation and logistics to lower emissions.

❖ **Employee Engagement and Training**

- **Awareness Programs:** Conduct training and awareness programs for employees on sustainability practices and energy conservation.
- **Incentives:** Provide incentives for employees to adopt sustainable practices in their daily work.

❖ **Process Optimization**

- **Lean Manufacturing:** Adopt lean principles to minimize waste and improve efficiency in production processes.
- **Life Cycle Assessment:** Conduct life cycle assessments (LCA) to identify and reduce carbon emissions associated with materials and processes.

❖ **Sustainable Procurement**

- **Vendor Selection:** Choose suppliers and vendors who prioritize sustainability and have low carbon footprints.
- **Green Certifications:** Look for products and materials that have recognized sustainability certifications (e.g., Energy Star, Forest Stewardship Council).
- **Greenbelt Development:** Carbon sequestration through greenbelt development capturing and storing carbon dioxide (CO₂) in natural or managed ecosystems.

CHAPTER 5: ANALYSIS OF ALTERNATIVES SITES

5.1 PREAMBLE

The current airport at Silchar belongs to IAF and AAI operates a civil enclave from 70.66 acres of land. Operators like Indigo, Air India & Spicejet are presently operating 80 flight movements in a week. It is suitable for the operation of A-320 type of aircraft. The Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave.

On receiving a request from State Govt. of Assam, a multi-disciplinary team had conducted a prefeasibility study of Doloo site, 28 kms away from current Civil Enclave and was found feasible for Construction of Greenfield Airport for Code-4C. Now the State Govt. has acquired land for the development of this Greenfield Airport and is in the process of handing over the land to AAI. The profile of land indicated by the State Govt. did not match the one suggested by AAI in the Master Plan Proposal. To develop the Airport for A-321 type Aircraft around 171 acres of additional land was essentially required. This critical issue was highlighted by HMCA vide letter dated 16/06/2022 to Chief Minister of Assam. In the letter, he also informed that AAI in collaboration with state Government will undertake this project.

The State Govt. vide letter dated 4th August, 2022 has assured that the required additional land will be subsequently arranged for and other necessary action may be taken up for development of Greenfield Airport at Silchar.

Hence, the following scope of work is prepared for obtaining in-principal approval from the Competent Authority for the preparation of estimates to obtain AA & ES so as to take up the development works through PMC

5.2 SELECTION OF LOCATION

5.2.1 No Development option

The current airport at Silchar belongs to IAF and AAI operates a civil enclave from 70.66 acres of land. Operators like Indigo, Air India & Spicejet are presently operating 80 flight movements in a week. It is suitable for the operation of A-320 type of aircraft. The Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave.

5.2.2 Selection of Site

A demand for conducting a pre-feasibility study was received from the Government of Assam for developing Greenfield Airport at Silchar in Assam. Accordingly, a team of officials from AAI consisting of Shri Varun Lau, JGM(Arch), Shri Manjit Singh DGM (ATM)-(PLG), Shri Soumen Poddar, AGM(ATM), Shri Sunil Kumar SM(Ops), RHQ NER and Shri Rajpal Lavasia Manager Engg.(Civil)CHQ-NER along with the officials from State Government of Assam carried out study at sites identified by State Government namely Doloo T.E., Khoreel T.E. and Silcoorie T.E. from 20.01.2020 to 22.01.2020.

i. Doloo T.E. Site

Doloo T.E. site is located parallel to NH-27. Ariel distance of site is at a distance of about 8NM from Silchar Airport and 22 KM by road from City.

AAI Team along with State Govt Officials during site visit has derived the coordinates of Doloo site as $24^{\circ} 56' 12.00''$ N; $92^{\circ} 49' 52.60''$ E and $24^{\circ}55' 54.01''$ N; $92^{\circ} 47' 30.50''$ E with elevation ranging from 30M AMSL (West side) to 80M AMSL (East side) with slope, which may require earth cutting & filling to level the surface. Site is full of Vegetation and Tea plantation and a Doloo lake (major tourist attraction) on western side of site. Probable Runway orientation, depending upon various parameters like availability of land, prevailing wind direction and speed, the airspace environment, obstructions in the Approach Funnel and topography around the site etc, is 08/26. There is a transmission line observed in approach path in North-West direction. This location is surrounded by hills in North, West, and North-East direction. As per initial proposed runway location (RWY 08/26), the instrument approach procedure for both runway is feasible but with minima higher than Khoreel site. All-weather access may be restricted for above aerodrome location.

ii. Khoreel T.E. Site

Khoreel T.E site is near Doloo T.E. and connected to NH-27 by village road. Ariel distance of site is at a distance of about 10 NM from Silchar Airport and 26 KM by road from City. AAI Team along with State Govt Officials during the site visit, has derived the site coordinates of identified site $24^{\circ} 53' 51''$ N; $92^{\circ} 45' 33''$ E. Site is mostly flat and low lying along Western side. Site elevation is around 25M AMSL and lower than surroundings. Major irrigation canal runs across middle of site from West to East with sluice gate to control the water flow which may require diversion. As per revenue officials, portion of land on North side had been handed over to BSF by State Govt. which have to be vacated. Probable Runway orientation, depending upon various parameters like availability of land, prevailing wind direction and speed, the airspace environment, obstructions in the Approach Funnel and topography around the site etc, is 04/22. Site is surrounded by high hills in North, North-

west, East and South-east direction. As per initial proposed Runway location (RWY 04/22), the instrument approach procedure for RWY 04 is feasible with reasonable minima. But IAP may not be feasible for RWY 22 due to high terrain on approach path RWY 22 and aircraft operations would be unidirectional.

iii. Silcoorie T.E. Site

Silcoorie T.E site is connected to SH39 by village road. There is a proposal for upgrading SH39 to National highway as per State Government team officials. Ariel distance of site is at a distance of about 18 NM from Silchar Airport and 26 KM by road from City. AAI Team along with State Govt Officials during the site visit has derived the site coordinates of feasible site 24°42'9.24"N; 92°46'56.60"E and 24° 40' 45.3 1" N; 92° 45' 52.91" E. Site is full of undulations with high mounds and elevation variations which may need extensive earth cutting and filling to make surface levelled. It also has tea plantations and vegetation. Probable Runway orientation, depending upon various parameters like availability of land, prevailing wind direction and speed, the airspace environment, obstructions in the Approach Funnel and topography around the site etc, is 03/21. Site is surrounded by high hills in North, East and South direction. As per initial proposed Runway location (RWY 03/21), the instrument approach procedure for both Runway is feasible with reasonable minima.

Table 5-1: Analysis of Proposed Sites

Connectivity	
Doloo T.E.	Site lies alongside to NH-27
Khoreel T.E.	Site connected by village road to NH-27
Silcoorie T.E.	Site connected by village road to SH-39
Physical Features	
Doloo T.E.	<ul style="list-style-type: none"> Site elevation ranging from 30M AMSL (West side) to 80M AMSL (East side) with slope. Site is full of Vegetation and Tea plantation Doloo Lake (major Tourist attraction) on western side of site. Transmission line observed in approach path in North West direction. Site is surrounded by hills in North, West and North-East direction.
Khoreel T.E.	<ul style="list-style-type: none"> Site elevation is around 25M AMSL and lower than surroundings. Major irrigation canal runs across middle of site from West to East with sluice gate to control the water flow. As per revenue officials, portion of land on North side had been handed over to BSF by State Govt. which may have to be vacated. Site is surrounded by high hills in North, North-west, East and South-east direction.

Silcoorie T.E.	<ul style="list-style-type: none"> • Site is full of undulations with high mounds and elevation variations which may need lot of earth cutting and filling to make surface levelled. • It also has tea plantations and vegetation. • Site is surrounded by high hills in North, East and South direction.
Planning	
Doloo T.E.	<ul style="list-style-type: none"> • Probable Runway orientation is 08/26. • As per initial proposed runway location (RWY 08/26), the instrument approach procedure for both runways is feasible.
Khoreel T.E.	<ul style="list-style-type: none"> • Probable Runway orientation is 04/22. • As per initial proposed Runway location (RWY 04/22), the instrument approach procedure for RWY 04 is feasible but IAP may not be feasible for RWY 22 due to high terrain on approach path RWY 22 making aircraft operations unidirectional.
Silcoorie T.E.	<ul style="list-style-type: none"> • Probable Runway orientation is 03/21. • As per initial proposed Runway location (RWY 03/21), the instrument approach procedure for both Runway is feasible with reasonable minima.
Environmental aspect	
Doloo T.E.	Site is full of Vegetation and Tea plantation and a Doloo lake (major tourist attraction) on western side of site.
Khoreel T.E.	Major irrigation canal runs across middle of site from West to East with sluice gate to control the water flow which may require diversion
Silcoorie T.E.	Site is full of undulations with high mounds and elevation variations which may need extensive earth cutting and filling to make surface levelled
<p>Regarding quantum of land required for development of Greenfield Airport for Code 4C type of aircraft operations, it was conveyed to State Government officials and T.E. representatives that land area of 800 Acre (approx.) may be acquired free from all encumbrances. The same was agreed by T.E. representatives to handover the land of suitable site to the State Government.</p>	

5.2.3 Recommendations & suggestions

1. As per above site analysis based on parameters like connectivity, physical features, and planning aspects, Doloo T.E. site can be considered for development of Greenfield Airport at Silchar compared to Khoreel T.E. and Silcoorie T.E. site.
2. For development of Airport for Code 4C Category type of Aircraft operations, the quantum of land requirement works out to be 870 Acre as per Draft Master Plan.
3. Site for the proposed Airport may require earth cutting and filling to get sufficient level surface for constructing Runway Strip and associated infrastructure. Land to be acquired shall be free from all the encumbrances.

4. The probable orientation of Runway would be 08/26. Final orientation may be adjusted considering the wind pattern at the proposed area subject to the limitations of nearby hillocks.
5. Obstacle Limitation Surfaces survey (OLS Survey) is required to be carried out mandatorily for establishment of Obstacle limitation surfaces in order to find out existing obstacle penetration, if any.
6. Site is within control zones of Silchar airport, which belongs to Indian Air Force. Establishment of control zones, ATS routes and development and approval of IAP will be subject to clearance from IAF. The responsibility for provision of Air Traffic service to be decided in coordination with Air Force. Therefore, clearance from Ministry of Defense is essentially required before any development of airport for commercial operations.
7. Doloo Lake exists in the vicinity of site, mandatory clearance from MoEF&CC is also to be sought before development of project.
8. The proposed Airport shall have to obtain Site clearance and 'In Principle' approval for all proposals pertaining to the aerodrome under 'Public Use' category from Ministry of Civil Aviation before development of project.

5.3 ANALYSIS OF ALTERNATIVES TECHNOLOGIES

Consideration of alternative technology and design to be used in building material, energy conservation and transportation methods are discussed in this chapter. Environmental aspects of present scheme are not just limited to impact of sources of pollution but also related to energy conservation, water conservation and other issues, which are mentioned below:

5.3.1 Design

Following important measures are adopted during designing of the airport:

- During the conceptual planning phase of the airport layout, a focused approach is adopted to ensure most appropriate entry and exit to the runway and least distance to the parking bays to reduce the Taxiing fuel and time for the anticipated mix of aircraft operating to/from the airport without compromising the safety norms. Terminals that can reduce energy consumption help to lower energy-related carbon emissions and achieve significant cost savings.
- Orientation of the building is considered such as to maximize the use of day lighting and significantly affect/reduce the amount of solar-heat gain. The building is oriented on an east-west axis, so that areas that need higher luminance face north, maximizing

the day lighting while minimizing the solar-heat gains. Expenses of glazing on the northern façade would also provide ample amounts of indirect light. Consideration is given to the sun path, particularly in summer season, to ensure shade, comfort and relief from hot winds in the forecourt area of the terminal

5.3.2 Energy Conservation

Project development will increase the energy demand. Estimated power requirement of the project is 3000 kVA. Thus, it is required to conserve the energy by adopting best management practices and utilizing the energy efficient material and equipment. Energy conservation program will be implemented through measures taken both on energy demand and supply. Energy conservation is integral part of our project planning. Energy saving will help saving the energy as well as the cost for the power usage.

The conservation efforts would consist of the following:

- ✓ **Natural Ventilation:** The project team will design the building following all the necessary provisions of NBC 2016 including the design guidelines for Natural Ventilation.
- ✓ **Minimum equipment efficiencies:** The project will meet all the minimum equipment efficiency norms under ECBC for Unitary AC Systems, Electric Heaters, Ceiling Fans etc.
- ✓ **Controls:** The project will give all the necessary controls required for heating and cooling equipment's.
- ✓ **Building HVAC design and systems:** The project will be providing cooling in the building through Central air-conditioning system. As the building is in construction phase, hence for now conditioned area is on basis of assumption & integrative discussion with the architect about the conditioned area. To meet the ECBC requirement, the project building will install Chiller with minimum COP of 6.2.
- ✓ **Piping and ductwork:** The piping systems will have insulation meeting the ECBC-2017 criteria.
- ✓ **Condensers:** Condensers shall be located such that the heat sink is free of interference from heat discharge by devices located in adjoining spaces, and do not interfere with other such systems installed nearby.
- ✓ **Automatic Controls:** Astronomical time switch which will be provided for exterior lighting.
- ✓ **Exterior lighting control:** Astronomical time switch will be provided for automatic control of exterior lighting.

- ✓ **Transformer:** Minimum BEE 3-star rated transformers will be installed to maintain the power losses as per table 8.1 at 50% and 100% loading of ECBC-2017.
- ✓ **Motors (type, efficiency):** The motors better than IE-2, IS 12615 rated motors shall be installed.
- ✓ **Check Metering and Monitoring:** The project will install smart meters that can display kVA, kWh, PF, current, voltage, THD.
- ✓ **Power Factor Correction:** Automatic Power Factor Corrector (APFC) will be integrated with the transformer to maintain the power factor close to unity.
- ✓ **Power Distribution System:** Project will install cables of adequate size to maintain the internal power distribution losses at max 1%.

To minimize the electrical load requirement of the project, entire electrical system will be designed as per ECBC and GRIHA. It is planned to achieve 4-star rating of GRIHA rating.

Following measures are considered for energy conservation:

- ✓ LED light will be used in the airport.
- ✓ Use of Automatic Power Factor Control (APFC) panels to reduce power loss.
- ✓ Use of VFD chillers.
- ✓ Occupancy Sensor.
- ✓ Energy efficient motors for AHUs and ventilation
- ✓ Usage of energy efficient for interior and exterior lighting system, chillers, lifts, pumps motors to minimize the energy requirement of the project.
- ✓ Usage of energy efficient building materials to minimize the energy foot prints of the project.
- ✓ Use of oil type transformer.

5.3.3 Water Conservation

Water consumption in airport terminals is affected by landscape irrigation demand; demand from commercial/retail facilities, restrooms, and kitchen spaces; as well as cooling towers and maintenance uses. Decreasing the demand for large volumes of water can decrease overall maintenance costs and life-cycle costs, as well as reduce costs through lower water usage and lower sewage treatment.

Following measures are considered to conserve the water.

- Fresh Water demand of the project has been tried to minimize by adopting dual plumbing alternative in place of conventional single piping system. Dual plumbing system in place of conventional plumbing system enables usage of STP treated for various uses and minimizes the fresh water demand.

- Specifying low- Flow fixtures for restroom lavatories, toilets, and urinals can significantly reduce the amount of water used on site, without large up-front costs and a relatively short payback period. Specifying 0.5 gallon per minute flow rates on bathroom lavatory faucets and employing automatic shut-off sensors can reduce the amount of water used from these fixtures by more than 80%.
- Installing signage to explain how the flush valves work in each stall helps ensure the toilets will be used correctly and water efficiency will be maximized.
- Low-flow urinals and fuzzy logic urinals are big contributors to water savings in men's rooms. Fuzzy logic flushing systems conserve water by measuring the length and frequency of use and flush an appropriate amount. Dry urinals or waterless urinals also contribute to water and sewage savings in men's rooms. These urinals eliminate the use of water for flushing except for maintenance. Specialized sealant liquids and innovative urinal traps are used to prevent odor
- In the project scheme, proposal of rainwater harvesting pit is considered instead of discharging storm water into the storm water drains of city. It is proposed rainwater will be collected from the site and will be recharged into ground through 6 nos. of rainwater harvesting pits. This will not only augment the ground water level of the site but will also help in reducing the run-off on roads & storm water drains during heavy rains which may sometime leads to local flooding.

5.3.4 Construction material

It is generally anticipated that building & construction projects do not have high emissions and discharges involved. However, emissions and discharges are involved but indirectly. Production of construction raw material is one of the majorly polluting sectors e.g. cements plant, brick kilns, steel plants, batching plants etc. Some of the construction materials are energy intensive and their manufacturing involves large amount of energy consumption. Along with the energy requirement, emissions, and raw material requirement for production of construction raw material, additional cost is associated which is transportation of construction material. Transportation of material to longer distance will add to cost, fuel requirement, emission, and time. Thus, analysis has been made to opt for less energy intensive raw material. Locally available raw material, i.e. sandstone shall be used for construction purpose to the extent possible. Additionally, option for usage of fly-ash bricks and fly-ash mix cement is also considered. Additionally, best practices shall be adopted like avoiding stock piling of material at site, storage of raw material under covered sheds and careful usage of raw material. These alternatives to some extent will reduce the requirement of raw material and energy footprints of the building.

CHAPTER 6: ENVIRONMENTAL MONITORING PROGRAMME

6.1 INTRODUCTION

Environmental Monitoring is an essential tool for sustainable development and ensuring most effective implementation and monitoring of Environmental Management Plan and mitigation measures. It is also very essential to keep updating the environmental management system for effective conservation of environment along with ongoing project activities/operation. The environment monitoring plan enables environmental management system with early sign of need for additional action and modification of ongoing actions for environment management, improvement, and conservation. It provides exact idea for mitigation measures to be implemented as it is linked with actual degradation of environmental quality due to the project activities. Hence, monitoring of critical parameters of environmental quality is very essential in the routine activity schedule of project operation.

An Environmental Monitoring Program will be scheduled for the following major objectives:

- Assessment of the changes in environmental conditions, if any, during the project operation/activities.
- Monitoring and tracking the effectiveness of Environment Management Plan and implementation of mitigation measures planned.
- Identification of any significant adverse transformation in environmental condition to plan additional mitigation measures.

6.2 ENVIRONMENTAL MONITORING

Project Proponent shall insure to monitor and analyze ambient air quality, workplace air, noise levels, groundwater quality, soil quality to know the impact if any during construction and operation phase of the project to understand the status of the environment after implementation of the project. The monitoring programs for the construction and operation phase are presented in **Table 6.1 and 6.2.**

Table 6-1: Environmental Monitoring Program during Construction Phase

S.No.	Aspects	Parameters to be Monitored	Frequency of Monitoring	Location
1	Ground Water [Physico-Chemical]	pH, temperature, Salinity, Conductivity, TDS,	As per CPCB Guidelines	2-3 Locations

S.No.	Aspects	Parameters to be Monitored	Frequency of Monitoring	Location
	Parameters]	Turbidity, DO, COD, BOD, Phosphate, Nitrate, sulphate, Chlorides etc.		
2	Ambient Air Quality Monitoring	Particulate Matter-10 Particulate Matter-2.5 Sulphure Dioxide Oxides of Nitrogen Carbon Monoxide	As per CPCB Guidelines	2-3 Locations
3	Noise	Equivalent Noise Levels	As per CPCB Guidelines	2 to 3 locations representing different receptors

Table 6-2: Environmental Monitoring Program during Operation Phase

S. No	Item	Parameters	Frequency	Methodology
1.	Ambient Air quality	PM ₁₀ , PM _{2.5} , SO ₂ , NO _x , CO, etc.	3-4 Location (Main Gate, and DG Sets Half Yearly, 24 Hr. at each location).	IS-5182, CPCB (guidelines for measurement of Ambient Air Pollutants).
2.	Stationary Emission from Stack	PM, SO ₂ , NO _x	Quarterly (Continuous Stack Monitoring by provided Online Monitoring station.	IS-11255 (guidelines for stack emission)
3.	Process emission	Fugitive gaseous pollutant expected.	Half Yearly	-
4.	Surface water and ground water	pH, Temperature, EC, Turbidity, Total Dissolved Solids, Calcium, magnesium, Total hardness, Total Alkalinity, Chlorides, Sulphates, Nitrates, DO, COD, BOD, oil and Grease, Metals expected in effluent.	Half Yearly	Standard limits: Surface- IS:2296 Ground- IS 10500 Sampling Methodology- IS: 3025
5	Liquid Effluent/ Waste Water	Physical and chemical parameters with organic content	Half Yearly	Sampling Methodology- IS: 3025
6.	Noise	Equivalent noise level- dB (A)	Half Yearly	IS:9989 (Assessment of noise with respect to community response)
7.	Solid/Haz. Waste	As per CPCB/SPCB Direction	As per CPCB/SPCB Direction	As per CPCB/SPCB Direction
8.	Greenbelt	Number of plantation (Units),	Regular basis	-

		Number of Survived plants/ trees, Number of poor plants/ Trees		
9.	Environmental Audit	As per Direction of ISO 14001	Once in a Year	-

6.3 MONITORING METHODOLOGY

Monitoring of environmental samples will be done as per the guidelines provided by MoEF&CC/ CPCB. The method followed will be recommended / standard method approved / recommended by MoEF&CC/CPCB/ SPCB.

6.4 REPORTING AND DOCUMENTATION

The records of the monitoring program will be kept on regular basis for all aspects of the monitoring. Separate records for water, wastewater, solid wastes, air emission, soil and manure/compost will be prepared and preserved regularly. Immediately upon the completion of monitoring as per the planned schedule, report will be prepared and necessary documents will be forwarded to the concerned authorities. Methodology of monitoring (sampling and analysis) will be prepared as separate documents as SOP (Standard Operating Procedure) wherever required. The records showing results/ outcome of the monitoring programs will be prepared as per the requirement of the schedule mentioned above. Regularly, these documents and records will be reviewed for necessary improvement of the monitoring plan/ mitigation measures/ environmental technologies as well as for necessary actions of environmental management cell.

6.4.1 Meteorology

Meteorology forms one of the important categories of environment in the area as it directly controls the levels of ambient air quality in the surrounding. As such, a meteorological station is proposed to be set up inside of plant at the highest point of building/ structure for recording of relevant meteorological parameters. The observatory should have equipment for recording the temperature, relative humidity, rainfall, atmospheric pressure as well as wind speed and wind direction. The parameters are regularly monitored at meteorological stations.

6.4.2 Ambient Air Quality

Monitoring of ambient air quality at inside and outside the proposed site should be carried out on a regular interval to ascertain the levels of harmful pollutants in the atmosphere. Ambient Air quality shall be monitored on quarterly basis for PM₁₀, SO_x and NO_x. 24 hourly samples of ambient air quality at three locations outside and inside the site, at least one in dominant wind direction, one in upwind direction shall be taken for PM₁₀, SO_x and NO_x quarterly basis at uniform interval at each location.

6.4.3 Surface Water Quality

Water quality constitutes another important area in post study monitoring programme. There are some major streams or perennial sources of surface water in the study area. Contamination of surface water during operation of airport is possible. Surface water should be generally sampled once in six months and analyzed for physical, chemical and bacteriological parameters, including heavy metals and trace elements throughout the year.

6.4.4 Ground Water Quality

Ground water quality is also required to be checked periodically to detect any contamination arising out of operation of airport. Ground water at the bore well should be generally sampled in six months and analyzed for physical, chemical and bacteriological parameters, including heavy metals and trace elements.

6.4.5 Noise Level

Ambient noise should be monitored at the inside and outside of site covering industrial, commercial residential and sensitive areas seasons for day time and night time L_{eq} .

6.5 ENVIRONMENTAL MANAGEMENT CELL (EMC)

To maintain the environmental quality within the standard, regular monitoring of various environmental components is necessary. The EMC takes care of pollution monitoring aspects and implementation of control measures. For proposed project, EMC shall be formed to maintain the environmental quality within the norms in and around the project site. A group of technically qualified person shall be deputed for maintenance, up keep and monitoring the pollution control equipment to keep them in working at the best of their efficiencies. The same EMC team will monitor the prescribed parameter.

6.5.1 Responsibility of EMC

The cell will be responsible for monitoring of the environment related requirements which include:

- EMC shall be in regular touch with SPCB and shall send them environmental monitoring reports regularly in the prescribed format, as per the prevailing practice. Any new regulations considered by State/Central Pollution Control Board for the facility shall be taken care of by EMC.
- In case of emergency (non-compliance/deviation/violation/major accident), Head of Environment Department will do immediate reporting to the Executive Director-Corporate, Directors and Chairman of the Company.
- Prevention of incidents/accidents that might result from abnormal operating

conditions.

- Establish appropriate management system for environment management and ensure regular auditing to verify compliance.
- Ensure conducting third party environmental monitoring through certified bodies to evaluate prevailing environmental condition with respect to statutory norms.
- Timely renewal of Consents & Authorization will be taken care of.
- Submitting environmental monitoring report to SPCB. The cell will also take mitigative or corrective measures as required or suggested by the Board.
- Conduct and submit annual Environmental Statement to SPCB.
- Prepare and submit six monthly report on the compliance with the conditions of the environmental clearance.
- Keeping the management updated on regular basis about the findings / results of monitoring activities and proposes measures to improve environmental performance.
- Conducting safety and health audits to ensure that recommended safety and health measures are followed.

6.6 BUDGET AND PROCUREMENT SCHEDULE

On regular basis, Environment Management Cell will inspect the necessity and availability of the materials, technologies, services, and maintenance works. The Cell will make appropriate budget for the purpose. Regular record review for any change in financial requirement of environment management will be done and appropriate budgetary provisions will be made. Along with other budgets, Budget for environmental management will be prepared and revised regularly as per requirement. The budget will include provisions for: -

- Environmental Monitoring Program
- Laboratory works for Environmental management activities
- Emergency Purchase of necessary material, equipment, tools, services
- Greenbelt development
- Social and Environmental Welfare and Awareness programs / training (CER)
- Annual Environmental Audit

Table 6-3: Environmental Monitoring Program

S. No.	Particulars	Parameters	Frequency	Recurring cost /Year (Lakh)
CONSTRUCTION PHASE				
1.	Ambient Air	PM _{2.5} , PM ₁₀ , SO ₂ & NO ₂	Once in a Month	2.0



	Monitoring			
2.	Water Quality Monitoring	Drinking Water Specifications	Once in three months	2.0
3.	Stack Emission Monitoring	PM _{2.5} , PM ₁₀ , SO ₂ , NO ₂ , HC & CO	Every Six Month	2.0
4.	Noise Level Monitoring	24 Hrs. Noise Level	Once in Every Week	1.0
TOTAL				7.0
OPERATION PHASE				
1.	Ambient Air Monitoring	PM _{2.5} , PM ₁₀ , SO ₂ CO & NO ₂	Once in Every Three months	3.0
2.	Stack Emission Monitoring	PM _{2.5} , PM ₁₀ , SO ₂ , NO ₂ , CO,	Every Six Months	2.0
3.	Treated Sewage/ Effluent Monitoring	pH, BOD, COD, Oil, Grease & Total Suspended solids	Daily	2.0
4.	Noise Level Monitoring	24 Hrs. Noise Level	Every Three Months	1.0
5.	Water Quality Monitoring	Drinking Water Specifications as per IS 10500	Once in three months	2.0
TOTAL				10.0

6.7 SUMMARY

The environment monitoring plan enables environmental management system with early sign of need for additional action and modification of ongoing actions for environment management, improvement, and conservation. The environmental monitoring points will be decided considering the environmental impacts likely to occur due to the operation of proposed project as the main scope of monitoring program is to track, timely and regularly, the change in environmental conditions and to take timely action for protection of environment. Monitoring of environmental samples will be done as per the guidelines provided by MoEF&CC/CPCB/SPCB. Separate records for water, wastewater, air emission, soil and manure/ compost will be prepared and preserved regularly. Along with other budgets, budget for environmental management will be prepared and revised regularly as per requirement.

CHAPTER 7: ADDITIONAL STUDIES

7.1 PREAMBLE

In this chapter following issues are described and have been carried out.

- Public Hearing
- Risk Assessment

7.2 PUBLIC HEARING

Public hearing is a very significant part of the process of public participation envisaged under guidelines issued by MoEF&CC, Government of India. It facilitates involvement of all the stake holders of the project which is essential for ensuring smooth running of project and benefitting all section of society in the process of economic development of the region.

This draft EIA report has been prepared which will be submitted to Assam State Pollution Control Board for conducting of public hearing as per EIA notification, 2006. The copies of the same will be sent to various govt. organizations located in the affected area. So, that it is easily approachable to the local persons inhabiting the impacted area and they should get aware about the benefits and other aspects of the proposed project and can express their suggestions/objection etc. during the Public Hearing.

Suggestions/Objection which will be raised in the public hearing will be addressed in the final EIA report.

7.3 FEASIBILITY STUDY ON USE OF NATURAL GAS IN POWER GENERATION SET

A natural gas power generation set is a system that uses natural gas as fuel to produce electricity while DG sets will use diesel as fuel to produce electricity. However, the availability of natural gas in remote areas hinders its feasibility. Additionally, there are various challenges that hinder the feasibility for usage of natural gas power generation sets. The factors are illustrated below:

- **Infrastructure Limitations:** The lack of developed infrastructure for natural gas distribution, such as pipelines and storage facilities, can hinder the deployment of natural gas power generation sets, especially in remote or less-developed areas.
- **Regulatory Hurdles:** Permitting and regulatory processes for natural gas facilities are more complex than those for diesel or other fuels, leading to delays in project development and deployment.

- **Technological Constraints:** Natural gas generators often require advanced technology, which may not be as widely available as traditional diesel generators. This can limit options for operators seeking to transition to natural gas.
- **High Flammability Risk:** While both natural gas and diesel are flammable still natural gas is more volatile than diesel, which may have some safety concerns associated with gas leaks.
- **Public Perception and Policy:** Public concerns over fracking, methane emissions, and environmental impacts can lead to resistance against natural gas projects, impacting their availability and implementation.
- **Market Dynamics:** Fluctuations in natural gas prices and supply can affect the feasibility and attractiveness of investing in natural gas power generation technology. In regions where natural gas is not abundantly available, reliance on it can be risky.
- **Economic Factors:** Initial costs for converting existing systems to natural gas or for new natural gas installations can be high, especially if existing infrastructure does not support it.
- **Demand Variability:** In regions where demand for electricity fluctuates significantly, the reliance on natural gas may be seen as less stable compared to more established sources like diesel, leading to cautious investment.

These factors contribute to the limited availability of natural gas power generation sets, making it essential to consider regional dynamics, infrastructure needs, and economic viability when assessing their use. However, diesels are readily available in remote areas as well. Other factors also make it feasible to operate DG sets in remote locations. These factors are illustrated below:

- **Infrastructure Readiness:** Diesel fuel is widely available and the infrastructure for storage, transportation, and distribution is well-established, making it easier to implement in various locations.
- **Higher Energy Density:** Diesel has a higher energy density compared to natural gas, meaning it can store more energy in a smaller volume. This is particularly advantageous in applications with space or weight constraints.
- **Engine Compatibility:** Diesel generators are specifically designed to run on diesel fuel, ensuring optimal performance and efficiency without the need for modifications or dual-fuel systems.
- **Reliability and Stability:** Diesel fuel provides a consistent energy output and can be

stored for long periods without degradation, ensuring reliability in power generation, especially in remote or off-grid areas.

- **Performance in Varying Conditions:** Diesel engines typically perform well in diverse environmental conditions, including extreme temperatures, where natural gas systems might face challenges.
- **Lower Initial Costs:** The initial investment for diesel generators can be lower than converting existing systems to run on natural gas, especially in areas where natural gas infrastructure is lacking.
- **Less Flammability Risk:** While diesel is still flammable, it is less volatile than natural gas, which can mitigate some safety concerns associated with gas leaks.
- **Less Methane Leakage:** While diesel has higher CO₂ emissions, natural gas production and transportation can result in methane leaks, a potent greenhouse gas. Diesel's closed-loop fuel system avoids this issue.
- **Reduced NO_x Emissions with Advanced Technology:** Modern diesel engines equipped with technologies like selective catalytic reduction (SCR) can significantly reduce NO_x emissions, making them competitive with natural gas generators in terms of air quality impacts.
- **Mature Technology:** Diesel power generation technology is well-understood and has a proven track record, making it a reliable choice for many industries.

In summary, diesel's established infrastructure, compatibility with existing equipment, higher energy density, and reliability make it a practical and often preferred choice for power generation in various applications.

7.4 RISK ASSESSMENT

Risk analysis is the systematic study of uncertainties and risks encountered in various areas during any operation. There may be possible hazards to human beings, flora- fauna, all forms of property and the environment. Extreme care is essential in handling all of them in various stages of manufacturing viz. processing, treatment etc. The management aims at full preparedness to meet effectively the eventualities resulting from any unfortunate occurrence of hazards/ accidents. Hazard analysis involves the identification and quantification of the various hazards (unsafe conditions) that exist in the project site. On the other hand, risk analysis deals with the identification and quantification of risks occurring due to the airport operations and personnel exposed, due to accident resulting from the hazards in the premises.

The main objective of the risk assessment study is to determine damage due to major hazards having damage potential to life and property and provide a scientific basis to assess safety level of the facility. In this chapter, an attempt has been made towards hazard identification and risk assessment with regards to the incident leading towards losses and to prioritize the action for either eliminating the hazard or minimizing the effect of it along with the disaster management plan.

Activities requiring assessment of risk due to occurrence of most probable instances of hazard and accident are both onsite and off-site.

Hence, RA is an invaluable method for making informed risk-based process safety and environmental impact planning decisions, as well as being fundamental to any decision while sitting a facility. Risk Assessment may be carried out to serve the following objectives:

- Identification of safety areas.
- Identification of hazard sources.
- To find out values of magnitude and severity of consequences for each hazard.
- Suggest risk mitigation measures based on engineering judgement, reliability, and risk analysis approaches as appropriate to each hazard.
- Disaster Management Plan

Purpose of Risk Assessment:

Although the purpose of risk assessment includes the prevention of occupational risks, and this should always be goal, it will not always be achievable in practice. Where elimination of risks is not possible, the risk should be reduced and the residual risk controlled. At a later stage, as part of a review program, such residual risk will be reassessed and the possibility of elimination of the risk, perhaps, in the light of new knowledge, can be reconsidered.

The purpose of the risk assessment is to evaluate the adequacy of the airport and aircraft security. This risk assessment provides a structured qualitative assessment of the operational environment. It addresses sensitivity, threats, vulnerabilities, risks, and safeguards. The assessment recommends cost-effective safeguards to mitigate threats and associated exploitable vulnerabilities. Conceptual framework of risk assessment is shown in **Figure 7.1**.

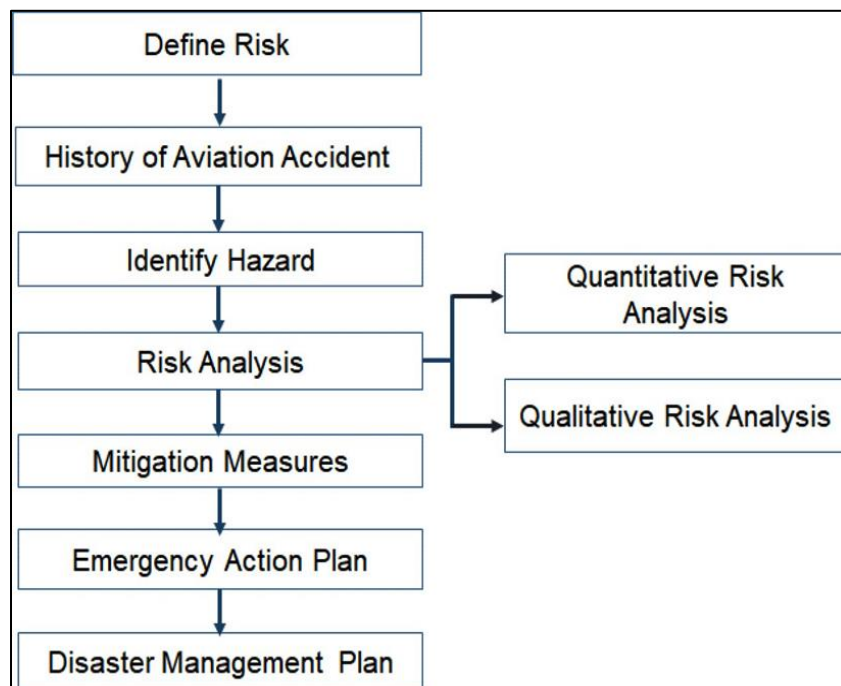


Figure 7-1: Conceptual Framework for Risk Assessment

Together, these broad tools attempt to minimize the chances of accidents occurring. Yet, there always exists, no matter how remote, probability of occurrence of a major accident. If the accident involves highly hazardous chemicals in sufficiently large quantities, the consequences may be serious to the site, to surrounding areas and the populations residing therein. It may happen usually as the result of a malfunction of the normal operating procedures. It may also be precipitated by the intervention of an outside force such as a cyclone, flood, earthquake or deliberate acts of arson or sabotage. This chapter deals with the risks associated with the project, its mitigation, and the Disaster Management Plan.

7.4.1 Hazard Identification

A) Hazard during construction phase:

The main risks associated with the construction hazards of the Airport project are mainly electrical and mechanical failures or lack of safety precautions. During the construction phase, the responsibility of maintaining safety is jointly on the project developer and the deployed contractors. The risks and hazards associated with various construction activities and their control measures/mitigation measures or safe working practices are listed in table below:

Table 7-1: Risk & Hazard Associated and their control measures

Risks & Hazards Associated with Construction	Control Measures
Manual Handling: <ul style="list-style-type: none"> • Strains and sprains • Incorrect Lifting Too heavy loads • Twisting • Bending • Repetitive movement 	<ul style="list-style-type: none"> • Exercise/warm up • Get help when needed Control Loads • No rapid movements/ twisting/ bending/ repetitive movement • Good housekeeping
Falls-Slips-Trips: <ul style="list-style-type: none"> • Falls on same level • Falls to surface below Poor house-keeping Slippery surfaces Uneven surfaces • Poor access to work areas Unloading materials Wind • Falling objects 	<ul style="list-style-type: none"> • Tidy work place • Guardians, handholds, harness, hole, cover, hoarding, no slippery floors/ trips hazards • Clear/safe access to work areas & egress from work areas. Dust/water controlled environment as much as possible • Good Housekeeping
Fire: <ul style="list-style-type: none"> • Flammable liquids like fuel storage area and combustible building materials Poor house-keeping • Grinding sparks • Open flames, absence of fire hydrant network. 	<ul style="list-style-type: none"> • Combustible/flammable materials properly stored/used Good housekeeping • Fire extinguishers made available & fire hydrant network with reserve Fire Water (as per NFPA code) • Emergency preparedness plan in case of fire or collapse of structure. • Regular mock drills
Absence of Personal Protective Equipment: <ul style="list-style-type: none"> • Lack of adequate footwear Head protection • Hearing/ eye protection • Respiratory protection • Gloves, goggles 	<ul style="list-style-type: none"> • Head/face-footwear-hearing/eye-skin-respiratory protection provided • Training for use of PPEs Proper maintenance of PPEs
Electricity: <ul style="list-style-type: none"> • Electrocution Overhead/underground services • Any leads damaged or poorly insulated Temporary repairs • No testing and tagging Circuits overloaded • Non-use of protective devices 	<ul style="list-style-type: none"> • All electrical equipments in good condition and earthed No Temporary repairs • No exposed wires & good insulation No overloading • Use of protective devices Testing and tagging
Excavations and land filling: <ul style="list-style-type: none"> • Trench collapse • Undetected underground services Falls • Hazardous atmosphere 	<ul style="list-style-type: none"> • Knowledge of Soil stability • No water accumulation and pumping facilities Clear of suspended loads • Hard hats/PPE Ladders Atmospheric testing Traffic controls Emergency Plan

<p>Noise:</p> <ul style="list-style-type: none"> • Unknown noise levels • Known noise levels over 85 decibels 	<ul style="list-style-type: none"> • Levels below 85 decibels Proper protections
<p>Falling Materials:</p> <ul style="list-style-type: none"> • Fall during carrying / lifting materials Dislodged tools and materials from overhead work areas. 	<ul style="list-style-type: none"> • Materials to be secured Kept away from edge Toe boards • Use of hard hats
<p>Cranes & Lifts:</p> <ul style="list-style-type: none"> • Display of carrying capacity loads (No. of person), incorrectly slung, defective lifting equipment, unsecured loads, craning in close proximity to building • Falls • Falling materials 	<ul style="list-style-type: none"> • Periodic testing by competent authority • Correctly slung/secured loads, lifting equipments good condition • Use of proper hand signals • Falls while unloading controlled

B) Hazard during Operation Phase:

Anticipated Impacts:

Identification of hazards at Airport is of primary significance in the analysis, quantification, and cost-effective control of unlikely events of accidents. A classic definition of hazard states that hazard is in fact the characteristics of system/process that presents potential for an accident. Hence, all the components of proposed project need to be thoroughly examined to assess their potential for initiating or propagating an unplanned event/sequence of events, which can be termed as an accident.

Doloo Airport will deal with two materials, which are generally hazardous in nature by virtue of their intrinsic chemical properties (highly inflammable). Fire, explosion, toxic release or combinations of these are the hazards associated with projects/ plants using hazardous chemicals. More comprehensive, systematic, and sophisticated methods of **Safety Engineering**, such as, **Hazard Analysis** and **Quantitative Risk Assessment** have now been developed to improve upon the integrity, reliability, and safety of such projects.

The Primary emphasis in safety engineering is to reduce risk to human life, property, and environment. Some of the more important methods used to achieve this are:

- **Work Safety Analysis:** The technique discerns whether the layout and operating procedures in practice have any inherent infirmities.
- **Quantitative Risk Analysis:** Provides a relative measure of the likelihood and severity of various possible hazardous events by critically examining the process and design.
- **Safety Audit:** Takes a careful look at operating conditions, work practices and



work environments to detect unsafe conditions.

Several hazards may endanger the Airport, health and safety of workers and may cause danger to the surrounding environment. The following hazards are to be identified, assessed and suitable preventive/mitigating plans taken prior to rolling out project works initiation. Details of Hazards are given in table below.

Table 7-2: Details of Hazards

Type of Hazard	Hazard	Details
Natural Hazard	Flood	Not Applicable
	Earthquake	The project site is located at Seismic Zone V; thus, area is at High Risk.
	Lightening	Electrical energy from lightning will flow out in all directions of lowest electrical impedance to equalize the electrical potential. Lightning poses a serious threat to the safety of people working outdoors: <ul style="list-style-type: none"> • Refuelling • Catering • Other aircraft services • Baggage handling • Aircraft marshalling, towering etc. • Passenger boarding/deplaning (passenger stairs) • Airport workers maintaining airports grounds
	Wildlife Strike	The chances of Bird or Animal strike are High.
Man Made	Leakage of flammable material	ATF will not be stored at the airport. Fuel will be supplied by IOCL/BPCL via tankers for refuelling of aircraft. Thus, chances of explosion are moderate.
	Crashing of aircraft	This can occur due to technical fault.
	Bomb Threat	Terrorism Risk
	Air raids	
	Sabotage	
	Hijacking	
	Fire & explosion	This can be occurred due to the electric spark, leakage in fuelling area, fire in fuel storage area, fire in aircraft, fire in GSE etc.
	Electricity	Fatalities can arise due to electric shocks, burns and when contacted with overhead or underground power cables.
	Mechanical	The Mechanical fault can cause the risk & hazard which include the Aircraft, GSE, elevator, DG sets
Chemical	Spillage of oil and other chemicals.	

Preventive Measures:

As per Hazard identified, few measures will be adopted to reduce the risk at the first place. Details are given below:

1. Flood

- ✓ Drainage & Sewerage System will be provided all over the project site
- ✓ Rainwater harvesting will be designed for peak rainfall
- ✓ Cleaning of Storm water line and rainwater harvesting will be done prior to the monsoon season
- ✓ Sewage line will be connected through outside sewerage system for disposal of excess sewage.

2. Earthquake

- ✓ Structure will be design as per NBC 2016.
- ✓ All norms for safety of structure will be followed
- ✓ All the raw material will be chosen as per standard norms laid by NBC 2016.

3. Lightning

- ✓ Lightning detectors will be used at airport for recording, analysing, and predicting of thunderstorms. Figure showing procedure for safety during lightning is given in **Figure 7.2**
- ✓ Use of an automated warning and alerting system
- ✓ Ensure that the building is well grounded, and every conductive path is bonded to the ground system.
- ✓ Lightning arrestor will be installed at every building.
- ✓ Fuel servicing operations shall be suspended where there are lightning flashes in the immediate vicinity of the airport.
- ✓ A written procedure shall be established for fuelling operations.



Figure 7-2: Procedure for safety during lightning

4. Wildlife Strike/Bird Strike:

Bird-strike events are relatively common, occur most often on the ground or at low altitude, and are usually benign. However, bird strikes can have significant economic and occasional safety consequences for flight operations. Pilots and operators should be knowledgeable about the hazard, and flight crews should use facts, data, and standard operating procedures to reduce the potential for and consequences of a bird strike. Three-quarters of bird strikes involve the wing or engines, but they can damage almost any part of an airplane. Single or multiple large birds, relatively small numbers of medium-size birds, and large flocks of relatively small birds are all problematic and have resulted in accidents. Wildlife Hazard Management Plan may be implemented by a single airport employee undertaking wildlife control activities on an occasional “as needed” basis or by a full-time wildlife biologist with a staff of operations personnel providing continuous bird. Bird identification is important because all species have unique vocalizations, behaviors, and habitat preferences that are useful in field identification. Figure 7.4 provides a list of the relative hazard of various species groups based on the percent of reported strikes that cause damage or an effect on flight.

Table 8-1. Ranking of 25 species groups as to relative hazard to aircraft (1=most hazardous) based on three criteria (damage, major damage, and effect-on-flight), a composite ranking based on all three rankings, and a relative hazard score. Data were derived from the FAA National Wildlife Strike Database, January 1990–April 2003¹.

Species group	Ranking by criteria			Composite ranking ⁵	Relative hazard score ⁶
	Damage ²	Major damage ³	Effect on flight ⁴		
Deer	1	1	1	1	100
Vultures	2	2	2	2	64
Geese	3	3	6	3	55
Cormorants/pelicans	4	5	3	4	54
Cranes	7	6	4	5	47
Eagles	6	9	8	6	41
Ducks	5	8	10	7	39
Osprey	8	4	8	8	39
Turkey/pheasants	9	7	11	9	33
Hérons	11	14	9	10	27
Hawks (buteos)	10	12	12	11	25
Gulls	12	11	13	12	24
Rock pigeon	13	10	14	13	23
Owls	14	13	20	14	23
Horned lark/snow bunting	18	15	15	15	17
Crows/ravens	15	16	16	16	16
Coyote	16	19	5	17	14
Mourning dove	17	17	17	18	14
Shorebirds	19	21	18	19	10
Blackbirds/starling	20	22	19	20	10
American kestrel	21	18	21	21	9
Meadowlarks	22	20	22	22	7
Swallows	24	23	24	23	4
Sparrows	25	24	23	24	4
Nighthawks	23	25	25	25	1

¹ Excerpted from the *Special Report for the FAA, Ranking the Hazard Level of Wildlife Species to Civil Aviation in the USA: Update #1, July 2, 2003*. Refer to this report for additional explanations of criteria and method of ranking.
² Aircraft incurred at least some damage (destroyed, substantial, minor, or unknown) from strike.
³ Aircraft incurred damage or structural failure that adversely affected the structure strength, performance, or flight characteristics and that would normally require major repair or replacement of the affected component, or the damage sustained makes it inadvisable to restore aircraft to airworthy condition.
⁴ Aborted takeoff, engine shutdown, precautionary landing, or other.
⁵ Relative rank of each species group was compared with every other group for the three variables, placing the species group with the greatest hazard rank for ≥ 2 of the 3 variables above the next highest ranked group, then proceeding down the list.
⁶ Percentage values, from Tables 3 and 4 in Footnote 1 of the *Special Report*, for the three criteria were summed and scaled down from 100, with 100 as the score for the species group with the maximum summed values and the greatest potential hazard to aircraft.

Figure 7-3: Hazard of various species based on reported strikes

Sources: Wildlife Hazard Management at Airports second Edition, July 2005 approved by FAA, Prepared by Ledward C. Clearly and Richard A. Dolbeer

Airports are responsible for bird control and should provide adequate wildlife control measures. If large birds or flocks of birds are reported or observed near the runway, the flight crew should consider:

- Delaying the takeoff or landing when fuel permits.
- Advise the tower and wait for airport action before continuing.
- Take off or land on another runway that is free of bird activity, if available.

To prevent or reduce the consequences of a bird strike, the flight crew should:



- Discuss bird strikes during takeoff and approach briefings when operating at airports with known or suspected bird activity.
- Be extremely vigilant if birds are reported on final approach. If birds are expected on final approach, plan additional landing distance to account for the possibility of no thrust reverser use if a bird strike occurs.
- Pilots should not rely on onboard weather radar, landing lights, airplane markings, time of day, or visibility to prevent bird strikes.
- Flight operations may need to be modified in the presence of known or anticipated bird activity.
- Delay takeoff or landing in the presence of bird activity.
- Below 10,000 feet, keep speed below 250 knots if operationally possible.
- Below 2,000 feet, climb at the maximum rate to reduce the flight time exposure to a strike hazard.
- Descend with idle power and avoid extended low-altitude level flight, particularly over water courses, nature reserves, or other areas of known or expected bird activity.
- When landing is assured, consider landing through birds versus a missed approach to avoid birds. This reduces the energy of the collision, the potential for increased damage associated with engines at a high-power level, and the potential for multiple engine ingestions at low airplane energy states and low altitude.
- Avoid or minimize manoeuvring at low altitude to avoid birds.

Measures suggested by FAA: Four basic control strategies are available to solve wildlife problems on airports:

- Aircraft flight schedule modification:** Pilot could be advised not to depart during a 20-minute period at sunrise or sunset during winter when large flocks of blackbirds cross an airport going to and from an off-airport roosting site. Air traffic controllers on occasion might need to temporarily close a runway with unusually high bird activity or a large mammal (e.g., deer) incursion until wildlife control personnel can disperse the animals.
- Habitat Modification and exclusion:** Habitat modification means changing the environment to make it less attractive or inaccessible to the problem wildlife. All wildlife requires food, cover, and water to survive. Any action that reduces, eliminates, or excludes one or more of these elements will result in a proportional reduction in the wildlife population at the airport. Habitat modifications to make the airport and surrounding area as unattractive as possible to hazardous wildlife must be the foundation of every airport's Wildlife Hazard Management Plan.
 - ✓ Be aware of food attractants for birds that exist on and in proximity to the airport. On the airport, require bird-proof storage of food waste, prohibit bird feeding, and

promote good sanitation and litter control programs.

- ✓ Do not use trees and other landscaping plants for the street side of airports that produce fruits or seeds attractive to birds. On airside areas, the large expanses of grass and forbs can sometimes provide ideal habitat for rodent and insect populations that attract raptors, gulls, other bird species, and mammalian predators such as coyotes. In addition, grasses allowed to produce seed heads can provide a desirable food source for doves, blackbirds, and other flocking species. The management of airside vegetation to minimize rodents, insects, and seeds might be complex, requiring insecticide, herbicide, and rodenticide applications; changes in vegetation cover; and adjustments in mowing schedules (e.g., mowing at night to minimize bird feeding on insects exposed by the mowing).
- ✓ Take care when selecting and spacing plants for airport landscaping. Avoid plants that produce fruits and seeds desired by birds. Also avoid the creation of areas of dense cover for roosting, especially by European starlings and blackbirds. Thinning the canopy of trees, or selectively removing trees to increase their spacing, can help eliminate bird roosts that form in trees on airports.
- ✓ Water acts as a magnet for birds; therefore, eliminate all standing water on an airport to the greatest extent possible. Fill or modify to allow rapid drainage of depressions in paved and vegetated areas, and disturbed areas at construction sites that accumulate standing water after rain. This is particularly important at coastal airports where fresh water is highly attractive to birds for drinking and bathing. Do not establish retention ponds, open drainage ditches, outdoor fountains and other wetland sites on or adjacent to airports.
- ✓ If food, water, or cover cannot be eliminated by habitat modification, then actions can sometimes be taken to exclude the wildlife from the desired resource. Exclusion involves the use of physical barriers to deny wildlife access to a particular area. As with habitat modification, exclusion techniques, such as installing a covered drainage ditch.

iii. Repellent Techniques: Repellent and harassment techniques are designed to make the area or resource desired by wildlife unattractive or to make the wildlife uncomfortable or fearful. Long term, the cost-effectiveness of repelling wildlife usually does not compare favourably with habitat modification or exclusion techniques. Habitat modifications and exclusion techniques will never completely rid an airport of problem wildlife; therefore, repellent techniques are a key component of any wildlife hazard management plan.

- ✓ Repellents work by affecting the animal's senses through chemical, auditory, or visual means. Habituation or acclimation of birds and mammals to most repellent devices or techniques is a major problem.

- ✓ Regular patrols of airside areas to disperse birds and other hazardous wildlife are a critical component of an integrated program of wildlife hazard management on airports. Often, driving a vehicle toward the wildlife will be enough to cause the wildlife to disperse, especially if the driver has been deploying repellent and removal techniques and strategies
- ✓ Probably the most commonly used audio scaring device for deer is the propane cannon. However, deer rapidly habituate to propane cannons.
- ✓ Most visual repellents are simply a variation on an ancient theme—the scarecrow. In general, visual repellents, such as hawk effigies or silhouettes, eyespot balloons, flags, and Mylar reflecting tapes, have shown only short-term effectiveness and are inappropriate for use as a long-term solution to bird problems on airports.
- ✓ Visual repellents such as flags and effigies have proven ineffective for repelling mammals.

iv. Wildlife Removal: Removal can be accomplished by capturing and relocating or by killing the target animals. With few exceptions, a federal Migratory Bird Depredation Permit, and in many cases a state permit is required before any migratory birds may be taken (captured or killed). A state permit is generally necessary before any state-protected birds or mammals may be taken. Any capturing or killing must be done humanely and only by people who are trained in wildlife species identification and the techniques to be deployed.

Habitat modifications to minimize food cover, and water and physical barriers to exclude wildlife are the foundations of wildlife hazard management programs for airports. In addition, an integrated array of repellent techniques is necessary to disrupt normal behaviour and to stress hazardous wildlife that attempt to use the airport. These repellent techniques must be used judiciously and backed by real threats to minimize habituation. To this end, lethal control of selected individuals of common species is sometimes necessary to reinforce repellent actions. Furthermore, the management of a wildlife hazard situation on an airport might require removal of a particular animal or group of animals or require that a local population of a problem species be reduced by lethal means until a long-term, nonlethal solution is implemented. Finally, the most critical factor for the success of a wildlife hazard management program is to have motivated and trained professionals who are knowledgeable about the wildlife species attempting to use the airport environment and the techniques used to manage the problems these species create.

5. Crashing of Aircraft

All safety norms laid by DGCA/ICAO/FAA/MoCA shall be followed.



6. Bomb Threat, Air raids, Sabotage, Hijacking

Airport security refers to the techniques and methods used to protect passengers, staff, aircraft, and airport property from accidental/malicious harm, crime, and other threats. Aviation security is a combination of human and material resources to safeguard civil aviation against unlawful interference. Government of India has established “Bureau of Civil Aviation Security” (BCAS) under Ministry of Civil Aviation which is responsible for regulating, monitoring, training, overseeing, and coordination of Airport Security function at all the civil airports and civil enclaves. BCAS has laid down security regulations and exhaustive guidelines for all the airport operators. The Contingency plan to deal with Bomb Threat in Civil Aviation at proposed Doloo Airport shall be developed (in association with local authorities) to ensure that the Aviation Security measures and responsibilities are clearly defined and understood by all the users of Doloo Airport. The Contingency Plan to bomb threat in Civil Aviation at Doloo Airport shall clarify and detail all measures that are required to be implemented at Doloo Airport to meet requirements of the National Civil Aviation Security Program. The Contingency Plan to deal bomb threat in Civil Aviation at Doloo Airport is primarily to address specific Aviation Security legislation, administered by BCAS, Govt. of India. Provision has also been made for procuring adequate quantity of security equipment namely, handheld metal detector, door frame metal detector, x-ray baggage scanning machines etc. The security at the airport shall be provided by highly trained manpower by CISF. Access to all the vital facilities and installations shall be guarded and controlled by CISF as per BCAS directives from time to time. Additional security measures would be taken as per directives of BCAS based on threat and risk perception.

7. Fire & Explosion

In accordance with the provisions of safety and security at airport, States are required to provide rescue and firefighting equipment and services at an airport. Besides aircraft fires the fire safety services at an airport are also expected to cater to incidents of fire in the passenger terminals, cargo terminal, air traffic control setup and ancillary buildings. Fire and emergency services are expected to cope with an emergency occurring at the aerodrome or in its vicinity. The objective of safety services is to minimize the effects of an emergency, particularly in respect of saving lives and minimizing losses; and maintaining uninterrupted aircraft operations to the extent possible or at least to restore airport operations as soon as possible.

The rupture of fuel tanks in an aircraft crash and the consequent spillage of highly volatile fuels, and other flammable liquids used by aircraft, present a high degree of probability of ignition, if these liquids meet hot metal parts of the aircraft or because of sparks caused by the movement of wreckage or disturbance of the electrical circuit. Fires may also occur

through the discharge of accumulated electrostatic charges at the time of ground contact or during fuelling operations. An outstanding characteristic of aircraft fires is their tendency to reach lethal intensity within a very short time. For this reason, the provision of adequate and special means of dealing promptly with an aircraft accident or incident occurring at, or in the immediate vicinity of, an airport assumes primary importance because it is within this area that there are maximum opportunities of saving lives.

Appropriate level of protection is planned to be provided at Doloo Airport for rescue and firefighting services in the master plan. Doloo Airport Authorities will developed Firefighting system which includes –Fire Tender approach road to various sensitive locations and fire hydrant system. Other Firefighting facilities i.e., Fire tenders, fire water, manpower etc. shall also be provided by adjoining IAF facilities.

Building fire protection systems have been categorized into Active measures and Passive measures. Active measures involve the detection and alarm that informs the occurrence of a fire and triggers sort of counteraction towards fire extinguishment and control of smoke spread.

Passive fire protection measures are proactive approach taken at building design stage. Passive measures are concerned with building structure integrity, compartmentation etc. The priority of Structural Fire Protection is to carry out search & rescue operation without the building collapsing and prevent disproportionate damage to property. During the detailed design process, due care will be taken to provide an effective and safe design from a fire safety point. Consideration needs to be given to both Active and Passive Fire Protection.

All buildings would be designed such that occupant could escape to the place of ultimate safety this should be in the open air where dispersal, away from the building, can be achieved when fire occurs and to ensure that adequate escape routes are also provided. Automatic fire detection and alarm system would be installed in all areas used by public as per norms of national fire protection association. All the areas shall be served by hydrant system/wet riser for fire protection of terminal, cargo, and other buildings. Automatic sprinkler systems shall be provided in the terminal and Cargo building as per NBC. Adequate Fire Hydrants to serve the terminal building and close to Cargo are to be planned.

Fire exits plans will be conspicuously posted on each floor showing clearly the routes to appropriate exits. Emergency lighting for exit signage in English and Hindi, and adequate egress illumination in the event of a power outage, shall be incorporated in the design.

First aid firefighting appliances would also be provided at all Terminal Building, Security Hold Area with 4 no. of aerobridges and bus lounge area, Parking Area Electrical Substations, and Aircraft Hanger etc.

8. Other measures:

- Safety officers will be appointed
- Routine Drill will be done
- All fire safety equipments will be installed in the complex as per norms for example fire hydrant, fire extinguishers, sprinkler, stand by pumps, booster pumps, water tanks, fire sensor, alarm system

7.4.2 Risk Assessment

Detailed QRA Approach: Rule Sets and Assumptions

Identification of hazards and likely scenarios (based on Level-1 and Level-2 activities) calls for detailed analysis of each scenario for potential of damage, impact area (may vary with weather conditions / wind direction) and safety system in place. Subsequently each incident is classified according to relative risk classifications provided in table below:

Table 7-3: Risk Classification

Stage	Description
High ($> 10^{-2}/\text{yr.}$)	A failure which could reasonably be expected to occur within the expected life time of the airport. Examples of high failure likelihood are process leaks or single instrument or valve failures or a human error which could result in releases of hazardous materials.
Moderate ($10^{-2} \text{--} 10^{-4}/\text{yr.}$)	A failure or sequence of failures which has a low probability of occurrence within the expected lifetime of the airport. Examples of moderate likelihood are dual instrument or valve failures, combination of instrument failures and human errors, or single failures of small process lines or fittings.
Low ($< 10^{-4}$)	A failure or series of failures which have a very low probability of occurrence within the expected lifetime of airport. Examples of 'low' likelihood are multiple instruments or valve failures or multiple human errors, or single spontaneous failures of tanks or process vessels.
Minor Incidents	Impact limited to the local area of the event with potent for 'knock-on events'
Serious Incident	One that could cause: 1. Any serious injury or fatality on/off site; 2. Property damage of \$ 1 million offsite or \$ 5 million onsite.
Extensive Incident	One that is five or more times worse than a serious incident.

Assigning a relative risk to each scenario provides a means of prioritising associated risk mitigation measures and planned actions.

1. Thermal Hazards

In order to understand the damages produced by various scenarios, it is appropriate to understand the physiological/physical effects of thermal radiation intensities. The thermal radiation due to tank fire usually results in burn on the human body. Furthermore, inanimate objects like equipment, piping, cables, etc. may also be affected and need to be evaluated for damages. **Tables 7.4, 7.5 and Table 7.6** (below), respectively give tolerable intensities of various objects and desirable escape time for thermal radiation.

Thermal hazards could be from fires or explosion. Fire releases energy slowly while explosion release energy very rapidly (typically in microseconds). Explosion is rapid expansion of gases resulting in rapidly moving shock wave. Explosion can be confined (within a vessel or building) or unconfined (due to release of flammable gases).

BLEVE (boiling liquid expanding vapour explosion) occurs if a vessel containing a liquid at a temperature above its atmospheric boiling point ruptures. The subsequent BLEVE is the explosive vaporisation of large fraction of its vapour contents; possibly followed by combustion or explosion of the vaporised cloud if it is combustible range.

Thermal hazards have been considered for various scenarios including Fire in fuel storage tank/ Aircraft refuelling zone.

Table 7-4: Effects due to Incident Radiation Intensity

Incident Radiation	Damage Type
0.7	Equivalent to Solar Radiation
1.6	No discomfort on long duration
4.0	Sufficient to cause pain within 20 sec. Blistering of skin (first degree burn are likely).
9.5	Pain threshold reached after 8 sec. Second degree burn after 20 sec.
12.5	Minimum energy required for piloted ignition of wood, melting of plastic tubing etc.
25	Minimum Energy required for piloted ignition of wood, melting, plastic tubing etc.
37.5	Sufficient to cause damage to process equipment.
62.0	Spontaneous ignition of wood.

Table 7-5: Thermal Radiation Impact to Human

Exposure Duration	Radiation Energy {1% lethality}	Radiation Energy for 2nd degree burns	Radiation Energy for 1st degree burns
10 sec	21.2 kW/ m ²	16 kW/ m ²	12.5 kW/ m ²
30 sec	9.3 kW/ m ²	7.0 kW/ m ²	4.0 kW/ m ²

Table 7-6: Tolerable Intensities for Various Objects

Objects	Tolerable Intensities (kw/m ²)
Drenched Tank	38
Special Buildings (No window, fireproof doors)	25
Normal Buildings	14
Vegetation	10-12
Escape Route	6 (up to 30 sec.)
Personnel in Emergencies	3 (up to 30 sec.)
Plastic Cables	2
Stationary Personnel	1.5

Doloo airport will store only Diesel in an isolated place with all safety measures as per Petroleum Rules. Damage estimates based on overpressure are given in **Table 7.7** below:

Table 7-7: Damage due to Overpressure

Overpressure (psig/bar)	Damage
0.04	Loud Noise / sonic boom glass failure
0.15	Typical pressure for glass failure
0.5-1	Large and small windows usually shattered
0.7	Minor damage to house structure
1	Partial demolition of houses, made uninhabitable
2.3	Lower limit of serious structure damage
5-7	Nearly complete destruction of houses
9	Loaded train box wagons completely demolished
10	Probable total destruction of houses
200	Limits of crater lip

However, there is a very less possibility of explosion.

2. ATF Hazards

Aviation Turbine Fuel (ATF) is a highly flammable liquid. The fuel has a low vapour pressure at ambient temperature, which makes the liquid less volatile. Hence, it evaporates slowly in case of fuel leakage and remains in the atmosphere posing threat of fire. Also, the fuel has a flash point lower than the ambient temperature of Doloo in summers (~35°C). This means that the fuel will give off flammable vapour at a concentration sufficient to cause ignition. However, significant heat source is required to ignite the fuel and therefore proper safety management must be implemented.

ATF is classified for supply purpose as harmful because of the aspiration hazard and irritation to the skin. Toxicity following a single exposure to high levels (orally, dermally or by inhalation) of ATF is of low order; however, exposure to high vapour concentration can lead to nausea, headache, and dizziness. Accidental ingestion can lead to chemical burning of the mouth. Ingestion can lead to vomiting and aspiration into the lungs which can result

in chemical pneumonitis which can be fatal. Prolonged and repeated skin contact can lead to defatting of the skin, drying, cracking and dermatitis.

Storage Hazards: Typical storage hazards are applicable for this type of tank farm systems. Sources of ignition can include lightning, open flame, electrical spark, static discharge, chemical reaction, or any heat source that can raise or ignite the fuel-air vapor mixture. Since at Doloo the HSD storage is underground there are very less chances of such occurrence. The release of ATF could occur from transfer stations (gantry areas), storage to refueller systems, and valve glands or pipelines leakages due to several reasons. The most typical emergency relating to fuel handling is a fuel overflow or spill. Such events can be very minor in nature involving just a few litres of product, or they can be a catastrophic event involving hundreds of litres of fuel.

Combustion Hazards: The combustion products of aviation fuel include carbon dioxide, nitrogen oxides and sulphur oxides. Incomplete combustion will generate thick black smoke and potentially hazardous gases including carbon monoxide. However, smoke from such fires is buoyant and does not tend to seriously impact people on the ground in the open air.

Electrostatic Hazards of ATF: ATF has a low electrical conductivity. This provides for static electricity to be generated and charges to be accumulated. According to HSE, UK, the degree to which a static charge may be acquired by aviation fuels depends upon many factors such as:

- Amount and type of residual impurities
- Dissolved water
- Linear velocity through piping systems
- Presence of static generating mechanisms e.g., filters and
- Opportunity for the fuel to relax for a period of time to allow any charge generated to dissipate safely to earth

To reduce the accumulated amount of static electricity, antistatic additives are added to the fuel. This works by enhancing the conductivity of the fuel in order to shorten the time required for dissipating the static charge safely to earth.

Health Hazard: ATF is classified, for supply purposes as harmful, as a result of the aspiration hazard and irritation to the skin.

Acute Health Hazard: Toxicity following a single exposure to high levels (orally, dermally or by inhalation) of ATF is of a low order. However, exposure to higher vapour concentrations can lead to nausea, headache and dizziness. If it is accidentally ingested, irritation to the gastric mucous membranes can lead to vomiting and aspiration into the lungs can result in chemical pneumonitis which can be fatal.

- *Inhalation:* Under normal conditions of use ATF is not expected to present an inhalation hazard.
- *Skin:* ATF is slightly irritating to the skin and has a defatting action on the skin.
- *Eyes:* ATF may cause discomfort to the eye.
- *Chronic Health Hazards:* Prolonged and repeated contact with ATF can be detrimental to health. The main hazards arise from skin contact and in the inhalation of mists. Skin contact over long periods can lead to defatting of the skin, drying, cracking and possibly dermatitis. Excessive and prolonged inhalation of mists may cause chronic inflammatory reaction of the lungs and a form of pulmonary fibrosis.

Exposure Limit Values: ATF does not contain any components to which exposure limits apply; however, it is chemically very similar to white spirit, for which the following UK occupational exposure standards apply (HSE, 2000):

- OEL= 575 mg/m³ (100 ppm) 8-hour TWA value
- OEL= 720 mg/m³ (125 ppm) 10-min TWA value
- Diesel has also got similar hazards. It is stored in much less quantity but in over ground tank.

(where OEL-Occupational Exposure Limit & TWA- Time Weighted Average)

Effect & Consequence Analysis: As a part of risk assessment study, maximum credible accident analysis (MCA) is carried out to determine the maximum loss scenario from this analysis. It is an eventuality, which is possible and will have maximum consequential distances for the hazardous chemicals under evaluation.

The selection of the accident scenarios is based on the engineering and professional judgment, accident descriptions of the past in similar type of plants & the expertise in risk analysis studies.

All measures suggested by AAI under Corporate Safety Management System Manual (AAI-SAF-001 dated 20.05.2013) will be followed.

❖ **Electricity**

- ✓ Safety norms as per Indian Electricity rules 1956 and ECBC shall be followed
- ✓ Earthing system will be provided
- ✓ All the wires will be selected as per norms
- ✓ Design shall be done as per all Indian Code
- ✓ Sandbags will be provided near to the electric control panel
- ✓ Precaution banners will be displayed wherever required



- ✓ Regular maintenance will be done to check any loophole.
- ✓ Routine Drill will be done
- ✓ Sign of Danger at all hazard places will be displayed
- ✓ PPE will be provided to the workers

❖ **Mechanical**

- ✓ All mechanical equipment will be services in routine
- ✓ Sign of Danger at all hazard places will be displayed
- ✓ All safeguards will be provided at appropriate places
- ✓ Periodic change of all damaged equipment will be done
- ✓ Logbook will be prepared

❖ **Chemical**

- ✓ Isolated place will be provided for stooge of chemical
- ✓ Full surveillance will be done on chemical storage area
- ✓ Fire system will be provided at chemical storage area
- ✓ MSDS will be displayed
- ✓ Separate storage of Fuel will be done.
- ✓ License will be taken from concern department

7.5 DISASTER MANAGEMENT PLAN

A disaster is a natural or man-made (or technological) hazard resulting in an event of substantial extent causing significant physical damage or destruction, loss of life, or drastic change to the environment. It is a phenomenon that can cause damage to life and property and destroy the economic, social, and cultural life of people. Natural disasters and manmade disasters like aircraft accidents, fires, terror attack & aircraft hijacking do occur at airports and therefore, it is required to prepare Disaster Management Plan (DMP). Airport emergency planning is the process of preparing an airport to cope with an emergency occurring at the airport or in its vicinity. The object of airport emergency planning is to minimize the effects of an emergency, particularly in respect of saving lives and maintaining aircraft operations. The airport emergency plan sets forth the procedures for coordinating the response of different airport agencies (or services) and those agencies in the surrounding community that could be of assistance in responding to the emergency.

The emergency arising out of the incidents whose effects are confined to the airport premises is termed as on-site emergency and those with effects extending beyond the airport premises is termed as off-site emergency. This section identifies possible disasters that could occur at the airport and draws a disaster management plan, which includes the

emergency control measures, plan of coordination and interaction with various agencies including administrative agencies, rescue and relief operations, training, and awareness to minimize the severity of disasters.

The DMP plan should be prepared in accordance with the Civil Aviation requirement laid down by the Director General of Civil Aviation (DGCA), the National Disaster Management Act, 2005, the National Building Code as well as various code provisions of the International Civil Aviation Organization (ICAO) Airport Service Manual, Part-7. The following most likely disaster scenarios shall be considered in the management plan.

7.5.1 Aerodrome Emergency Plan (AEP) for Disaster Management

A comprehensive Aerodrome Emergency Plan is already in place. The AEM plan is comprehensively prepared for specifying role of various groups / organizations/ agencies and plan of disaster management during various types of emergencies / disasters like in-flight mass casualties, medical emergencies, aircraft accidents, various fires on ground, accidents involving dangerous goods, natural disaster management, unlawful act of seizure of aircraft etc. The following most likely disaster scenarios are considered in the Aerodrome Emergency Plan.

1. Plan Development and Maintenance

This Emergency Response Plan has been developed to facilitate the timely and appropriate response to emergencies occurring on or in the immediate vicinity of the airport. The principal goals of this plan are to render necessary assistance and minimize further injury and damage to persons and property involved in accidents or emergency situations at the airport.

Personnel should periodically review AEP policies, procedures, and related information. Training that covers changes in policies, procedures, resource availability, etc. should be provided to ensure that all personnel stay familiar with current information.

2. Schedule of Review

A schedule should be developed for reviewing each part of the AEP. A suggested schedule for some of the key elements is:

- ✓ Telephone numbers contained in the AEP should be reviewed quarterly for accuracy. Changes should be noted, particularly in the procedures of the individual(s)/ organization(s) tasked with making the calls during an emergency;
- ✓ Radio frequencies used in support of the AEP should be tested at least monthly;
- ✓ Emergency resources should be inspected routinely;

- ✓ Personnel assignments to include descriptions of duties and responsibilities should be reviewed semi-annually;
- ✓ Mutual aid agreements should be reviewed annually or as specified in the Agreement;
- ✓ Off-airport activity should be reviewed on an on-going basis. Maintain open dialogue with off-airport agencies, such as utilities, public works departments, etc. to learn of activity that may affect the airport's emergency response effort, i.e. road construction and closures, major utility work, etc.

3. Mock Drills and Exercises

Mock drills constitute another important component of emergency preparedness and refer to the re-enactment, under the assumption of a mock scenario, of the implementation of response actions to be taken during an emergency. Mock drills and integrated exercises have the following objectives:

- ✓ To test, efficacy, timing, and content of the plan and implementing procedures;
- ✓ To ensure, that the emergency organization personnel are familiar with their duties and responsibilities by demonstration;
- ✓ Provide hands-on experience with the procedures to be implemented during emergency; and
- ✓ Maintain emergency preparedness.

The frequency of the drills would vary depending on the severity of the hazard. However, drills shall be conducted once in a year. Scenarios may be developed in such a manner as to accomplish more than one event objective. Drills and exercises will be conducted as realistically as is reasonably practicable. Planning for drills and exercises would include:

- Basic objectives;
- Date, time and venue;
- Participating organizations;
- Events to be simulated;
- Approximate schedule of events;
- Arrangements for qualified observers; and
- An appropriate critique of drills/exercises with participants

Evaluation of drills and exercises would be carried out which include comments from the participants and observers. Discrepancies noted by the drill observers during the drill shall be pointed out. The individual responsible for conducting the drill or exercise would prepare a written evaluation of the drill or exercise. The evaluation would include assessments and recommendations on:

- Areas that require immediate correction;
- Areas where additional training is needed;
- Suggested modifications to the plan or procedures;
- Deficiencies in equipment, training, and facilities; and
- Records of drills, exercises, evaluations, and corrective actions would be duly maintained.

4. Plan Development for Specific Hazards

This section focuses on the special planning needs of the hazards that airports may encounter. It addresses the essential operational actions that must be accomplished to facilitate the successful completion of a specific response function. Some of the hazards that may require response are:

- Aircraft incidents and accidents;
- Natural disasters;
- Bomb incidents;
- Hazardous materials incidents;
- Structural fires; and
- Failure of power for movement area lighting.

❖ *Aircraft incidents and accidents:*

Aircraft accident is 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.

Aircraft incident is any occurrence associated with the operation of an aircraft that is not considered an “aircraft accident.”

❖ *Incident Classification System*

Level 1: Accident may happen. Landing Gear Problem. A situation or emergency exists or is perceived to exist, that may result in an incident or accident. This includes situations where it is not known if an incident or accident emergency has actually occurred;

Level 2: An aircraft is known or suspected to have an operational defect that affects normal flight operations to the extent that there is danger of an accident; and

Level 3: An aircraft accident has occurred on or in the vicinity of the Airport.

Response: The Airport Director

Responsible for all areas of the airport and areas of approach off airport property used by aircraft for landing at the airport. Airport staff will coordinate with all agencies involved to ensure the quick and efficient response to the emergency.

Level 1 Classification Response:

The Aircraft Rescue Fire Fighter (ARFF) personnel should be advised of the following information if known:

- ✓ Type of aircraft;
- ✓ Type and amount of fuel;
- ✓ Number, or potential number, of passengers and crew;
- ✓ Nature of emergency; and
- ✓ Number of injured passengers on board.

Level 2 Classification Response:

- ✓ ARFF personnel should be provided with the same information as above plus any additional details that will allow preparation for likely contingencies. Fire/police dispatch should advise Airport Staff of the applicable Fire Department radio talk group or provide a radio patch to facilitate efficient response coordination. A full response should be made with the emergency equipment manned and positioned with engines running and all emergency lights operating so rapid response to the incident / accident site can be accomplished;
- ✓ Standby locations on the airport should be accessed through the terminal apron gates and responding units should position themselves in such a manner as to have a clear view of the runway and taxiways. The person in charge of response equipment (Fire Department) should anticipate the aircraft's rollout and station emergency response vehicles some distance up wind from the rollout area;
- ✓ Communication with aircraft by Airport staff (on Unicom frequency) and passed to the fire department. This provides a safety factor for rollout and should an emergency require, the vehicle could be on the move to the aircraft stopping point from an upwind direction; and
- ✓ The ARFF vehicle shall move on a fast parallel course to the aircraft once it is apparent that the aircraft is going to pass the standby position.

Level 3 Classification Response:

- ✓ Full ARFF procedures should be put into effect. All pertinent updated information should be relayed by the Airport Staff and or dispatching agency to responding emergency units and include the location of the accident using direction and

distance from the terminal building, thresholds, mid-field, street/road intersections or landmarks (creeks, businesses, etc);

- ✓ When complete aircraft related information is not available, the ARFF personnel should anticipate the worst situation and prepare accordingly; and
- ✓ Notify the Operations Center of conditions at the site, particularly if such conditions could interfere with flight operations. Airport Staff should issue applicable NOTAMS and ensure appropriate Unicom advisories are communicated.

If the accident involves personal injury/death, the wreckage cannot be moved or disturbed until so authorized by the Duty Officer. Following FAA authorization, the wreckage may be moved away from the runway/taxiways system so as to facilitate the timely reopening of the airport. The aircraft owner is responsible for removing the damaged aircraft. The airport and transportation department shall assist as required in this recovery process.

Following removal of the wreckage, an airport operations representative shall inspect the runway/taxiways pavement surfaces for damage/debris, and if satisfactory, the airport reopened to air traffic.

❖ **Bomb Incidents**

Bomb Emergency Management: Bomb threats by their very nature the very real potential for serious damage to aircraft, buildings, and property, as well as the potential for serious injuries or loss of life. A bomb threat could be written, recorded, or communicated orally. Every threat must be taken seriously and dealt with in such a way as to not create panic. The call recipient must remember to do many things, all of which will aid in the search for the device and provide authorities with as much information as possible for their investigation. The following immediate actions are suggested.

- Any aircraft that is suspected of carrying a bomb should be parked in isolated Bay area.
- All passengers should be evacuated immediately by the fastest means whilst the local or airport police arrange for bomb disposal experts to attend and search the aircraft. All baggage should be left on board until it has been searched and cleared. Airport rescue and fire services should be standby at point no less than 300 m from air craft and predetermined procedure for bomb alerts should be taken into account the calling of local authority services of fire, police, ambulance and hospitals.
- Air traffic control must maintain continuous communication with the rescue and firefighting services to ensure that they are kept updated in relation to any change in distressed aircraft condition.
- To attend to bomb threat calls received to aircraft, terminal building, vital

installations and arising from unclaimed observed inside/outside the airport and safe neutralization of explosives device found.

- As soon as emergency is envisaged/occurs, the Emergency chief or his alternate shall promptly communicate the information by a telephone or any other quickest mode of communication to the Inspector of Police, highest administrative officer and Fire brigade. The information should include the location in question and the degree of emergency (anticipated, eminent or actual).
- To conduct regular training of airport security police and staff, airlines agencies working at the airport. This training is based for identification of explosives.

7.5.2 Onsite Emergency Plan

The onsite emergency is an unpleasant situation that causes extensive damage to plant personnel and surrounding area and its environment due to in operation, maintenance, design, and human error. Following points are to be taken into consideration:

- To identify, assess, foresee, and work out various kinds of possible hazards, their places, potential and damaging capacity, and area in case of above happenings.
- Review, revise, redesign, replace or reconstruct the process, plant, vessels, and control measures if so assessed.
- Measures to protect persons and property of processing equipment in case of all kinds of accidents, emergencies, and disasters
- To inform people and surroundings about emergency if it is likely to adversely affect them.

Disaster Control Management System:

Disaster Management group plays an important role in combating emergency in a systematic manner. Schematic representation Emergency Control Management system for Airports Authority of India is shown in **Figure 7.4**.

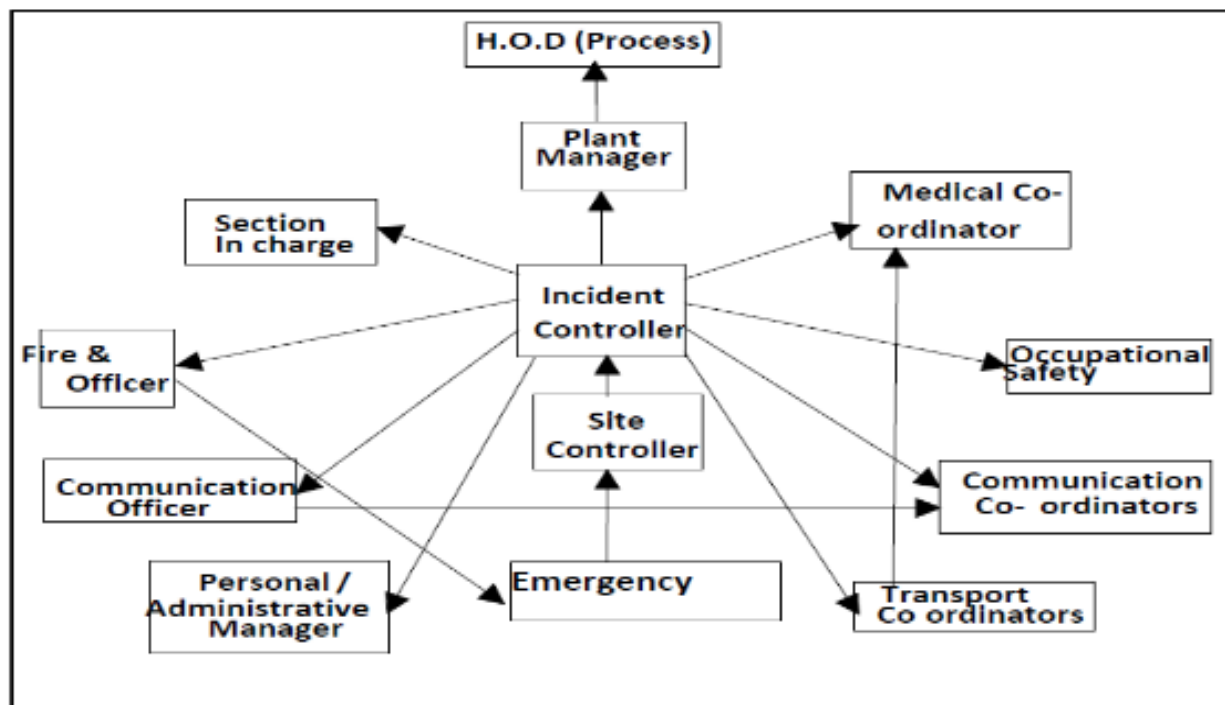


Figure 7-4: Onsite DMP – Disaster Control / Management System

❖ **Control Room Facility:**

Following are the facilities to be provided at the control room of Airports Authority of India to tackle the emergency failure scenarios:

- Fire Detection System is to be installed in the control room
- VHF base station with a range of 25 km and VHF handsets of range 5 km is to be installed for ready communication in emergency
- Public address System (PAS) is to be installed to ease the communication to various corners of the site
- The duties and responsibilities of different Co-ordinators of Onsite Disaster Management Plan is to be displayed in the Control Room.

❖ **Alarm System:**

A siren shall be provided under the control of Security office in the airport premises to give warning. In case of emergencies this will be used on the instructions to shift in charge that is positioned round the clock. The warning signal for emergency shall be as follows:

- Emergency Siren: Waxing and waning sound for 3 minutes.
- All clear signal: Continuous siren for one minute.

❖ **Communication:**

Walkies & Talkies shall be located at strategic locations; internal telephone system EPBX with external P&T telephones would be provided.

❖ **Fire Fighting System:**

The fire protection system for the unit is to provide for early detection, alarm, containment, and suppression of fires. The fire detection and protection system has been planned to meet the above objective an all-statutory and insurance requirement of Tariff Advisory Committee (TAC) of India. The complete fire protection system will comprise of the following.

A designated fire-fighting team would be available in the facility to handle the fire emergency.

System Description of Fire Fighting System:

The entire fire safety installation shall be compliant with the most stringent codes / standard for the entire complex to ensure the highest safety standard and uniformity of system. Further, before property is operational, the fire protection shall be fully operated and tested under simulated conditions to demonstrate compliance with the most stringent standards, codes, and guidelines.

Fire pumping system:

The fire pumping system shall comprise of independent electrical pumps for hydrant and sprinkler system, diesel engine driven pump & jockey pump for hydrant & sprinkler system. Electrical pump shall provide adequate flow for catering requirement of hydrant system. Diesel engine driven fire pumps shall be provided for ensuring operation & performance of the system in case of total electrical power failure. Jockey pumps shall compensate for pressure drop and line leakage in the hydrant and sprinkler installation. Provision of PRS/ orifice plate shall be made in sprinkler riser to restrict pressure on sprinkler system.

Individual suction lines shall be drawn from the fire reserve tanks at the basement level and connected to independent fire suction header. The electric fire pumps, diesel engine driven fire pumps and the jockey pumps shall all draw from this suction header.

Delivery lines from various pumps shall also be connected to a common header to ensure that maximum standby capacity is available. The sprinkler pump shall be isolated from the main discharge header by a non-return valve so that the hydrant pump can also act as standby for the sprinkler system. The ring main will remain pressurized at all times and Jockey pumps shall make up minor line losses. Automation required to make the system fully functional shall be provided.

Fire hydrant system:

Internal and external standpipe fire hydrant system shall be provided with landing valve, hose reel, first aid hose reels, complete with instantaneous pattern short gunmetal pipe in the Complex.

The internal diameter of inlet connection shall be at least 80 mm. The outlet shall be of instant spring lock type gunmetal ferrule coupling of 63 mm dia. For connecting to hose pipe. Provision of flow switch on riser shall be made for effective zone monitoring. The flow switch shall be wired to FAP and shall indicate water flow on hydrant of the identified zone. Recessed cupboard/ fire hydrant cabinet shall be strategically located for firefighting requirement. Location of cabinets shall be accessed as per compartmentation plan in consultation with the Architect. Provision of fire man's axe shall be made for internal hydrant.

External hydrant shall be located within 2 m to 15 m from the building to be protected such that they are accessible and may not be damaged by vehicle movement. A spacing of about 45-50 m between hydrants for the building shall be adopted. Details of fire hydrant system are as follows:

Piping: Mild Steel pipes (heavy class) as per IS: 1239 shall be provided throughout the complex. Pipes buried below ground shall be suitably lagged with 2 layers of 400 micron polythene sheet over 2 coats of bitumen.

External Hydrants: External hydrants shall be provided all around the Complex. The hydrants shall be controlled by a cast iron sluice valve or butterfly valve. Hydrants shall have instantaneous type 63mm dia outlets.

For each external fire hydrant two numbers of 63mm dia. 15 m long controlled percolation hose pipe with gunmetal male and female instantaneous type couplings machine wound with GI wire, gunmetal branch pipe with nozzle shall be provided.

- Each external hydrant hose cabinet shall be provided with a drain in the bottom plate.
- Each hose cabinet shall be conspicuously painted with the letters "FIRE HOSE".

Hose Reel: Hose reel shall be heavy duty, 20 mm dia, length shall be 36.5 metre long fitted with gun metal chromium plated nozzle, mild steel pressed reel drum which can swing upto 170 degree with wall brackets of cast iron finished with red and black enamel complete.

Sprinkler system:

Elaborate automatic sprinkler system shall be provided. The system shall be suitably zoned for its optimum functional performance.

The sprinkler system shall be provided with control valves, flow and tamper switches at suitable location and shall be connected to control module of the fire alarm system for its monitoring and annunciation in case of activation.

Sprinkler type along with its Quartzite bulbs rating shall be selected based on the requirement of the space and shall be specified accordingly. Inspector's test valve assembly with sight glass shall be provided at remote end with discharge piped to drain outlet / pipe.

Fire Extinguishers:

Portable fire extinguishers of water (gas pressure), Carbon-di-oxide, foam type, Dry Chemical Powder shall be provided as first aid fire extinguishing appliances. These extinguishers shall be suitably installed in the entire areas as per IS: 2190.

The appliances shall be so installed over the entire sections, that a person is not required to travel more than 15 m to reach the nearest extinguisher. These shall be placed or hanged on wall in a group on several suitable places.

Fire Pump:

The fire pump shall be horizontally mounted, variable speed type. It shall have a capacity to deliver and developing adequate head to ensure a minimum pressure at the highest and the farthest outlet. The pump shall be capable of giving a discharge of not less than 150 per cent of the rated discharge, at a head of not less than 65 per cent of the rated head. The shut off head shall be within 120 per cent of the rated head.

The pump casing shall be of cast iron and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze/brass/gun metal. The shaft shall be of stainless steel. Provision of mechanical seal shall also be made.

Bearings of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water. The pump shall be provided with a plate indicating the suction lift, delivery head, discharge, speed, and number of stages. The pump casing shall be designed to withstand 1.5 times the working pressure.

Foam System for Fire Fighting:

Aqueous Film-Forming Foams (AFFF) based on combinations of fluoro-chemical surfactants, hydrocarbon surfactants, and solvents will be used as foam agent. These agents require a very low energy input to produce high quality fire-fighting foam.

Foam concentrate will be stored in a bladder tank system. In AFFF systems a bladder tank containing a nylon reinforced elastomeric bladder is used to store the foam concentrate. System water pressure is used to squeeze the bladder providing firefighting foam concentrate, at the same pressure, to the proportional.

An aqueous film will be formed on the surface of the alcohol by the foam solution as it drains from the foam blanket.

This film is very fluid and floats on the surface of most alcohol. This gives the AFFF unequalled speed in fire control and control the spill fire.

❖ First Aid

A first aid centre with adequate facilities shall be provided. It shall be maintained round the clock by a compounder cum dresser and a doctor. An Ambulance shall also be provided at site to carry affected people to hospital.



Security:

The security requirements of the company premises shall be taken care of by CSO assisted by a Fire In charge. The team, apart from the normal security functions will manage the role required during a disaster management operation as a part of the crisis control team.

Safety:

The safety wing led by a Safety Head will meet the requirement of emergencies round the clock. The required safety appliances shall be distributed at different locations of the plant to meet any eventualities. Poster/placards reflecting safety awareness will be placed at different locations in the airport area.

Evacuation Procedure:

As the major hazard is only due to fire, which has more or less localized impact no mass evacuation, procedures are required. Evacuation would involve only the people working very close to the fire area.

Personal Protective Equipment's (PPE):

This equipment is used mainly for three reasons; to protect personnel from a hazard while performing rescue/accident control operations, to do maintenance and repair work under hazardous conditions, and for escape purposes. The list of Personal Protective Equipment provided at the facility and their locations shall be available in ECC.

Effective command and control accomplish these functions necessitates personal trained in this On-site Disaster Management Plan with adequate facilities and equipments and equipment to carry out their duties and functions. These organizations and the facilities required to support their response are summarized in the following subsections.

Personal protective equipment plays a vital role in overcoming major disastrous situation saving life during onsite emergency. List of recommended Personal Protective equipment (PPE) is given below in table below:

Table 7-8: Summary of Recommended Personal Protective Equipment According to hazard onsite

Objective	Workplace Hazards	Suggested PPE
Eye and face protection	Flying particles, liquid chemicals, gases or vapors, light radiation	Safety glasses with side-shields, protective shades, etc.
Head protection	Falling objects, inadequate height clearance, and overhead power cords	Plastic helmets with top and side impact protection
Hearing protection	Noise of machineries	Hearing protectors (ear plugs or ear muffs)
Foot protection	Falling or rolling objects, points objects. Corrosive or hot liquids	Safety shoes and boots for protection against moving and

		failing objects, liquids, and chemicals
Hand protection	Hazardous materials, cuts or lacerations, vibrations, extreme temperatures	Gloves made of rubber or synthetic material (Neoprene), leather, steel, insulation materials, etc.
Respiratory protection	Dust, fogs, fumes, mists, gases, smokes, vapors	Facemasks with appropriate filters for dust removal and air purification (chemical, mists, vapors, and gases). Single or multi-gas personal monitors, if available
	Oxygen deficiency	Portable or supplied air (fixed lines). Onsite rescue equipment
Body / leg protection	Extreme temperatures, hazardous materials, biological agents, cutting and laceration	Insulating clothing, body suits, aprons etc. of appropriate materials

❖ Mock Drill

As per the Industrial Major Accident Hazard Rules, Mock drills of the on-site emergency plan are conducted every six months. A detail report of the mock drill conducted is to be made immediately available to all the concerned authority. Also, Major Fire and Minor Fire mock drills are conducted once in six months.

Training:

On job training to the engineers on various stages of risk analysis and preparedness during emergency to reflect in the operation of terminal, especially from the safety stand point. The fire team belonging to the firefighting department is to be intensively trained for the use of all equipment and in various fire-fighting methods for handling different types of fires.

Details of Training facilities for

- Safety - Monthly
- Fire Fighting - Monthly
- Occupational Health & safety- Monthly

Procedure for Testing & Updating the Plan:

Simulated emergency preparedness exercises and mock fire-fighting exercises including mutual aid scheme resources and in conservation with district emergency authority to be carried out time to time. Also, designated assembly point with head count facility to be there.

Disclosure of Information to Worker & Public Awareness System:



- Safety awareness among workers by conserving various training programs and Seminars, competition, slogans etc.
- Practical exercise.
- Distribution and practices of safety Instructions.
- Safety Quiz contests.
- Display of Safety Posters & Safety Slogans.
- Developing Safety Instructions for every Job and ensuring these instructions/ booklets or manuals by the workers.

7.5.3 Off-Site Emergency Planning

The off-site emergency plan is an integral part of any hazard control system. It is based on those accidents identified by the works management, which could affect people and the environment outside the works. Thus, the off-site plan follows logically from the analysis that took place to provide the basis for the on-site plan and the two plans therefore complement each other. The roles of the various parties that may be involved in the implementation of an off-site plan are described below. The responsibility for the off-site plan will be likely to rest either with the works management or with the local authority. Schematic representation of various organizations involved during emergency is shown below in **Figure 7.4**.

Either way, the plan must identify an emergency coordinating officer who would take overall command of the off-site activities. Consideration of evacuation may include the following factors:

- In the case of a major fire but without explosion risk, only houses close to the fire are likely to need evacuation.
- If fire is escalating very fast it is necessary to evacuate people nearby as soon as possible.
- In acute emergency people are advised to stay indoors and shield themselves from the fire.

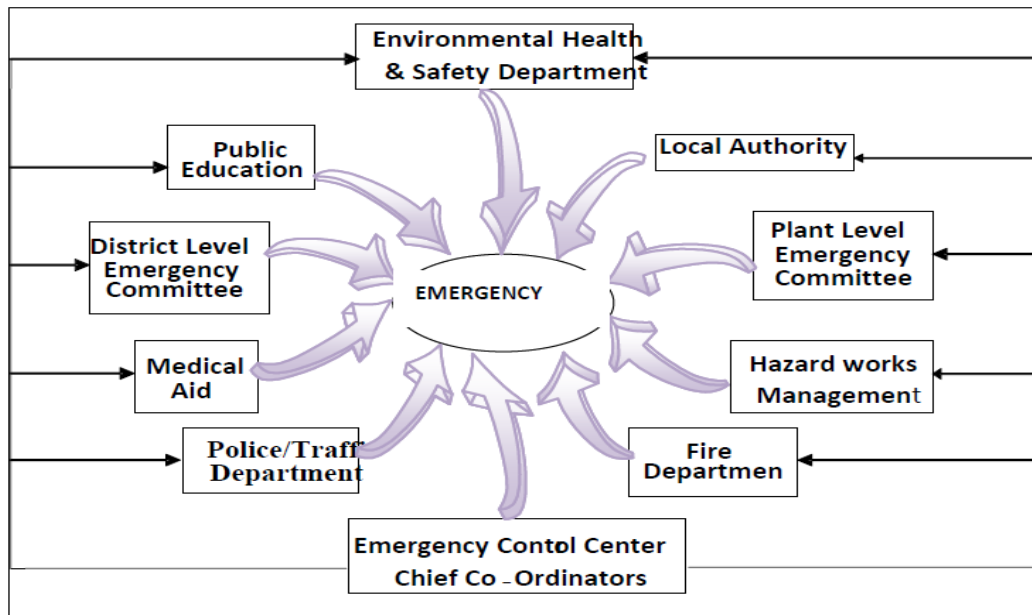


Figure 7-5: Various Organizations Involved During Emergency

❖ **Organization**

Organizational details of command structure, warning systems, implementation procedures, emergency control centres include name and appointments of incident controller, site main controller, their deputies and other key personnel involved during emergency.

❖ **Communications:**

Identification of personnel involved, communication centre, call signs, network, list of telephone numbers.

❖ **Special Emergency Equipment:**

Details of availability and location of heavy lifting gear, specified fire-fighting equipment, fireboats etc.

❖ **Voluntary Organizations:**

Details of Voluntary organizations, telephone numbers nearby of hospitals, Emergency helpline, resources etc are to be available with chief authorities.

❖ **Non-governmental Organizations (NGO):**

NGO's could provide a valuable source of expertise and information to support emergency response efforts. Members of NGOs could assist response personnel by performing specified tasks, as planned during the emergency planning process.

- Evacuation of personnel from the affected area

- Arrangements at rallying posts and parking yards
- Rehabilitation of evacuated persons

❖ **Chemical information:**

Details of the hazardous substances (MSDS information) and a summary of the risks associated with them are to be made available at respective site.

❖ **Meteorological information:**

There is to be arrangements for obtaining details of weather conditions prevailing at or before the time of accident and weather forecasts updates.

❖ **Humanitarian Arrangements:**

Transport, evacuation centers, emergency feeding, treatment of injured, first aid, ambulances, temporary mortuaries.

❖ **Public Information:**

- Dealing with the media-press office
- Informing relatives, etc.

❖ **Assessment:**

- Collecting information on the causes of the emergency
- Reviewing the efficiency and effectiveness of all aspects of the emergency plan.

❖ **Role of Local Authority:**

Local Authorities like Panchayat, Sabha, Samity, municipalities can help in combating emergency after assessing the impact scenario in rescue phase.

❖ **Role of Police:**

The police are to assist in controlling of the accident site, organizing evacuation, and removing of any seriously injured people to hospitals.

- Co-ordination with the transport authorities, civil defence and home guards.
- Co-ordination with army, navy, air force and state fire services.
- Arrange for post mortem of dead bodies.
- Establish communication centre with easy contact with ECC.

❖ **Role of Fire Brigade:**

The fire brigade is to be organized to put out fires and provide assistance as required during emergency.

❖ **Role of Media:**

- The media is to have ready and continuous access to designated officials with relevant information, as well as to other sources to provide essential and accurate information to public throughout the emergency and to avoid commotion and confusion.

- Efforts are made to check the clarity and reliability of information as it becomes available, and before it is communicated to public
- Public health authorities are consulted when issuing statements to the media concerning health aspects of chemical accidents
- Members of the media are to facilitate response efforts by providing means for informing the public with credible information about accidents involving hazardous substances

❖ **Role of health care authorities:**

Hospitals and doctors must be ready to treat all type of injuries to casualties during emergency.

- Co-ordinate the activities of Primary Health Centers and Municipal Dispensaries to ensure required quantities of drugs and equipment.
- Securing assistance of medical and paramedical personnel from nearby hospitals/institutions.
- Temporary mortuary and identification of dead bodies.

❖ **Roles and Responsibility in Handling Emergencies:**

The roles and responsibilities of the different departments involved in handling emergency cases arise if any are given in the table below:

Table 7-9: Roles and Responsibility in Handling Emergencies

Description	Responsibilities for airport Emergency
Airport Director	<ul style="list-style-type: none"> ▪ Serve as Emergency Coordinator. ▪ Assume Incident Command responsibility for all response and Recovery operations, as appropriate. ▪ Establish, promulgate, coordinate, maintain, and implement the Airport Emergency Plan (AEP). ▪ Contact concern department and provide appropriate alerts and notifications. ▪ Coordinate the closing of the airport when necessary and initiate the dissemination of relevant safety-related information to aviation users (NOTAMs).
Aircraft Operator	<ul style="list-style-type: none"> ▪ Provide full details of aircraft-related information, as appropriate, to include number of persons, fuel, and dangerous goods on board. ▪ Coordinate transportation, accommodations, and other arrangements for uninjured passengers. ▪ Coordinate use of air carrier/aircraft personnel and other supplies and equipment for all types of emergencies occurring at the airport.

City Administrator	<ul style="list-style-type: none"> ▪ Provide access to city resources.
Fire Department	<ul style="list-style-type: none"> ▪ Manage and direct firefighting and rescue operations. ▪ Direct search and rescue or hazardous materials response. ▪ Coordinate mutual aid resources through Incident Command System. ▪ Assist with search and rescue or evacuations. ▪ Assume Incident Command as appropriate.
Police Department	<ul style="list-style-type: none"> ▪ Manage and direct police operations. ▪ Assist with traffic control and scene security. ▪ Assist with search and rescue or evacuations. ▪ Respond as needed for activities involving crowds or assemblies of people. ▪ Respond to bomb threats or acts of terrorism. ▪ Assume Incident Command as appropriate.
Hospital	<ul style="list-style-type: none"> ▪ Provide emergency medical services to the airport during emergency conditions to include triage, stabilization, first aid, medical care, and transportation of the injured. ▪ Coordinate planning, response, and recovery efforts with hospitals, fire and police departments, airport operator, etc. ▪ Coordinate the hospital disaster plan with the airport and community ▪ Emergency Operations Plan (EOP).
Public Work Department	<ul style="list-style-type: none"> ▪ Coordinate use of resources for debris removal or building maintenance. ▪ Coordinate restoration of utilities. ▪ Provide equipment for emergency response and recovery.

❖ **Fire Department**

The Fire Chief or Senior Fire Department representative on the scene will be the Incident Commander and will direct all efforts of fire suppression and the rescue of individuals involved in the incident. The Incident Commander will assess the situation and ensure that adequate equipment is available for rapid-fire suppression, rescue of victims and transportation of victims to area hospitals. The Scene Incident Commander will maintain contact with the Airport Director.

Fire/police dispatch should advise Airport Staff of the applicable Fire Department radio talk group or provide a radio patch to facilitate efficient response and coordination. (i.e. directions to the emergency site / recommended access gate, etc).

❖ **Police Department**



The Police Department will secure the area and ensure the free flow of emergency equipment into the incident scene. The Police Department will be responsible for crowd control, site security, and control of ingress and egress to the incident scene by authorized personnel. Law Enforcement personnel shall assist fire fighters in the suppression of fire and rescue of victims if requested by the Incident Commander. The accident / incident scene shall be treated as a major crime scene and secured as such.

❖ **Health Department**

In the event of an aircraft accident, health departments play a crucial role in managing the emergency response. They assess and address any potential public health risks arising from the accident, such as exposure to hazardous materials or disease outbreaks. This includes monitoring environmental contamination and ensuring that public health protocols are followed. They coordinate with hospitals and medical personnel to manage the influx of injured individuals, ensuring that medical resources are appropriately allocated and that patients receive timely care.

❖ **Airport Tenants**

Airport Tenants and their employees should be considered as a prime source of readily available equipment and manpower that may have intimate knowledge of the airport and the aircraft. They can be valuable, especially if their background includes aircraft maintenance, medical training, or is transportation related. If utilized, on a voluntary basis only, it is imperative that these persons be deployed under supervision and assigned specific functions to avoid duplication of efforts and the possibility of disrupting the other emergency operations.

7.5.4 Operation And Management Control

Airport Emergency Managing Committee

To ensure coordinated action, an Airport Emergency Managing Committee will be constituted. The airport director will be the chairman of this committee. The committee will comprise of members from various airport departments including the following:

- Airport administration;
- Air traffic control;
- Airport rescue and fire fighting;
- Airport security services;
- Safety department;
- Airport medical services;
- Maintenance department;
- Environment management cell;

- Representative from airlines;
- Transportation department;
- Department of information and publicity;
- Representative from local NGO's and social group; and
- Also, member from airport authority of India and district administration will be part of the committee.

Airport emergency managing committee will design the procedure, the emergency action plan, evacuation plan and procedures for implementation based on local needs and facilities available. For effective implementation of emergency action, coordination among the various agencies involved in Emergency Control Centre will be expected. Emergency control centre will be established as the supreme command post for emergency action. For direct action and coordination at ground level mobile command post will be established. Emergency action committee will select officers in charge for emergency control center.

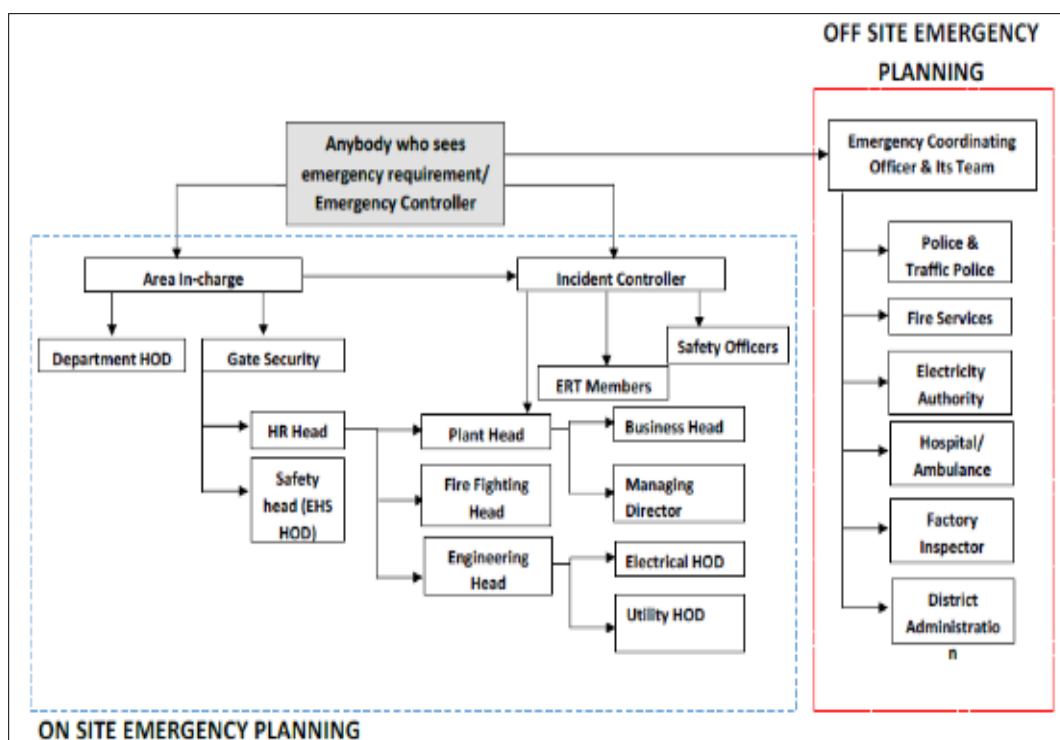


Figure 7-6: Combined On-site and Off-site Emergency Planning Chart

7.5.5 Airport Emergency Operation/ Coordination Centre

During a major airport disaster such as an aircraft crash or a severe fire outbreak at terminal building, the various emergency operations and coordination centres will be established immediately to mitigate the disaster. The emergency control centre will be the top command for coordination and communication centre for all kinds of emergencies. The

chairman of emergency managing committee will be the head of emergency control centre. Under his direction, chief officer will operate and regulate all emergency operation. The centre will operate under the directions of airport emergency managing committee. Its location will be fixed, as per the requirement emergency situations. The main features of this unit will be:

- It will be operated by a specialized trained staff from Fire, Safety, Health, and Environment department personnel of airport;
- It will be the command, co-ordination, and communication centre for unlawful seizure of aircraft and bomb threats;
- It is operationally available for 24 hours; and
- The location of the emergency operations centre should provide a clear view of the movement area and isolated aircraft parking position, wherever possible.

The airport emergency operation center should contain:

- Emergency alert and communication system;
- Adequate number of internal and external telephones. The latest telephone directories with a list of important numbers;
- Radio equipment, hot-lines, and walkie-talkie;
- Plans of the airport to show various areas of airport;
- Sources of sirens and safety equipment including fire, explosion, spill, and gas controls; and
- Stock of other fire extinguishing materials.

7.6 OCCUPATIONAL HEALTH SURVEILLANCE PROGRAMME

Health surveillance is the monitoring of a person's health to identify changes in health status due to occupational exposure to a hazardous substance. It includes biological monitoring. Ideally, the avoidance of work-related diseases should be achieved by the prevention or controlling exposures to hazardous substances in the workplace. Where a process cannot be designed or maintained to eliminate the risk of exposure, it may be necessary for workers to undergo health surveillance.

7.6.1 Risk Reduction Measurement & Recommendations

To ensure the safety of the installation, the facility should be constructed as per relevant codes and standards. As per consequence analysis, the damage distance may go outside the airport boundary as it involves the involvement as hazardous chemicals, care to be taken to prevent the leakage of such chemical by proper designing, preventing corrosion, proper periodic inspection, and maintenance of all instruments/ equipment. Wind indicator

should be provided at the highest level of the airport to know the wind direction. Automatic sprinkler system for the flammable material tanks (over ground tanks only) may be provided as knock on effect in case of fire is possible. Containment dyes with proper sloping and collection sumps should be provided so that any spillages in the bulk storage and other handling areas shall not stagnate and shall be quickly led away to a safe distance from the source of leakage. This reduces the risk of any major fire on the bulk storages and the risk to the environment shall be minimized/ eliminated. Inspection of the storage tanks as per prefixed inspection schedule for thickness measurement, joint and weld efficiency etc.

7.6.2 Provision of flameproof electrical fittings / equipment's.

- Proper maintenance of earth pits.
- Strict compliance of security procedures like issue of identity badges for outsiders, gate passes system for vehicles, checking of spark arrestors fitted to the tank lorries etc.
- Strict enforcement of no smoking.
- Periodic training and refresher courses to train the staff in safety fire-fighting.
- Employee training and education will be carried out.
- Structural fireproofing in the process area could be considered as a safety measure in the light of probable spill and fires in the area.

Emergency drills should be carried out periodically to ensure preparedness must continue. Many operations involve use of highly toxic/flammable materials and these needs to be documented as SOPs. These must be made and kept updated on priority. Extensive training on use of Self-Contained Breathing apparatus (SCBAs) must be ensured for emergency control. Loose drums of waste materials must be removed from the working areas and close watch kept. Proper Earthing system needs to be provided at appropriate locations for example while loading/unlading of methanol from Tanker. All electrical equipment needs to place as per HAC. Ventilation should be provided for any enclosed are where hydrocarbon or toxic vapours may accumulate. Several such areas were noticed- these may be surveyed and tackled accordingly. All personnel should be trained in handling emergency situations and should be appraised of their role in handling emergency and to ensure adequacy of the emergency procedures simulated exercise should be carried out. Flame arrestor should be provided.

- Adequate number of caution boards highlighting the hazards of chemicals should be provided at critical locations.
- The health & physical hazards caused due to toxic, irritant, corrosive, flammable materials. All chemicals are within Threshold Limit Value as per ACGIH.

- Monitoring of occupational hazards like noise, ventilation, chemical exposure etc. will be carried out regularly and its record will be maintained.
- Good housekeeping, use of PPE, Engineering controls, Enclosure processes, display of safety boards, SOP of loading / unloading, local exhaust ventilation, safety shower etc. are important safety measures have taken to keep these chemicals within TLV.
- Appropriate personal protective equipment will be provided & ensure the usage of them.
- Workers will be trained on safe material handling of hazardous chemicals.
- Prepare & display the safe operating procedure for hazardous chemicals storage, handling & transporting or using.
- Local Exhaust ventilation should be installed where it is required to reduce fumes, vapours, temperature, and heat stress.
- Reduce the level of physical activity by sharing workload with other or by using mechanical means.
- Pre-employment medical checkup and periodically medical examination will be done.
- Proper inspection and maintenance of all instruments like temperature indicator etc to avoid furnace box explosion
- Use alcohol foam, water spray or fog in case of large fire & dry chemical powder for small fire.
- Following Fire Safety Devices/ Provision will be provided to protect from any incidents:
 - Water storage of adequate capacity to meet the requirements of water for firefighting purposes.
 - Fire hydrants and automatic sprinkler system. Diesel driven pumps and headers to supply water to fire hydrant network.
 - Adequate Portable fire extinguishers, sand bucket, wheeled fire & safety equipment should be provided at the required places.
 - Equipment required for personal safety like blankets, gloves, apron, gum boots, face mask helmets, safety belts, first aid boxes etc. are provided. Proximity suits and self-contained breathing apparatus to be provided.
- Designated fire-fighting team should be present to handle the emergency

7.6.3 Aims of health surveillance

i) Identify those at increased risk

Health surveillance is used to identify workers who have an increased risk of developing an occupational disease. For example, people who have existing skin, kidney, liver and eye

disorders, heart problem; additionally, smokers and pregnant women are at increased risk of being severely affected if exposed to chemicals.

ii) Compliance with regulations

Health surveillance is sometimes required by laws and codes of practice (for example, a worker exposed to lead in battery manufacture or a spray-painted exposed to isocyanates in two-pack paints). Each state or territory has regulations containing a schedule of hazardous substances for which health surveillance is mandated.

iii) Early detection

The major purpose of health surveillance is to detect adverse health effects at an early stage so that the worker may be protected from further injury, either by control of the process or by removal from exposure.

iv) Evaluating effectiveness of control measures

Health surveillance is not a control measure and should not be the sole means of determining whether control measures are effective. However, it can provide useful information on the effectiveness of safe working practices.

v) Epidemiology and disease

Health surveillance can be used to evaluate the health experiences of groups of workers exposed to specific hazardous agents or working within a particular industry.

Workers should be made aware that health surveillance is sometimes necessary to ensure their ongoing health. Health surveillance is often used in addition to workplace monitoring. Workplace monitoring will only indicate the potential for exposure of workers to a hazardous substance. It can never be an indication of the actual amount of substance absorbed or the effect on the body of absorbing the hazardous substance.

When a toxic substance (such as an industrial chemical) is present in the environment, it contaminates air, water, food, or surfaces in contact with the skin: environmental monitoring evaluates the amount of toxic agent in these media.

As a result of absorption, distribution, metabolism, and excretion, a certain internal dose of the toxic agent (the net amount of a pollutant absorbed in or passed through the organism over a specific time interval) is effectively delivered to the body and becomes detectable in body fluids.

Subsequent interaction with a receptor in the critical organ (the organ which, under specific conditions of exposure, exhibits the first or the most important adverse effect) leads to biochemical and cellular events. Both the internal dose and the elicited biochemical and cellular effects may be measured through biological monitoring.

7.6.4 Occupational Health Programme

- The health & physical hazards caused due to toxic, irritant, corrosive, flammable materials. All chemicals should be within Threshold Limit Value as per ACGIH.
- Monitoring of occupational hazards like noise, ventilation, chemical exposure etc. will be carried out regularly and its record will be maintained.
- Good housekeeping, use of PPE, Engineering controls, Enclosure processes, display of safety boards, SOP of loading / unloading, local exhaust ventilation, safety shower etc. are important safety measures have taken to keep these chemicals within TLV.
- Appropriate personal protective equipment will be provided & ensure the usage of them.
- Workers will be trained on safe material handling of hazardous chemicals.
- Prepare & display the safe operating procedure for hazardous chemicals storage, handling & transporting or using.
- Periodical medical examination of the workers & Liver Function Testes will be done.
- Employee training and education will be carried out.
- Control the noise at source by substitution, isolation, segregation, barriers etc.
- Insulate all hot equipment to reduce air temperature.
- Reduce the level of physical activity by sharing workload with other or by using mechanical mean.

7.6.5 Minimization of the Manual Handling of Hazardous Substance

- Whether moving materials manually or mechanically, your employees should know and understand the potential hazards associated with the task at hand and how to control. Their workplaces to minimize the danger.
- Employers and employees should examine their workplaces to detect any unsafe or unhealthful conditions, practices, or equipment and take corrective action.
- Provide flameproof electrical motor & transfer chemicals through the pipelines.
- Use specially designed pallets to hold, move raw materials, finished products through work areas.
- Minimize lifting of raw materials, heavy loads by using appropriate platforms, trolleys etc.
- Avoid the moving, manual handling of hazardous material.

7.6.6 Do's and Dont's

i) Handling of Chemicals:



DO'S	DON'TS
<ul style="list-style-type: none"> • Know the hazards of the chemical before handling. • Know the antidotes for chemical, which is to be handled. • Do keep material safety data sheet in locations where chemicals are being handled and study it. • Use appropriate personal protective equipment like gloves, aprons, and respirator; face shield etc. depending upon nature of the work. • Label every chemical that you use and tightly close the container. • Use eye wash fountain / safety shower in case of splash of chemicals in the eye or body for at least 15 minutes. • Segregate toxic, flammable chemicals and keep them under control. • In addition to draining and closing valves, lines should be blanked before taking up maintenance work. • Provide proper ventilation at the chemical handling area to limit their concentration within prescribed level. 	<ul style="list-style-type: none"> • Do not store the chemicals that are incompatible with other chemicals. • Do not spill the chemicals. • Do not dispose chemical without neutralizing. • Do not keep large inventory of chemicals. • Do not allow empty containers of hazardous chemicals to be used by others. • Do not use compressed air for transferring chemicals. • Do not stand near chemical transfer pump while it is in operation with temporary hose connection. • Pouring of chemicals by hand or doing siphoning by mouth should never be adopted. • Chemicals drums should never be moved without protection. • Do not attempt to neutralize the acid /alkali on the skin. Use water only. • Do not use solvent for cleaning hands.

ii) Material Handling:

DO'S	DON'TS
<ul style="list-style-type: none"> • Use proper lifting tool and tackle having adequate capacity. • Only authorized persons should operate material handling equipment's. • Each tool, tackle or equipment should have number and safe working load (SWL) marked on it. • Assess weight of the material, distance to be carried and hazards etc. before lifting the load. • Inspect and test all the lifting tools and tackles regularly as per Factory Rules. • Wear Personal Protective Equipments while handling of material. 	<ul style="list-style-type: none"> • Do not use the equipment for the purpose other than its design intention. • Do not allow personnel to move underneath lifted load. • Do not load the equipment above its safe working load. • Does not use make shift arrangements for lifting equipment without inspection and test. • Do not use effective tool and tackles. • Keep the tools & tackles free from adverse effect of atmosphere by applying suitable protective coating.

iii) House Keeping:

DO'S	DON'TS



<ul style="list-style-type: none"> • Assign places for everything and maintain things at assigned places. • Clean the area after completion of work. • Use aisle space free for personnel and material movement. • Ensure adequate illumination and ventilation for the job. 	<ul style="list-style-type: none"> • Do not leave combustible materials in the work area. • Do not smoke in the area of work. • Do not allow dust bin to overflow. • Do not generate extra waste. • Do not disturb the safety equipment from assigned location. • Do not block emergency switches and on/off.
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iv) Fire Prevention:

DO'S	DON'TS
<ul style="list-style-type: none"> • Follow 'NO SMOKING' sign. • Deposit oily rags and waste combustible material in the identified containers and dispose them suitably. • Fire Hose used for any other purpose should be permanently marked and taken out of fire hydrant system. • Keep minimum inventory of flammable and combustible substances. • Take permission before breaking or removal of fire barrier and ensure subsequent relocation of fire barrier. • Check periodically the operability of fixed fire-fighting system. • Attend any abnormality/deficiency with fire protection system promptly. • Provide earthing or bonding to prevent accumulation of static charges to tanks where flammable chemicals are stored / handled. • Use instruments that are intrinsically safe in explosive atmosphere. 	<ul style="list-style-type: none"> • Do not leave flammable material like acetone, kerosene etc. used as cleaning agent at the work area. • Do not over tighten fire hydrant valves with F-lever. • Do not allow wild grass growth around storage of the gas cylinders and switchyard. • Do not obstruct accessibility to the fire related equipment. • Do not destroy the inspection tag provided with the fire equipment. • Do not misuse fire-fighting equipment other than intended purpose. • Do not store the flammable material in the open container. • Do not use instruments that are not intrinsically safe in the explosive atmosphere.

7.7 CONCLUSION

As discussed in above sections, adequate risk Control measures for process needs to be considered for the new proposed Project Activity is not likely to cause major significant risk to onsite, offsite & environment. Suitable Mitigation Measures will be taken by **Airports Authority of India** to ensure complete workplace safety. In the event of disaster onsite, offsite and all the emergency planning procedures will be followed to minimize the impact on working personnel, surrounding and environment.

CHAPTER 8: PROJECT BENEFITS

8.1 INTRODUCTION

Airports Authority of India has proposed to develop a new green-field airport at Doloo, Silchar as the existing Terminal Building at the current airport at silchar is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave. The proposed site for development of the green-field airport for Code-4C is located at 28 km away from the current civil enclave at Silchar. A total land area of 997.4 acres has been earmarked for the development of the proposed Airport.

To meet the growing demands of the traffic and to facilitate bigger & wider aircrafts and for safety purposes, the runway end safety area is proposed to be extended. It is anticipated that the proposed extension will smoothen the airport functioning.

8.2 EDUCATION

The local peoples' interest towards education will increase due to the expectation of getting jobs in the vicinity of Airports Authority of India. The project is expected to increase such aspirations by bringing opportunities of some direct and indirect employment for the local people. The general awareness towards the importance of education is expected to increase as a result of the proposed project. The project will have positive impact on the level of education of the people.

8.3 PROJECT BENEFITS

8.3.1 Benefit to the country & state

- Civil Aviation industry in India has come up as fast-growing industries during last three years. India has become the third largest domestic aviation market in the world. The proposed project will cater the rising air traffic;
- Air aviation is the key of GDP growth, project will help in increasing GDP of the country;
- It will also help in decongestion of Silchar airport in Assam;
- Airport is directly or indirectly key to the development and revenue generation. It expected boost of industrialization, multi-model-connectivity, and infrastructure development in the hinterland.

8.3.2 Environmental Benefits

- Terminal Building will be designed to achieve 5-star GRIHA rating



- It is proposed to install more than 20% of power load by solar power plant which will reduce the power requirement by state grid. Ultimately, it will reduce the CO₂ emission from coal fired power plant.
- Green area will be developed all around the city side. This will help in reducing air pollution, noise pollution and increase the aesthetic of the area.
- Biodegradable waste will be treated in in-house Organic waste converter. No Biodegradable waste will be disposed through authorised vendor.
- Energy Efficient material will reduce the carbon footprint.
- 167 no. of rainwater harvesting pits will be provided to recharge the ground water.
- All ICAO/MoEF&CC/MoCA norms shall be adopted to reduce impact on Environment.

8.3.3 Social Benefits

The development of the proposed airport will induce economic and social benefits to the people in the project influence zone. Economic development not only in the direct influence area, but also for the surroundings and would generate employment opportunities. The employment opportunities will grow steadily resulting in more demand of skilled, educated, and un-skilled people thereby increasing the standard of education in the area. The commercial development such as budget hotels, office space, retail outlets, food-courts, multiplexes, and market zone shall lift the socio-economic status of the area. The aviation industry itself is a source of considerable economic activity, creating jobs that directly serve passengers at airlines, airports, and air navigation services providers. These include check-in, baggage handling, onsite retail, cargo, and catering facilities. These could be a push for people in the project influence area to scale up their primary education enrolment for women and children, to cater to the requirement of new works and employment opportunities that will be created by the airport as well as its allied services like the hotel industry, transport, tourism, etc. Thereby uplifting the standard of living of the nearby people due to development.

❖ Direct Employment

During the construction phase, employment opportunity to skilled, semi-skilled and unskilled persons will be required. The construction contractors are likely to use unskilled labour drawn from local communities. It is anticipated that the construction labour inputs for the construction of the project will be mostly hired from the surrounding areas per day directly. Even during operation phase, significant numbers of persons will get direct and indirect employment opportunities.

❖ Indirect Employment



Indirect employment and income effects of the proposed project are non-marginal and usually remain widespread across a long region. It is expected that substantial portion of the investment in this project will trickle down to the local people in the form of employment and income. A part of this increase in employment potential may be attributed to the existing project and other industries in the vicinity. The project is expected to generate substantial indirect employment in other sectors such as service units etc. employment and income effects indicates that the project has strong positive direct as well as indirect impact on employment and income generation of the area.

8.4 CORPORATE ENVIRONMENT RESPONSIBILITY

MoEF&CC vide its OM dated 30th Sept. 2020 in suppression of the above OM, has nullified the provision of CER.

A total of 15 Cr. i.e., approx. 1% of the total project cost has been allocated for CER activities. However, a separate detailed budget will be allocated for social & infrastructural development and will be finalized on the basis of Public Hearing issues.

The strategies for designing, implementing, and monitoring the CER activities of AAI are based on the existing good practice models.

Tentative CER activities with budget for addressing Public Hearing issues are given below:

Table 8-1: Proposed CER Plan

S. No.	Activity	Total Cost (Cr.)
1.	Infrastructure improvement such as roads, drinking water facility, sanitation in R&R colony & nearby areas.	3.0
2.	Provision of health services such as upgradation of medical facility in hospitals of nearby areas.	2.0
3.	Landscaping development and improvement in the government schools and library such as development of smart class, distribution of benches, fans, upgradation of drinking water facility & sanitary facility.	2.0
4.	Provision of solar street lights on roads outside the project sites and in Government schools, parks, library, and R&R colony.	3.0
5.	Greenbelt development in and around the R&R colony	2.0
6.	Doloo lake rejuvenation	1.0
7.	Awareness Programs for local farmers to increase soil productivity and water conservation and other environmental benefits.	1.0
8.	Training program & skill development for females of the nearby villages	1.0
TOTAL		15

8.5 CONCLUSION

The management will recruit the semi-skilled, unskilled workers from the nearby villagers. The project activity and the management will support the local Panchayat and provide other form of assistance for the development of public amenities in this region. The company is committed towards the environment & will use the technology to minimize the impact from the proposed project & by handling/disposing the waste properly as per the CPCB/SPCB requirement.

Thus, considering the overall benefits from the proposed it is likely to generate the positive impact in the region.

CHAPTER 9: ENVIRONMENTAL COST BENEFIT ANALYSIS

The scope of the EIA/EMP has been prescribed vide the Terms of Reference (TOR) issued by MoEF&CC vide F. No. 21-273/2024-IA.III dated 02.09.2024.

As per SO 1533 dated 14th September 2006, the chapter on environmental cost benefit analysis is to be prepared if prescribed at scoping stage.

This chapter has to be carried out if specifically required as per scoping. As this is not specifically mentioned in TOR, further detail study is not carried out.

CHAPTER 10: ENVIRONMENT MANAGEMENT PLAN

10.1 INTRODUCTION

Environmental Management Plan consists of the set of mitigation, management, monitoring, and institutional measures to be taken during implementation and operation phase to eliminate adverse environmental impacts or reduce them to acceptable levels. The environmental management plan shall address the components of the environment affected during construction and operation of the airport and by the different activities forming part of the processes of the proposed airport. Based on the evaluation of impacts and baseline conditions, an Environmental Management Plan (EMP) has been delineated to mitigate the adverse impacts on the environment of the area due to the Proposed Project. The EMP is herein outlined after considering the various Acts, Rules and Regulations /Standards concerned with the environmental management.

- An EMP assures that the desired environmental management is communicated by the management to the executing teams and members of the EHS cell in a systematic manner without missing any information.
- It helps the EHS cell in formulating the role and responsibilities of the members and their respective departments. The EMP also helps in formulating preventive measures in terms of inspections, preventive maintenance, monitoring, etc. so that the performance of equipment and manpower are verified periodically.

10.2 OBJECTIVES OF ENVIRONMENTAL MANAGEMENT PLAN

The most reliable way to ensure that these plans are integrated into the overall project planning and implementation to include them as an integral component of the project. This ensures that it will receive funding and supervision along with other investment components. For optimal integration of EMP into the project, there should be links for:

- a) Funding,
- b) Management and
- c) Monitoring

The environment management plan is prepared with a view to facilitate effective environment management of the project, in general and implementation of the mitigation measures in particular. The EMP provides a delivery mechanism to address potential adverse impacts and to introduce standards of good practice to be adopted for all project



works. For each stage of the program, the EMP lists all the requirements to ensure effective mitigation of every potential biophysical and socio-economic impact identified in the EIA. The main objectives in formulating the environmental management plan are:

- To comply with all the regulations stipulated by MoEFCC/CPCB/SPCB related to liquid effluents discharge and air emission as per applicable laws.
- To support and implement work to achieve environmental standards and to improve the methods of environmental management.
- To promote green-belt development.
- To encourage good working conditions for employees.
- To reduce fire and accident hazards.
- Budgeting and allocation of funds for the environment management system.
- To adopt cleaner production technology and waste minimization programs.

The Environment Management area will be handled by a Qualified Manager with adequate training and experience in operation of equipment, ETP, and management of other pollution control devices. They will be assisted by a Qualified Executive and operators (in each shift) to run installed systems. All the necessary control measures w.r.t. management of Liquid/ Hazardous/ Gaseous pollutants will be exercised. Gas Gensets will be provided with acoustic enclosure and stack with appropriate height.

To handle hazardous waste as per Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016 of Environment Protection Act, 1986. Hazardous waste will be disposed of at the secured land fill facility available in the nearby vicinity.

- Fixed gas detection system will be installed in the workplace area.
- Work place monitoring will be carried out regularly through continuous monitoring systems and periodic checking.
- Ambient air quality will be monitored regularly.
- Sufficient green belt will be maintained inside and outside the premises by planting local species of trees.
- R&D team will work for continuous improvement in process to reduce Pollution Load & moving towards adopting cleaner production technology.

10.3 ENVIRONMENTAL MANAGEMENT PLAN

The Environment Management plan is meant for mitigation/ management of the adverse impacts and the strengthening positive impacts during proposed project. Environment Management Plan is tabulated in **Table: -10.1**.

Table 10-1: Environment Management Plan

Activity	Aspect	Source	Potential Impacts	Standards	Mitigation Measure	Emission	Budget	Timeframe	Responsibility
DURING CONSTRUCTION PHASE									
Excavation activity	Soil Pollution	Excavation for foundation & runway.	Eroded soil has reduced water absorption capacity, which can result in flooding and water stagnation.	<ul style="list-style-type: none"> ✓ Construction & Demolition Waste (Management & Handling) Rules, 2016 ✓ The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982 	<ul style="list-style-type: none"> ✓ Excavated soil will be stored properly using tarpaulin sheets & covers to avoid the spread of wind-blown dust and shall be reused for backfilling and landscape development. 	As per NAAQS, 2019; MoEFCC Notification & CPCB standards as amended.	<ul style="list-style-type: none"> ✓ Tarpaulin sheets & covers - Rs. 0.02 Cr ✓ Galvanized Corrugated (GC) sheet & barricades - Rs. 1.5 Cr ✓ Anti-smog Gun- Rs. 0.5 Cr. 	<ul style="list-style-type: none"> ✓ Boundary barricading will be done before the commencement of construction activities. ✓ Other measures will be followed throughout the construction period. 	Environmental Engineer
Constructional activities	Soil Pollution & Air Pollution	Construction of process area, office building, terminal building, ATC tower, electrical complex, utility area, runway, apron, taxiway, etc, water complex, roads & parking area	<p>Contamination of land/soil which may lead to leaching.</p> <p>Site development activities may cause release of particulate matters & dusts which can cause chronic lung diseases & breathing problems to human/workers & animals.</p>	<ul style="list-style-type: none"> ✓ The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982 	<ul style="list-style-type: none"> ✓ Proper barricading of the project site boundary will be done. ✓ PPE kits such as face mask, glasses, etc. will be provided to the labourers working in the site. ✓ Construction material will be kept over tarpaulin sheets and will be covered properly. ✓ Dust generating activities will be avoided in windy days. ✓ Water sprinkling will be done using anti-smog gun which will be rented during construction phase. 				

			Accumulation of dusts on leaves of trees						
Vehicular Activity	Air Pollution	Vehicular movement of trucks for constructional raw materials	Vehicular movements to & from project site may release other air pollutants such as NO _x , PMS, SO ₂ , CO ₂ which can again cause chronic lung diseases & breathing problems to human/workers & animals.	<ul style="list-style-type: none"> ✓ The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982 	<ul style="list-style-type: none"> ✓ Transportation of raw material will be done in vehicles covered with tarpaulin cover. ✓ The raw materials transporting vehicles will be selected of having valid PUC certificate. ✓ The vehicular impacts on the environment will be minimized by proper maintenance and limitation of speed. 	As per the Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982; MoEFCC Notification & CPCB standards as amended.		Will be followed throughout the construction period.	Environmental Engineer
Water consumption	Water Pollution	Treated water requirement for construction activities and tanker water for domestic purposes overall during construction period	Usage of ground water for construction purpose will lead to depletion as well as contamination of ground water table.	<ul style="list-style-type: none"> ✓ Water Act (Pollution Prevention & Control), 1974 ✓ Ground Water Guidelines for Withdrawal and Policies of Irrigation Department 	<ul style="list-style-type: none"> ✓ Ground water will not be used during construction period. ✓ Treated water will be used for construction purpose & flushing purpose while tanker water will be used for domestic purpose. ✓ Garland drains and sedimentation basins will be constructed for proper drainage of water from the site during construction 	-	<ul style="list-style-type: none"> ✓ Treated water - Rs. 1.0 Cr. ✓ Tanker water - Rs. 0.5 Cr 	Measures will be followed throughout the construction period.	Environmental Engineer

					phase.				
Sewage generation		Runoff due to construction & other domestic activities	Runoff from the project site containing domestic sewage into the stream could degrade the quality of the nearby water body, potentially affecting the water consumed by residents or animals and leading to waterborne health risks.		<ul style="list-style-type: none"> ✓ 30-35 Bio-toilets will be proposed. ✓ The liquid output from bio-toilets will be treated further or released back into nature, while the solid output will be converted into compost or disposed of in a safe manner. 	As per Water Act (Pollution Prevention & Control), 1974; MoEFCC Notification & CPCB standards as amended.	✓ 30-35 Bio-toilets = Rs. 0.02 Cr.	Bio-toilets will be set up before the commencement of construction activities & measures will be followed throughout the construction period.	Environmental Engineer & Safety Officer
Effluent generation		Runoff due to construction & equipment washing activities.	Release of effluent generated by washing of equipment may cause unnecessary runoff at project site.		<ul style="list-style-type: none"> ✓ It will be ensured that equipment/machinery used during construction period are washed properly only at the designated washing places to avoid any unnecessary runoff at project site 		Garland drains - Rs. 0.1 Cr.	Measures will be constructed before the commencement of construction activities.	Safety officer
Operation of machineries/equipment & vehicular movement	Noise Pollution	Machineries, Equipment, Vehicular movement	Noise pollution can cause harmful effects on human health aids such as hearing impairment,	<ul style="list-style-type: none"> ✓ Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 	<ul style="list-style-type: none"> ✓ Transportation of raw material & operation of construction machinery will be allowed only during daytime. ✓ The construction equipment/ 	As per Noise Pollution (Regulation and Control) (Amendment) Rules, 2002;	Acoustic enclosure/fencing - Rs. 0.15 Cr.	Will be followed throughout the construction period.	Environmental Engineer & Safety Officer



s, & constructi on activities.			annoyance and negative social behavior, interference in sleep schedule, spoken communication.	as amended	<p>machineries will be turned off when not in use.</p> <ul style="list-style-type: none"> ✓ Acoustic enclosure/fencing will be provided to construction machineries and equipment. ✓ Regular maintenance & lubrication of constructional equipment & machineries will be undertaken. ✓ Adequate PPEs like ear muff, ear plug, etc. will be provided to worker. 	MoEFCC Notification & CPCB standards as amended.			
Accident Hazards	Occupational Health & Safety	Falling from height, mishap during machinery & equipment operations etc.	Accidents such as fracture, injury, etc. due to fall from high place, equipment/machineries, fire hazard may be caused to laborers.	<ul style="list-style-type: none"> ✓ BOCWA, 1996 as amended ✓ Labour Act, 1970 ✓ OHSAS 	<ul style="list-style-type: none"> ✓ Personal Protection Equipment (PPE) like helmets, goggles, safety mask, ear plugs, safety shoes, etc. will be provided to workers. ✓ Safety measure sign boards/flex will be proposed in every possible corner of the project site. ✓ Training to worker will help to minimize the probability of accident to large extent. ✓ Effective implementation of the mitigation measures, proper care for the safety aspects will be followed. 	-	<ul style="list-style-type: none"> ✓ Industrial PPE Kits - Rs. 0.2 Cr. ✓ Safety board/flex - Rs. 0.01 Cr. 	<ul style="list-style-type: none"> ✓ Training for workers and the placement of safety signboards will be completed prior to the start of construction activities. ✓ Other measures will be followed throughout the construction 	Environmental Engineer & Safety Officer

								period.	
Construction & domestic activities	Waste & Generation	Solid & hazardous waste generation from excavation, construction & domestic sources	Open dumping or improper disposal of garbage & sewage wastes provides breeding ground for pathogenic bacteria and other micro-organisms which may spread diseases like diarrhea, infections with intestinal helminthes (worms), malaria, typhoid, and other infectious diseases.	✓ Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2016	<ul style="list-style-type: none"> ✓ Dustbins will be provided at site for collection of municipal waste. ✓ The garbage & sewage wastes will be treated properly and will be disposed at a safe location to avoid the impact of these pollutants on the land/soil, human health, etc. ✓ Spillage & leakage of fuel will be prevented by providing well lined/ paved area for the works having potential of leakage/ spillage of fuel or material. ✓ Hazardous waste like used oil from equipment & machineries shall be stored in sealed containers and shall be disposed of through authorized agencies only. 	As per Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2016; MoEFCC Notification & CPCB standards as amended.	<ul style="list-style-type: none"> ✓ Dustbins - Rs. 0.01 Cr. ✓ Sealed containers - Rs. 0.01 Cr. 	Dustbins & sealed containers will be kept at designated places before the commencement of construction activities & measures will be followed throughout the construction period.	Environmental Engineer & Safety Officer
DURING OPERATION PHASE									
Raw materials handling	Soil Pollution	Fuel handling (ATF, HSD), Dust generation	Contamination of land/soil due to spillage of raw material, disposal of waste water and hazardous substances may degrade the	-	<ul style="list-style-type: none"> ✓ Industrial Vacuum cleaners and Internal Road sweeping machines will also be deployed for the cleaning purpose of the premises. 	-	<ul style="list-style-type: none"> ✓ Industrial Vacuum cleaner - Rs. 0.1 Cr. ✓ Internal road sweeping machines 	Measures will be followed throughout the operation period.	Environmental Engineer

			quality of soil of the open ground which may further impact the health of living organisms leading to various diseases like diarrhea, cholera etc.				-- Rs. 0.1 Cr. ✓ Tarpaulin sheets & covers - Rs. 0.02 Cr. ✓ Water sprinkling system - Rs. 0.1 cr.		
Transportation	Air Pollution	Vehicular movement of trucks, two-wheeler; three-wheeler, four-wheeler.	Vehicular emissions may cause allergy, breathing problems, cough, wheezing, accumulation of dusts in trees & plants, etc. Accumulation of dusts on leaves & contamination of roots	The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982	<ul style="list-style-type: none"> ✓ Transportation of ATF will be done in tanker vehicles. ✓ Transportation of raw material and products will be avoided in the early morning and evening. ✓ The transporting vehicles will be selected of having valid PUC certificate. ✓ The vehicular impacts on the environment will be minimized by proper maintenance and limitation of speed. ✓ Pucca roads will be proposed within the premises. ✓ Industrial Vacuum cleaners and Internal Road sweeping machines will also be deployed for the cleaning 	-		<ul style="list-style-type: none"> ✓ Pucca roads will be developed within the airport premises during the construction phase & before the commencement of the airport. ✓ Industrial vacuum cleaners and internal road sweeping machines will be deployed during the operation phase. 	Environmental Engineer & Safety Officer

					<p>purpose of the premises.</p> <ul style="list-style-type: none"> ✓ Water sprinkling will be done in dusty areas and greenbelt/green cover to arrest the fugitive dust emission. 			<ul style="list-style-type: none"> ✓ Water sprinkling system will be installed prior to the operation of the airport. ✓ Other measures will be followed throughout the operation period. 	
Operation	Air Pollution	Burning of HSD in DG sets & ATF in aircraft during LTO cycle.	Main sources of air emission will be from aircraft LTO cycle & DG sets. PM 10, PM 2.5, SO ₂ , NO _x , CO, CO ₂ , Water vapour, etc., will be released which may cause COPD (Chronic Obstructive Pulmonary Disease). Short-term exposure to air pollutants is closely related	<ul style="list-style-type: none"> ✓ The Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982 	<ul style="list-style-type: none"> ✓ DG set will be deployed for power backup which will be used only during load shedding. ✓ Height of the stack for DG sets will be 6m & will be ensured for proper disposal of gas emissions. ✓ Emission norms for PM will be maintained within 30 mg/Nm³. ✓ Water sprinkling will be done during loading/unloading of trucks to control fugitive emissions. ✓ Lawn will be developed & 	As per the Air (Prevention & Control of Pollution) Acts 1981/ Rules 1982; MoEFCC Notification & CPCB standards as amended.	<ul style="list-style-type: none"> ✓ Stacks for DG – Rs. 0.02 Cr. ✓ CAAQMS – Rs. 0.4 Cr. 	<ul style="list-style-type: none"> ✓ Water sprinkling system will be installed prior to the operation of the airport. ✓ Lawn will be developed & maintained. ✓ Maintenance of greenbelt, & water sprinkling system along with its calibration will be 	Environmental Engineer & Safety Officer

			to cough, shortness of breath, wheezing, asthma, respiratory disease while long-term effects are chronic asthma, pulmonary insufficiency, cardiovascular diseases,		maintained.			carried out on regular basis throughout the operational phase.	
Water consumption	Water Pollution	Abstraction of ground water of 203 KLD of fresh water will be required for process as well as domestic purpose	Abstraction of ground water required for production may cause depletion of ground water.	<ul style="list-style-type: none"> ✓ Water Act (Pollution Prevention & Control), 1974 ✓ Ground Water Guidelines for Withdrawal and Policies of Irrigation Department 	<ul style="list-style-type: none"> ✓ Ground water abstraction permission will be obtained from competent authority and will be used accordingly. ✓ 167 rain water harvesting (RWH) tanks will be proposed each of capacity 54.8 m³ and the stored water will be used for flushing & gardening purpose. 	-	Rain water harvesting (RWH) – Rs. 3.0 Cr.	RWH tank will be constructed prior to the operation of the airport.	Water utility department Head
Sewage generation		Sewage water generation of 318 KLD from usage of 355 KLD of domestic water	Sewage generated from the use of domestic water may cause health hazard if not treated properly.		<ul style="list-style-type: none"> ✓ Domestic Sewage will be treated in sewage treatment plant of capacity 400 KLD and the treated water will be used for flushing & gardening purpose. ✓ STP sludge will be used as manure for gardening 	As per Water Act (Pollution Prevention & Control), 1974; MoEFCC Notification	Sewage Treatment Plant - Rs. 0.2 Cr.	STP will be constructed prior to the operation of the airport.	Water utility department Head

					purpose.	& CPCB standards as amended.			
Sludge generation		Sludge generation from treated water in STP.	Release of effluent generated in the production process, equipment washing may cause unnecessary runoff at project site.		✓ Sludge will be sent to authorized recycler or vendor/ TSDF.		Solid waste management & disposal - Rs. 0.5 Cr.	Measures will be followed throughout the operation period.	Environmental Engineer & Safety Officer
Operation of Machineries, Equipment, DG set, Vehicular & aircraft movement	Noise Pollution	Machineries, Equipment, DG set, Vehicular & aircraft movement	Noise Generation from operation of machineries/equipment, DG set, vehicular movements can cause harmful effects on human health such as Hearing Impairment, negative social behaviour and annoyance, interference with spoken communication, sleep disturbance, cardio vascular disease, etc.	✓ Noise Pollution (Regulation and Control) (Amendment) Rules, 2002 as amended	<ul style="list-style-type: none"> ✓ Adequate PPEs like ear muff, ear plugs, etc. will be provided to workers. ✓ Vibrating pads & acoustic enclosure will be provided to noise generating equipment and machineries to control noise level within norms. ✓ The operator's cabins (control rooms) will be properly (acoustically) insulated with special doors with observation windows. ✓ Lubrication of moving/rotating part or component of machineries will be done on regular basis. ✓ Latest technology and utmost care will be taken at the time 	As per Noise Pollution (Regulation and Control) (Amendment) Rules, 2002; MoEFCC Notification & CPCB standards as amended.	<ul style="list-style-type: none"> ✓ Acoustic Enclosures for DG set - Rs. 1.0 Cr. ✓ Sound proof or insulated doors & windows of control room (medium to high performance) - Rs. 1.0 Cr. ✓ Lubricating oils/grease - Rs. 	<ul style="list-style-type: none"> ✓ PPE kits will be distributed among labors before the commencement of operational activities. ✓ Acoustic enclosure for DG set will be set up at the time of installation of DG set. ✓ Soundproof/insulated doors & windows will 	Environmental Engineer & Safety Officer

					of equipment/machinery installation.		0.0025 Cr.	be installed during the construction of the airport. ✓ Other measures will be followed throughout the operation period.	
Construction of runway, roads, terminal building, parking etc.	Ecology & Biodiversity	Clearance of shrubs & plants	The shrubs & weeds may be cleared off from the project.	✓ The Environment Protection Act, 1986 as amended	✓ Lawn will be developed.	-	✓ Lawn development - Rs. 0.1 Cr.	✓ Maintenance of lawn will be carried out on regular basis throughout the operational period.	Horticulture department
Accident Hazards	Occupational Health & Safety	Mishap during machinery & equipment operations etc.	It is envisaged that occupational health hazards shall be associated with operational activities such as spillage and exposure to the chemical, mechanical	<ul style="list-style-type: none"> ✓ BOCWA, 1996 as amended ✓ Labour Act, 1970 ✓ OHSAS 	<ul style="list-style-type: none"> ✓ PPE like helmets, goggles, safety mask, ear plugs, safety shoes, etc. will be provided to workers. ✓ Training to worker will help to minimize the probability of accident to large extent. ✓ All safety signs boards will be placed at proper location. 	-	<ul style="list-style-type: none"> ✓ Industrial PPE Kits - Rs. 0.1 Cr. ✓ First Aid kit - Rs. 0.05 Cr. ✓ Fire hydrant system - 	<ul style="list-style-type: none"> ✓ PPE kits will be distributed among labours before the commencement of operational activities along with the training 	Environmental Engineer, Safety Officer & Fire-fighting Department Head

		hazards like cuts and hits and electrical shocks, accidents due to fall from height, burn injury and trap in the machine or motors, etc.	<ul style="list-style-type: none"> ✓ First aid kits will be made available at every department. ✓ All arrangement required for Fire hydrant system & Fire Extinguishers will be made at every vulnerable location to have the fire-fighting facility. ✓ All staff and workers will be trained in fire-fighting operations and emergency preparedness plan or to tackle the accident. ✓ Good housekeeping also plays important role in avoiding the undesirable incidences/accidents, hence good housekeeping practices will be employed throughout the Factory premises. ✓ Isolation in case of leakage/maintenance will be ensured. ✓ Strict implementation of 'NO SMOKING' and 'NO MOBILE' at the vulnerable zones will be ensured to minimize ignition chances. The vehicles entering inside the airport should be ensured to be fitted with flame arrestors. 	<p>Rs. 1.0 Cr.</p> <ul style="list-style-type: none"> ✓ First extinguisher - Rs. 0.05 Cr. ✓ Safety boards, windsock s & others - Rs. 0.02 Cr. 	<p>of the workers.</p> <ul style="list-style-type: none"> ✓ All safety signs boards, fire extinguisher s and windsocks will be placed at proper location before the commencement of operational activities. ✓ Fire hydrant system will be installed during the construction period and will be completed before the commencement of operational activities. ✓ Other measures will be followed
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					<ul style="list-style-type: none"> ✓ Clearly defined escape routes will be developed with identified Assembly Point in case of an emergency. ✓ Windssocks will be provided at prominent places to assist station personnel to see wind flow direction. This will assist people to escape in upwind or cross wind direction from flammable releases. ✓ Pre-employment Medical check-up and periodical medical check-up shall be undertaken to know the occupational health hazards at the early stage. 			throughout the operation period.	
Operational & domestic activities	Waste generation	Solid & hazardous waste generation from excavation, construction & domestic sources	Open dumping or improper disposal of sewage and garbage provides breeding ground for pathogenic bacteria and other creatures which may spread diseases like Diarrhea, Infections with intestinal helminthes (worms),	✓ Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2016	<ul style="list-style-type: none"> ✓ Separate wet & dry dustbins will be provided at site for collection of municipal waste. ✓ The sewage will be treated properly and garbage if any shall be disposed at a safe location to avoid the impact of these pollutants on the land. ✓ Spillage & leakage of fuel will be prevented by providing well lined/ paved area for the works having potential of leakage/ spillage of fuel or 	As per Hazardous & Other Waste (Management and Transboundary Movement) Amendment Rules, 2016; MoEFCC Notification & CPCB standards as	<ul style="list-style-type: none"> ✓ Dustbins - Rs. 0.01 Cr. ✓ Sealed containers - Rs. 0.01 Cr. 	<ul style="list-style-type: none"> ✓ Separate wet & dry dustbins will be placed at proper location before the commencement of operational activities. ✓ Garbage from wet dustbins will be treated while from 	Safety Officer & Cleaning department head

			Malaria, Typhoid, and other infectious diseases		<p>material.</p> <ul style="list-style-type: none"> ✓ Hazardous waste like used oil from equipment/machineries shall be stored in sealed containers and will be disposed-off through authorized agencies only. ✓ STP sludge will be used as manure for gardening purpose. 	amended.		<p>dry bins will be sold to authorized recyclers.</p> <ul style="list-style-type: none"> ✓ Sealed containers marked with danger sign will be placed at designated location ✓ Other measures will be followed throughout the operation period. 	
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10.4 ENVIRONMENTAL MANAGEMENT CELL (EMC)

Apart from having an Environment Management Plan, it is also necessary to have a permanent organizational set up charged with the task of proposed airport will create a department consisting of officers from various disciplines to co-ordinate the activities concerned with the management and implementation of the environmental control measures. Environment Management cell is defined in the Fig 10.1.

Basically, this department will undertake to monitor the environmental pollution levels by measuring stack emissions, ambient air quality, water and effluent quality, noise level etc. either departmentally or by appointing external agencies wherever necessary.

In case the monitored results of environmental pollution are found exceeding the allowable values, the environmental management cell will suggest remedial action and get these suggestions implemented through the concerned authorities. The actual operation and maintenance of pollution control equipment of each unit will be under the respective managers.

The Environmental Management Cell (EMC) will handle of all the related activities such as collection of statistics of health of workers and population of the region, afforestation, and green belt development.

10.4.1 SOP for Flow of Information

The flow of information in the Environment Management Cell will be as follows:

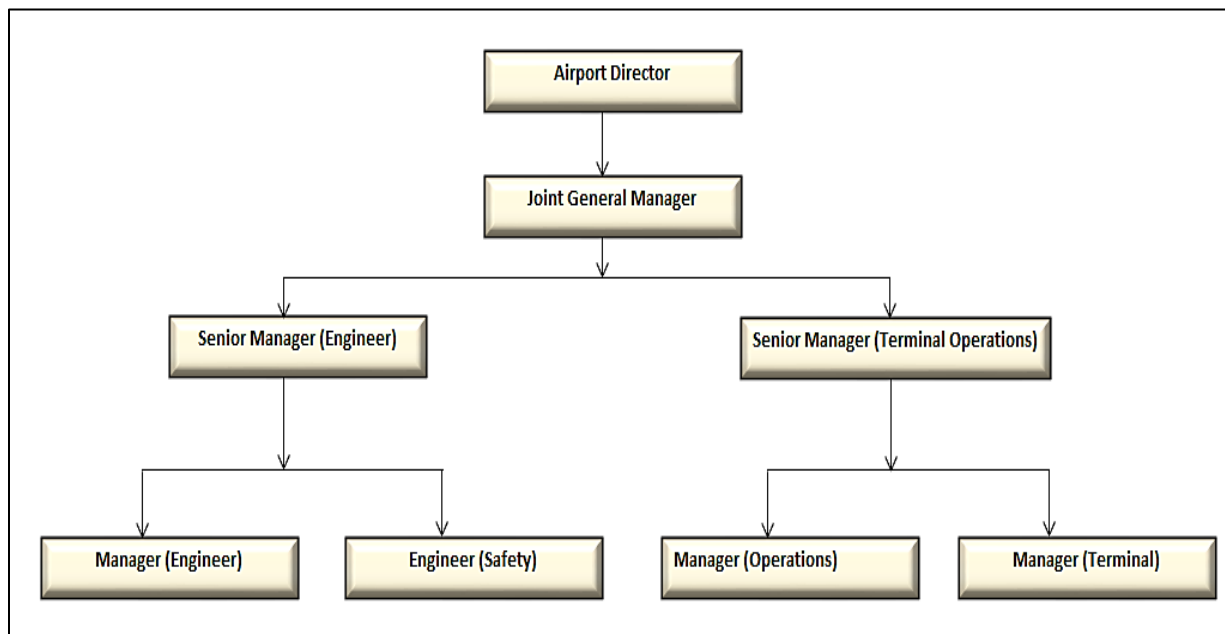


Figure 10-1: Environment Management Cell

The Environmental Management Cell would consist of Environmental Engineer, HR department, Admin office, Horticulture, Cleanliness, Medical and Safety officer headed by EMC/EHS Head and Head reporting to Managing Director.

During the construction & operation of the project, Project Review Team (PRT) meetings will be held every month wherein officials from the project and corporate centre will participate and discuss the progress and problems related to implementation of schedules of activities for construction, completion, and commissioning.

Monthly Operation Review Team (ORT) meetings for the project will be also held during project operation.

The issues related to the compliance of environmental norms including problems associated with the mitigation measures identified will be included in the agenda for quarterly review meetings, wherein action plan for remedial measures will be drawn and monitored.

The EMC/EHS Head will brief the ORT about the environmental performance and all compliances/non-compliances are brought to the notice of MD.

Action plan will be drawn for rectifying the Non-compliance.

10.4.2 Responsibility of EMC

The cell will be responsible for monitoring of the environment related requirements which include:

- EMC shall be in regular touch with PCB and will send them environmental monitoring reports regularly in the prescribed format, as per the prevailing practice.
- Any new regulations considered by State/Central Pollution Control Board for the facility shall be taken care of by EMC.
- In case of emergency (non-compliance/deviation/violation/major accident), Head of Environment Department will do immediate reporting to the Executive Director-Corporate, Directors and Chairman of the Company.
- Prevention of incidents/accidents that might result from abnormal operating conditions.
- Establish appropriate management system for environment management and ensure regular auditing to verify compliance.
- Ensure conducting third party environmental monitoring through certified bodies to evaluate prevailing environmental condition with respect to statutory norms.
- Timely renewal of Consents & Authorization will be taken care of.

- Submitting environmental monitoring report to PCB. The cell will also take mitigative or corrective measures as required or suggested by the Board.
- Conduct and submit annual Environmental Statement to PCB.
- Prepare and submit six monthly reports on the compliance with the conditions of the environmental clearance.
- Keeping the management updated on regular basis about the findings / results of monitoring activities and proposes measures to improve environmental performance.
- Conducting safety and health audits to ensure that recommended safety and health measures are followed.
- Proper housekeeping will be adopted to prevent spillages and contaminated surface runoff going to storm water drains.

10.5 BUDGETS FOR ENVIRONMENTAL MANAGEMENT PLAN

On regular basis, Environment Management Cell shall inspect the necessity and availability of the materials, technologies, services, and maintenance works. The Cell shall make appropriate budget for the purpose. Regular record review for any change in financial requirement of environment management shall be done and appropriate budgetary provisions shall be made. Along with other budgets, Budget for environmental management shall be prepared and revised regularly as per requirement. The budget shall include provisions for:

- Operation and Maintenance of Environmental Technologies / Equipment
- Environmental Monitoring Program
- Emergency Purchase of necessary material, equipment, tools, services
- Greenbelt development
- Social and Environmental Welfare and Awareness programs / training (CER)

The total capital investment on environmental control measures is envisaged to be about 30 crores (approx. 4.3 crores during construction phase & Rs 25.7 Crores during operation phase) which is about 2% out of a total proposed project cost i.e., **Rs 1400.0 Crores**. Details are given in table below:

Table 10-2: EMP Cost Details

S. No.	Environment Component	Basis of Cost Estimation	Capital Cost (In Cr.)	Recurring Cost (In Cr.)
Construction Phase				
1	Air	Tarpaulin sheets & covers	0.02	0.005
		Site barricading	1.5	0
		Anti-smog gun (rent)	0.5	0.01
2	Water	Treated water	1.0	0.02
		Tanker water	0.5	0.01

		Bio-toilet (30-35 nos.)	0.02	0.005
		Temporary garland drains and sedimentation basin	0.1	0.005
3	Noise	Acoustic Enclosures	0.15	0.01
4	Occupational Health & Safety	Industrial PPE Kits	0.2	0.01
		Safety board/flex	0.01	0.001
5	Solid Waste Management	Dustbins (for domestic & recyclable wastes)	0.01	0.002
		Sealed containers (for hazardous waste)	0.01	0.002
		Solid waste management & disposal (including C&D wastes)	0.15	0.05
6	Environment Monitoring	Quarterly monitoring of Air, Water, Noise, Soil	0	0.07
7	Escalation Cost	Miscellaneous	0.13	0.02
SUB-TOTAL			4.3	0.22
Operation Phase				
1	Air	CAAQMS	0.4	0.005
		Industrial Vacuum cleaner	0.1	0.005
		Internal road sweeping machine	0.1	0.005
		Water sprinkling system	0.1	0.005
2	Water	Water saving fixtures & devices	0.5	0.05
		RWH tank	3.0	0.01
		STP (400 KLD)	0.2	0.01
3	Noise	Acoustic Enclosures	1.0	0.01
		Sound proof doors & windows (medium to high performance)	1.0	0.01
		Lubricating materials	0	0.0025
4	Occupational Health & Safety	PPE Kits	0.1	0.005
		First Aid kit	0.05	0.005
		Fire hydrant system	1.0	0.1
		Fire extinguishers	0.05	0.01
		Safety board/signs, windsocks & others	0.02	0.005
		Health Check up	0.2	0.05
5	Solid Waste Management	Dustbins (for domestic wastes)	0.01	0.005
		Sealed containers (for hazardous waste)	0.01	0.005
		Solid waste management & disposal	0.5	0.02
6	Solar power	Solar Pannels	1.0	0.02
7	Landscape	Lawn development	0.1	0.01
8	Environment Monitoring	Quarterly monitoring of Air, Water, Noise, Soil	0.01	0.1
9	EMC	Environment Management Cell	0.5	0.05
10	CER	Corporate Environment Responsibility/ Addressing Public Hearing Issues	15.0	0
11	Escalation Cost	Miscellaneous	0.75	0.02
SUB-TOTAL			25.7	0.5175
GRAND TOTAL			30.0	0.7375

CHAPTER 11: SUMMARY & CONCLUSION

11.1 INTRODUCTION

The EIA report has been prepared as per TOR (Terms of Reference) grant in addition to “Generic Structure of EIA/EMP/RA Report” required by the Ministry of Environment & Forest, Government of India as per the general condition stipulated in the EIA notification dated 14.09.2006.

11.2 PROJECT DESCRIPTION

Airports Authority of India has proposed to develop a new Greenfield Airport at Doloo, Silchar. The current airport at Silchar belongs to IAF and AAI operates a civil enclave from 70.66 acres of land. Operators like Indigo, Air India & Spicejet are presently operating 80 flight movements in a week. It is suitable for the operation of A-320 type of aircraft. The Terminal Building at the current airport is likely to saturate soon and due to land constraints, there is no further scope of expansion of the Civil Enclave.

Table 11-1: Project Details

1 Nature and size of the Project			
Name of the project	Development of New Greenfield Airport at Doloo, Silchar, Cachar district, Assam by Airports Authority of India		
Category of the Project	As per EIA Notification dated 14th Sept., 2006 as amended from time to time; the project falls in Category A, Activity 7(a).		
2 Location Details			
Village /Town/Plot No.	Village-Doloo		
Tehsil	Silchar Sadar		
District	Cachar		
State	Assam		
Latitude and Longitude	Points	Latitude	Longitude
	Core	24°55'56.85"N	92°48'52.40"E
Toposheet No.	G46016, G46012, G46U13 & G46U9		
3 Area Details			
Total Project Area	997.4 Acres		
4 Environmental Setting Details (with approximate aerial distance & direction from site)			
Nearest Settlement	Mulidahar Grant village adjacent towards SW direction.		

	Nearest Highway	NH-27 parallelly adjacent towards South direction. SH-38 at 8.3 km distance towards SW direction.
	Nearest Railway station	Moinarband Railway Station 8.3 km in South direction.
	Nearest Airport	Silchar Airport at 14 kms towards East direction.
	National Parks, Wildlife Sanctuaries, Biosphere Reserves, Tiger/ Elephant Reserves, Wildlife Corridors etc. within 10 km radius	Barail Wildlife Sanctuary at 3.3 Kms towards North direction.
	Nearby Water Bodies	Dalu River & Dalu Lake adjacent towards East direction.
	Defence Installations	None within 10 km radius from Centre of plot.
	Seismic Zone	Zone V
5	Cost Details	
	Total Cost of the Project	1400.0 Crores
	Budget for EMP (construction+ Operation)	Capital Cost of Rs. 30 Cr.
6	Basic Requirements for the project	
	Fresh Water (m ³ /day)	203 KLD (Source: Ground Water)
	Manpower	During Construction: 10 (permanent) + 350 (temporary) During Operation: 40 (permanent)
	Electricity Requirement	3000 kVA or 2400 kW Source: State Electricity Board
	Power Backup	DG Sets - 4 x 1,250 kVA (3W+1S) Solar Power - 500 kWp (20.83%)
	Working Days	365 days

11.3 DESCRIPTION OF THE ENVIRONMENT

Table 11-2: Summary of Baseline Monitoring Study

S. No	Parameters	Baseline Status
1.	Ambient Air Quality	
i.	PM10	27.0 ug/m ³ to 47.0 ug/m ³
ii.	PM2.5	11.0 ug/m ³ to 25.8 ug/m ³
iii.	SO ₂	4.2 ug/m ³ to 15.2 ug/m ³
iv.	NO ₂	9.4 ug/m ³ to 23.06 ug/m ³
v.	CO	0.42 mg/m ³ and 0.93 mg/m ³
Values are well within the stipulated standard of CPCB.		
2.	Noise Level Monitoring	
i.	Day Time (6:00 a.m. to 10:00 p.m.)	47.24 Leq dB to 53.75 Leq dB

ii.	Night Time (10:00 p.m. to 6:00 a.m.)	38.12 Leq dB to 42.8 Leq dB
The observed noise levels were found slightly higher than the stipulated standards of CPCB.		
3.	Soil Quality and Characteristics	
i.	pH	7.15 to 7.59
ii.	Organic Matter	0.58% to 0.94%
iii.	Nitrogen	162.79 Kg/ha. to 195.15 Kg/ha.
iv.	Phosphorus	17.12 Kg/ha. to 29.15 Kg/ha.
v.	Potassium	140.00 Kg/ha. to 163.15 Kg/ha.
4.	Ground Water	
i.	pH	7.51 to 7.88
ii.	Total Hardness	148 mg/l to 157 mg/l
iii.	Total Dissolved Solids	213 mg/l to 222 mg/l.
5.	Surface Water	
i.	pH	7.44 to 7.78
ii.	Total Hardness	216.0 mg/l to 288.0 mg/l
iii.	Total Dissolved Solids	397 mg/l to 679 mg/l
iv.	BOD	20 to 38(mg/l)
v.	COD	62 to 82 (mg/l)
The concentrations were found to be within permissible limits (Compared with IS 10500:2012)		

11.4 ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

S.No.	Particulars	Mitigation measures to be adopted
1	Air Environment	<ul style="list-style-type: none"> • ICAO emission standards will be maintained at the airport • Efforts will be done to reduce the use of fuel to save money and reduce emission • Single engine taxiing will be adopted at the airport • Engine will be shut down during idling • Airport will be designed to reduce the taxiing length of aircraft • Proper signage will be displayed at the airside for movement of vehicles and aircraft • Low Sulphur Diesel will be used in DG set • Regular Vehicle pollution check will be done for vehicle used in airside • Proper traffic management plan will be prepared to ensure no traffic congestion at internal road and NH-27. • Stack height to the DG set as per CPCB guideline will be provided • Wide access pathways and sufficient nos. of exit & entry shall be provided to minimize the congestion • All measures will be adopted to reduce fugitive emission during handling and refueling of fuel.

2.	Water Environment	<ul style="list-style-type: none"> • Proper oil & grease interceptors have been installed at wastewater outlet from the fuel depots, hotels/restaurants, and flight catering. The wastewater will be passed through oil and grease interceptors and then routed to STP. Sludge will be removed regularly and after appropriate treatment it will be used as manure. • Proper drainage will be provided to mitigate the impacts which can be due to run-off of the storm water.
3.	Hazardous Waste Environment	<ul style="list-style-type: none"> • Used oil will be send to authorized recycler identified by SPCB. • Sludge from STP can be used in-house in green belt plantation. • Discarded Containers/ Empty Barrels will be sent to vendors/ SPCB approved scrap dealer.
4.	Noise Environment	<ul style="list-style-type: none"> • Personal protective equipment-like ear plugs and ear muffs will be provided to employees working in the noise prone areas. • Time to time oiling and servicing and Maintenance of machineries will be done. • Acoustic enclosure for heavy machines/ equipment/ GG sets would be used. • The Noise free machines of latest technology will be installed • A high standard of maintenance and proper lubricants will be practiced for machinery and equipment, which helps to avert potential noise problems.
5.	Occupational Health & Safety	<ul style="list-style-type: none"> • All safety signs will be placed at proper location. • First aid kits will be made available at every department. • Pre-employment medical check-up and periodical medical check-up shall be undertaken to know the occupational health hazards at the early stage. • Work permit system has been introduced to avoid the entry or unauthorized working to avoid the incidences which can lead to the accident if proper care is not taken. • A well-developed fire fighting system is already Implemented at the airport premises. • Apart from all engineering control measures, if required necessary PPEs shall be provided as last protection measures to the employees. • Good housekeeping also plays important role in avoiding the undesirable incidences / accidents, hence good housekeeping practices will be employed throughout the Airport premises

11.5 ANALYSIS OF ALTERNATIVES

A team of officials from AAI consisting of Shri Varun Lau, JGM(Arch), Shri Manjit Singh DGM (ATM)-(PLG), Shri Soumen Poddar, AGM(ATM), Shri Sunil Kumar SM(Ops), RHQ NER and Shri Rajpal Lavasia Manager Engg. (Civil)CHQ-NER along with the officials from State Government of Assam carried out study at sites identified by State Government namely Doloo T.E., Khoreel T.E. and Silcoorie T.E. from 20.01.2020 to 22.01.2020. As per site analysis based on parameters like connectivity, physical features, and planning aspects,

Doloo T.E. site has been considered for development of Greenfield Airport at Silchar compared to Khoreel T.E. and Silcoorie T.E. site.

11.6 ENVIRONMENTAL MONITORING PROGRAM

Monitoring of environmental samples will be done as per the guidelines provided by MoEF&CC/ CPCB. The method followed will be recommended / standard method approved / recommended by MoEF&CC /CPCB/SPCB

S.No.	Environmental Components	Monitoring Points/Locations
1.	Ambient Air	8 locations (upwind, downwind & crosswind directions) within 10 km radius around the project site
2.	Water	Ground water samples were collected from 6 different locations and Surface Water quality from 7 locations (including upstream & Downstream) within the study area.
3.	Noise	8 locations within 10 km radius around the project site.
4.	Greenbelt/Vegetation Cover	Greenbelt area around the project boundary & lawn area.
5.	Soil	6 locations within 10 km radius around the project site.

11.7 ADDITIONAL STUDIES

This report is prepared based on the one non-monsoon season (three months) baseline monitoring data during 1st October to 31st December 2023, Post-monsoon season, by field study. Data from the secondary sources are used for comparison between present environmental conditions and our laboratory results. The data includes meteorological conditions, ambient air quality, noise, water quality and soil quality. Site survey has been conducted for studying the flora and fauna, socio- economic conditions land use etc. Additional information is also collected from several agencies and departments, both under State and Central Governments pertaining to above. The collected data have been analysed in detail for identifying, predicting, and evaluating the environmental impacts of the proposed project. The anticipated impacts on environment are assessed and suitable environmental management plan has been suggested.

11.8 PROJECT BENEFITS

Direct and indirect employment opportunities will be generated which will result in the growth and development of the surrounding areas.

Special emphasis on financial and social benefits will be given to the local people including the tribal population, if any, in the area. Development of social amenities will be in the form of medical facilities, education, and the creation of self-help groups.

11.9 ENVIRONMENT MANAGEMENT PLAN AND FINAL RECOMMENDATIONS

M/s Airports Authority of India has committed to implement all the pollution control measures to protect the surrounding environment. The project can improve the regional, state, and national economy. Industrial growth is an indication of socio-economic development. The implementation of this project will improve the physical and social infrastructure of the surrounding area.

CHAPTER 12: DISCLOSURE OF CONSULTANTS

12.1 INTRODUCTION

Vardan EnviroNet LLP (formally known as Vardan EnviroNet) is a pioneer consulting organisation of India specializing in Environmental Protection, Industrial Pollution Control, Environmental & Mechanical testing, and engineering field. Vardan EnviroNet LLP is NABET, QCI approved in 21 sectors. The accreditation certificate no. is NABET/EIA/2326/RA 0284 which is attached as **Annexure-6**.

Vardan assists clients in comprehensive environmental and engineering services ranging from conceptual planning and preliminary investigation to detailed engineering designs. Local knowledge coupled with national and international experience of proven technical know-how and a strong commitment from our team of experts enables Vardan to assist in solving the clients environmental and engineering problems successfully with competence by first analysing then visualizing and finally utilizing technically strong and dedicated skill.

Vardan has successfully completed a wide range of multi-disciplinary assignments/reports. The company's project formulation requires preliminary and detailed project investigation. The objective of the investigation is to assess the technical viability and cost effectiveness of the proposals vis-à-vis the objective and benefit. Vardan was founded in 2012 and brought together several consultancy services with a track record of performance in the environmental Science and Engineering field.

Headquartered in Gurugram, Vardan has prominent presence in Delhi-NCR, Rajasthan, Maharashtra, Madhya Pradesh, West Bengal, and Jharkhand. With a man-power of over more than 200 professionals, the organization comprises of senior retired government officers from various departments like Pollution Control Board, Mines & Geology, Civil Services, SAIL, GAIL, NEERI who have decades of experience in the field of environmental management. The team also Comprises of young, dynamic and progress driven Environment, Civil, Mechanical & Chemical engineers, Geologists, GIS experts, Ecologists and Auditors.

Vardan EnviroLab LLP (formally known as Vardan EnviroLab), a sister concern provides reliable and precise testing services for a wide range of Environmental, Chemical, Food testing, Microbiology and Building Materials with in-house Equipment/Instruments of advance technology along with experienced technical staff.

12.2 SERVICES OF VARDAN ENVIRONET

- Environmental Impact Assessment (EIA), Environmental Management Plan (EMP), Environmental Compliance, Mining Plan, Social Impact Assessment.
- Testing of water, Waste water, Ambient & work zone air, stack emissions, noise, soil, limestone, dolomite, iron ore, coal, cement, bricks, concrete, blocks, steel bars & wires, Indoor Air Quality monitoring, Sludge.
- Hydrological surveys for ground water clearance.
- Approvals/NOC/Clearances from various Government Authorities.
- Detailed Project report/Feasibility report/Plans/Designs.
- Environmental Quality Monitoring and analysis.
- Geotechnical investigations, Topographical Survey, Planning and Designs.
- EHS, Energy and water Audit, risk/hazard studies and disaster management plan (both onsite and off-site).

12.3 ENVIRONMENTAL MONITORING AND ANALYSIS LABORATORY

Environmental Baseline data generation has been carried out by NABL Accredited laboratory M/s Vardan EnviroLab, Gurugram, NABL Accredited Lab, and Certificate No. TC-6299. The laboratory has also been accorded recognition as Environment Laboratory by CPCB (MoEF&CC). NABL Accreditation Certificate No. Is TC-6299 attached as **Annexure-7**.

12.4 RECOGNITIONS

- Approved by NABET in 21 sectors for preparation of EIA/EMP reports
- Vardan EnviroNet is recognized by Ministry of Environment, Forest & Climate Change, Govt. of India under Environmental Protection Act 1986
- Vardan EnviroLab is accredited by NABL in the field of Testing
- Vardan EnviroLab is certified by OHSAS 45001:2018
- Vardan EnviroLab is certified by ISO 14001:2015
- Vardan EnviroLab is certified by ISO 9001:2015
- Vardan EnviroLab is approved by HSPCB & RSPCB

12.5 LIST OF SOFTWARE MODELS FOR ENVIRONMENTAL STUDIES

- Multisource Dispersion Model based on Gaussian Model (ISCST3, AERMOD)
- Noise Propagation Model (Dhwani Pro)
- Risk and Hazard studies through Aloha model

- GIS mapping through Arc GIS, watershed & area drainage mapping, cadastral mapping, DGPS survey, 3D modelling, Urban/Rural area planning & management and Digital Elevation Model.
- Transect and line intercepts for Ecology and Biodiversity studies
- Extrapolative method & Intuitive technique (Delphi technique) in socio-economic assessment.

12.6 EMINENT CLIENTELE OF VARDAN

Vardan has executed around 1000 projects across all over India in a short span of time covering both public and private sectors. Various reputed clients of Vardan are IOCL, HPCL, NTPC, NHPC, DMRC, GAIL, SAIL, NHAI, APCPL, RITES, MPPGCL, Indian Railways, JK Lakshmi Cement Ltd., L&T, Tata, Adani, Hero, Honda, HCL, Panasonic, Jaypee group, DLF, Godrej, Haldiram's, Unitech, JBM, Trident hotels, Lanco, Mangalam cement, JW Marriot, Eros group and many others.

12.7 KEY MANAGEMENT PERSONNEL OF VARDAN

Table 12-1: Key Management Personnel of Vardan

S. No.	Name	Designation	Experience (Years)
1.	R.S. Yadav	Managing Director	35
2.	Aman Sharma	President	16
3.	Roopika Sharma	CEO	14
4.	Anshul Yadav	General Manager	12

12.8 PERSONNEL INVOLVED

The EIA/EMP report has been prepared under the guidance of following Coordinators & Functional Area Experts:

EC/FAE	Name of the expert/s	Involvement
EIA Coordinator	Mr. Saurabh Garg	Coordinated the EIA Study and instructed FAE's and PA's for proper data generation, assessment and report writing
FAE-AP	Mr. K.M. Khare	Period of Involvement- October to December, 2023 ➤ Identifying the sources of emissions and mitigation measures. ➤ Site-specific micro meteorology monitoring. ➤ Ambient Air Quality (AAQ) monitoring ➤ Impact predictions and mitigations. ➤ Impact identification
FAE-WP	Mr. Shubham Tyagi	Period of Involvement- October to December, 2023

		<ul style="list-style-type: none"> ➤ Selection of sampling locations ➤ Ground water quality monitoring and assessment, impacts on water environment and mitigations. ➤ Identification, characterization of effluent and treatments there of ➤ Water balance and conservation measures
FAE-SHW	Mr. Anasua Nag	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Identification of hazardous, solid waste generation, and their disposal and mitigation measure. ➤ Suggesting proper Recycling and disposal techniques
FAE-SE	Ms. Shilpa Mishra	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Determination of demographic profile including socio economy & livelihood ➤ Assessing the changes in socio economic pattern
FAE-EB	Dr. Sunil Prasad Bhatt TM: Swetagni Mohanty	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Biological environment status in respect of terrestrial fauna and aquatic eco system ➤ Impact on ecological environment
FAE-HG	Mr. R. S Yadav	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Ground water resource assessment ➤ Impact on ground water potential and mitigation measures for avoiding ground water contamination.
FAE- SC	Mr. Sameer Deshpande FAA: Adarsh Bhardwaj	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Monitoring, analysis, and characterization of soil ➤ Assessment of impact on soil quality and mitigation measure.
FAE- AQ	Ms. Surbhi Makwana	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Processing of site specific micro-meteorological data. ➤ Collection and use of data for modelling. ➤ Air dispersion modelling for prediction of GLCS due to PM10, SO2 and NOx.
FAE – NV	Mr. K.M. Khare	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Analysis of ambient noise quality data ➤ Impact due to noise and abatement measures
FAE – LU	Ms. Mamta Pandey	<p>Period of Involvement- October to December, 2023</p> <ul style="list-style-type: none"> ➤ Analysis of data related to land use pattern ➤ Land use map development. ➤ Impact on land environment in respect to land

		form change
F AE-RH	Mr. Jayeshbhai Y. Makwana	Period of Involvement- October to December, 2023 ➤ Identification of hazardous prone areas ➤ Environment risk evaluation ➤ On-site and Off-site emergency planning
F AE-GEO	Mr. R. S Yadav	Period of Involvement- October to December, 2023 ➤ Topography and geological aspects. ➤ Developing geological maps.

Apart from EIA Coordinator and FAE's involved in the project the other technical staff involved in the preparation of EIA is listed below: -

Table 12-2: Personnels involved in EIA Report Preparation

Name of Internal Team Member	Activity / Area	Involvement - Actual Work Performed
Ms. Aanchal Sharma	EIA Report Compilation	Coordination for data collection for draft EIA documentation. Assisted FAE for identification of impacts and mitigation measures.
Ms. Meenu	Lab data Compilation	Assisted FAE for identification of impacts and mitigation measures.