AMENDED FORM I-JUNE 2017

ENVIRONMENTAL CLEARANCE FOR DEVELOPMENT OF COMMERCIAL AIRPORT AT MUNDRA, KUTCH DISTRICT, GUJARAT

PROJECT PROPONENT
MUNDRA INTERNATIONAL AIRPORT PRIVATE LIMITED

ENVIRONMENT CONSULTANT
GREENCINDIA CONSULTING PRIVATE LIMITED

NABET/EIA/RA014/041

FORM-I

I. BASIC INFORMATION

S. No.	Item		Details
1.	Name of the Project/s	:	Environmental Clearance for Development of Commercial Airport at Mundra, Kutch District, Gujarat
2.	Sl. No. of the Schedule	:	7(a)
3.	Proposed capacity/ area / length/ tonnage to be handled/ command area/ lease area/ lease area/ number of wells to be drilled	:	Commercial Airport at Mundra, Gujarat. Total area 522 Ha
4.	New / Expansion / Modernization	:	**Expansion**
5.	Existing Capacity / Area etc.	:	45 Ha (Existing airstrip)
6.	Category of Project i.e. 'A' or 'B'	:	'A'
7.	Does it attract the general condition? If yes please specify.	:	Not Applicable
8.	Does it attract the specific condition? If yes please specify.	:	Not Applicable
9.	**Location**	:	Points: A; Latitude: 22°51'08.1" N; Longitude: 69°47'31.2" E
i.	Plot/Survey/Khasra No.	:	**Baroi:** 244, 207, 238, **Goarsama:** 52, 53, 24/1,2; 25/1,2,3; 26, 34/1; 34/6; 34/7, 34/8; 34/9; 34/10; 23/1,2; 27, **Shekhadia:** 81/2; 120 **Luni:** 468/4; 468/5
ii.	Village	:	Baroi, Goarsama, Shekhadia, Luni
iii.	Tehsil/Mandal	:	Mundra Taluka
iv.	District	:	Kutch
v.	State	:	Gujarat

10.	Nearest Railway Station / Airport along with distance in kms.	:	**Facility**	**Name**	**Aerial Distance**	**Direction**
			Airport	Bhuj Airport, Gujarat	70 km	NW
			Railway Station	Gandhidham Railway Junction	50 km	NE
11.	Nearest Town, city, District Headquarters along with distance in kms.	:	Nearest Town	Bhuj	50 km	NW
			District HQ	Bhuj	55 km	NW

12.	Village Panchayats, Zila Parishad, Municipal Corporation, Local body (complete postal addresses with telephone nos. to be given)	:	Village Panchayat	:	Baroi, Goarsama, Shekhadia, Luni.
			Village	:	Baroi, Goarsama, Shekhadia, Luni
			Tehsil/Mandal	:	Mundra Taluka
			District	:	Kutch

S. No.	Item		Details
			State : Gujarat
13.	Name of the Applicant	:	Mundra International Airport Pvt. Ltd. (MIAPL)
14.	Registered Address	:	M/s Mundra International Airport Pvt. Ltd. 'Adani House' Near Mithakhali Six Roads, Navrangpura, Ahmedabad-380009
15.	Address for correspondence	:	M/s Mundra International Airport Pvt. Ltd. 'Adani House' Near Mithakhali Six Roads, Navrangpura, Ahmedabad-380009
	Name	:	Capt. Unmesh Abhayankar
	Designation (Owner / Partner / CEO)	:	Jt. President
	Address	:	Mundra International Airport Pvt. Ltd. 'Adani House' Near Mithakhali Six Roads, Navrangpura, Ahmedabad-380009
	Pin Code	:	380009
	E-mail	:	shalinm.shah@adani.com
	Telephone No.	:	079-2555 7362, 0-9099938893
16.	Details of alternative Sites examined. If any, location of these sites should be shown on a topo sheet.	:	Not Applicable-Project is an expansion of existing airstrip to commercial airport
17.	Interlinked Projects	:	The existing airstrip area as well as the proposed expansion project falls partly within the notified SEZ area. The master plan of Mundra SEZ was prepared considering the development of full-fledged cargo as well as passenger airport. However, this project is independent and is not linked with other project/s which may attract/s directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.
18.	Whether separate application of interlinked project has been submitted?	:	Not Applicable
19.	If yes, date of submission	:	Not Applicable.
20.	If no, reason	:	Not Applicable.
21.	Whether the proposal involves approval / clearance under: if yes, details of the same and their status to be given	:	
	(i) The Forest (Conservation) Act, 1980		Yes. The project involves 185 ha of forest land (the application for forest diversion of 1576.81 ha has been applied by APSEZ for its proposed expansion of existing SEZ and industrial park at Village Sirancha, Navinal, Dhrub, Mundra, Baroi, Goarsama, Luni, Bhadreshwar,

S. No.	Item		Details
			Mundra Taluka in Kutch District. This 185 ha. forest land is part of this application.)
	(ii) The Wildlife (Protection) Act, 1972		The project does not involve clearance under The Wildlife (Protection) Act, 1972.
	(iii) The C.R.Z. Notification, 1991		No. The project is outside the CRZ area as per CRZ notification 2011.
22.	Whether there is any Government Order / Policy relevant / relating to the site?		The proposed project area falls partly under notified SEZ.
23.	Forest Land involved (hectares)		185 ha
24.	Whether there is any litigation pending against the project and/or land in which the project is propose to be set up? (a) Name of the court (b) Case No. (c) Orders / directions of Court, if any and its relevance with the proposed project.		No. There are no litigations against the project.

II. ACTIVITY

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

S. No.	Information / Checklist confirmation	Yes/ No	Details there of (with approximate quantities/rates, wherever possible) with source of information data.
1.1	Permanent or temporary change in land use, land cover or topography including increase in intensity of land use (with respect to local land use plan)	Yes	About **522 Ha** of land is required for the Proposed Airport. of which, Land owned by APSEZ- **170 ha** Abandoned salt works- **167 ha** Forest land- **185 ha** Permanent land use change includes building-up of the following facilities. • Runway, taxiway system, turning pads, isolation bay, Aprons, RESA, DVOR • Passenger and Cargo Terminals • Control Tower, Technical Block, Fire Station, Fuel storage, Administration Building, Residential complex for staff • Development of Basic Strip, Approach Roads, Car Parking • Communication and Navigational Aids. • Landscape area

			• Related associated infrastructure facilities. • Aerospace manufacturing facility
1.2	Clearance of existing land, vegetation and buildings?	Yes	Existing vegetation at the proposed project site (approximately 185 ha of forest land) will be cleared according to expansion plan.
1.3	Creation of new land uses?	Yes	Refer point no. 1.1
1.4	Pre-Construction investigations e.g. bore houses, soil testing?	Yes	Soil investigation carried out by M/s. Geotech, in August 2005, reveals that a CBR of 15% is available for pavement design works.
1.5	Construction works?	Yes	Please refer Point no. 1.1
1.6	Demolition works?	No	No demolition works are involved.
1.7	Temporary sites used for construction or housing of construction works?	Yes	Only temporary rest shelter will be constructed at / near the project site for construction labours. Basic amenities will be provided in the rest shelters.
1.8	Above ground buildings, structures, cut or fill or excavations	Yes	Please refer point 1.1
1.9	Underground works including mining or tunneling?	No	No underground works will be carried out.
1.10	Reclamation works?	No	The area will be level raised to attain uniform ground level.
1.11	Dredging?	No	No dredging works are involved
1.12	Offshore Structures?	No	No offshore works are involved
1.13	Production and manufacturing processes?	Yes	The project involves aerospace manufacturing facility which will encompass the complete production process for Aircrafts & Unmanned Aircraft Vehicles beginning with the process of sheet metal to the final delivery hangar wherein the final product shall be delivered to the customer.
1.14	Facilities for storage of goods or materials?	Yes	There will be facility for cargo storage as well as aviation fuel storage inside the project area. Also the raw materials for aerospace manufacturing facility shall be stored in the site itself.
1.15	Facilities for treatment or disposal of solid waste or liquid effluents?	Yes	▪ **Liquid effluent:** a) Wastewater generated from the domestic activities during construction phase will be treated in septic tank followed by soak pit or used for green belt development. ▪ The sewage and sanitary wastes from the buildings and airport terminals during operation phase will be treated in a 50 KL capacity STP comprising primary, secondary and tertiary treatment facilities. The liquid effluent from the site will be sent to CETP of SEZ. ▪ **Solid waste:** a) Biodegradable portion of MSW will be treated at site by Organic Waste Converters and manure generated will be used for plantation.

			b) Recyclable waste will be sold to recyclers. Inert waste will be sent to MSW Disposal sites for land fill. c) Hazardous waste shall be treated in accordance with Hazardous and Other Wastes (Management and Trans-boundary Movement) Rules, 2016. d) The e-wastes and used oil will be stored properly and handed over to recyclers authorized by GPCB.
1.16	Facilities for long term housing of operational workers?	No	Residential facilities are not proposed for this project
1.17	New road, rail or sea traffic during construction or operation?	Yes	New road traffic will be generated due to transportation of construction material as well as construction workers. During operation phase, cargo evacuation as well as passenger transit within the state/country from the airport will add traffic. Also transporting raw materials for aerospace manufacturing shall add to the existing traffic.
1.18	New road, rail, air, waterborne or other transport infrastructure including new or altered routes and stations, ports, airports etc.?	Yes	The project proposal involves expansion of the existing airstrip. The existing two lane road will be utilized for traffic management. However, there is a provision of expansion of road, if required.
1.19	Closure or diversion of existing transport routes or infrastructure leading to changes in traffic movements?	No	None of the existing transport routes or infrastructure will be closed or diverted.
1.20	New or diverted transmission lines or pipelines?	No	No new transmission line will be laid down for this project.
1.21	Impoundment, damming, culverting, realignment or other changes to the hydrology of neither watercourses nor aquifers?	No	There will no adverse changes to hydrology of watercourses or aquifers due to operation. Also, no impoundment, damming, culverting, realignment or other changes will be done.
1.22	Stream crossings?	No	No stream crossings are involved.
1.23	Abstraction or transfers of water from ground or surface water?	No	Source of water for the proposed project will be from APSEZ's Utility Division. Proposed project will not have any adverse effect on the ground water.
1.24	Changes in water bodies or the land surface affecting drainage or run off?	No	The project is not going to bring any changes in water bodies. The change in land surface is not going to affect the drainage.
1.25	Transport of personnel or materials for construction, operation or decommissioning?	Yes	Personnel and raw materials shall be transported during construction phase. During operation phase, raw materials shall be brought to the aerospace manufacturing facility from outside.
1.26	Long-term dismantling or decommissioning or restoration	No	The project does not involve long term dismantling, decommissioning or restoration works.

	works?		
1.27	Ongoing activity during decommissioning, which could have impact on the environment?	No	The project does not involve decommissioning.
1.28	Influx of people to an area in either temporarily or permanently?	Yes	There will be temporary influx of people in the area during the construction phase. Local people will be given preference for employment. The project will provide direct and indirect employment to the local people living in surrounding villages depending on their skills.
1.29	Introduction of alien species?	No	The project involves landscaping and greenbelt development with native species and as suggested by CPCB.
1.30	Loss of native species or genetic diversity?	No	The project will not lead to loss of native species or genetic diversity.
1.31	Any other actions?	No	No other actions are involved.

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

<table>
<tr><th>S. No.</th><th>Information/Checklist confirmation</th><th>Yes /No</th><th>Details thereof (with approximate quantities / rates, wherever possible) with source of information data</th></tr>
<tr><td>2.1</td><td>Land especially undeveloped or agricultural (ha)</td><td>Yes</td><td>The total land required for developing the airport is about 522 hectares, of which-
• Land owned by APSEZ- 170 ha
• Abandoned salt works- 167 ha
• Forest land- 185 ha</td></tr>
<tr><td>2.2</td><td>Water (expected source & competing users) unit: KLD</td><td>Yes</td><td>The water for the project will be sourced from APSEZ's utility Division.
The water requirement for the project is as follows:
<table>
<tr><th>Activities</th><th>Construction Phase (KLD)</th><th>Operation Phase (KLD)</th></tr>
<tr><td>Domestic</td><td>60</td><td>80</td></tr>
<tr><td>Industrial</td><td>500</td><td>40</td></tr>
<tr><td>Fire</td><td>-</td><td>1500 KL</td></tr>
</table></td></tr>
<tr><td>2.3</td><td>Minerals (MT)</td><td>Yes</td><td>Minor minerals like sand & gravels will be used during construction.</td></tr>
<tr><td>2.4</td><td>Construction material- stone, aggregates, and/ soil (expected source- MT)</td><td>Yes</td><td>
<table>
<tr><th>Construction materials</th><th>Quantity</th></tr>
<tr><td>Cement</td><td>15,00,000 bags</td></tr>
<tr><td>Sand</td><td>11,88,947 cum</td></tr>
<tr><td>Stone aggregates</td><td>8,91,710 cum</td></tr>
<tr><td>Bricks</td><td>20,00,000</td></tr>
</table></td></tr>
</table>

S. No.	Information/Checklist confirmation	Yes /No	Details thereof (with approximate quantities / rates, wherever possible) with source of information data	
			Reinforcement steel	18,872 tonnes
2.5	Forest and Timber (source –MT)	No	No forest or timber resources will be used	
2.6	Energy including electricity and fuels (source, competing users) Unit: fuel (MT), Energy (MW)	Yes	**Power:** The maximum power consumption for the entire airport has been estimated to be 10,000 kW. The electricity will be sourced from Mundra Utility Division. Procurement and installation of three standby DG sets of 500 kVA each will be done for necessary power back up. The use of suitable renewable sources of energy will be explored. **Fuel:** ATF storage tanks and facilities will be provided in the proposed project. The fuel depot will be of 3,000 KL capacity. The fuel will be received from refineries in Jamnagar and nearby areas through tankers.	
2.7	Any other natural resources (use appropriate standard units)	No	No other natural resources will be used.	

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

S. No.	Information / Checklist confirmation	Yes /No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data.
3.1	Use of substances or materials, which are hazardous (as per MSIHC rules) to human health or the environment (flora, fauna, and water supplies)?	Yes	The project will be using the following substances which are hazardous as per MHISC Rules: • Diesel, lubricating oils will be stored at site during construction phase. • During Operation phase, aviation fuel, diesel (for backup power source) as well as lubricating oil will be stored at site. • Aerospace manufacturing facility is going to use certain hazardous substances like chromic acid and phosphoric acid. • All applicable permission for the same will be taken and storage facilities will be developed in accordance with national / international codes and standards.
3.2	Changes in occurrence of diseases or affect disease vectors (e.g. insect or waterborne diseases)?	No	The project is not going to affect occurrence of diseases and disease vectors.
3.3	Affect the welfare of people e.g. by changing living condition?	Yes	The facility will generate direct employment opportunities for 825 persons and indirect employment for 7,500 persons during the operation phase. During construction phase, employment opportunities for 1,200 persons will be

S. No.	Information / Checklist confirmation	Yes /No	Details thereof (with approximate quantities /rates, wherever possible) with source of information data.
			generated.
3.4	Vulnerable groups of people who could be affected by the project e.g. hospital patients, children, the elderly etc.	No	As no settlement is coming under the project site area, so no vulnerable groups of people will be directly affected by this project. However, such vulnerable groups present in the study area will be identified and impact will be studied and incorporated in the EIA report
3.5	Any other causes	No	No other causes have been identified.

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

S. No.	Information / Checklist confirmation	Yes /No	Details there of (with approximate quantities wherever possible) with the source of information.
4.1	Spoil, overburden or mine wastes	Yes	Topsoil scraped during construction will be stored on site and utilized for landscaping purpose. Construction wastes generated will be used for leveling of site area. No mine waste generation is involved.
4.2	Municipal waste (domestic and or commercial wastes)	Yes	The municipal solid waste generated from the proposed project is estimated to be 2539 kg per day.
4.3	Hazardous waste (as per Hazardous Waste Management Rules)	Yes	i. Used / spent oil–approx. 2 tonnes of spent oil/year from operations in hangars. ii. Other hazardous solid waste–5 tonnes of electronic waste, used filters, light bulbs etc.
4.4	Other industrial process wastes	No	No other industrial process wastes will be generated.
4.5	Surplus product	No	No surplus products will be produced
4.6	Sewage sludge or other sludge from effluent treatment	Yes	Option for utilization of sewage sludge for horticulture will be explored.
4.7	Construction or demolition wastes	Yes	Construction waste will be used for levelling of low lying area.
4.8	Redundant machinery or equipment	No	No redundant machinery or equipment will be used in this project.
4.9	Contaminated soils or other materials	No	The project will not lead to contamination of soil or other material.
4.10	Agricultural wastes	No	No agricultural wastes will be generated. However, wastes from landscaping areas will generate which be duly handled.
4.11	Other solid wastes	No	No other solid wastes are expected to be generated.

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

S. No	Information / Checklist confirmation	Yes /No	Details thereof (with approximate quantities wherever possible) with the source of information.

<table>
<tr><th>S. No</th><th>Information / Checklist confirmation</th><th>Yes /No</th><th>Details thereof (with approximate quantities wherever possible) with the source of information.</th></tr>
<tr><td>5.1</td><td>Emissions from combustion of fossil fuels from stationary or mobile sources</td><td>Yes</td><td>The fuel consumption rate of Aircraft will be around 700 kg/hr in Idle conditions. However, this rate will increase during approach and take-off situations.
For reference, the average emission rate of the aircraft during LTO (landing and take-off cycle) is as follows:
Emission factors for B747-400 for LTO cycle (Kg/LTO)
<table><tr><th>CO_2</th><th>NOx</th><th>CO</th><th>SO_2</th></tr><tr><td>10710</td><td>49.2</td><td>115</td><td>3.2</td></tr></table>Source: IPCC Guidelines on National Greenhouse Gas Inventories. Reference Manual, page 1.96.
There will be emissions from D.G sets and vehicles.</td></tr>
<tr><td>5.2</td><td>Emission from production process</td><td>Yes</td><td>There will be emission from the assembly facility.</td></tr>
<tr><td>5.3</td><td>Emission from materials handling including storage or transport</td><td>No</td><td>Cargo handling is envisaged as part of the project proposal; however, emissions from material handling will be insignificant.</td></tr>
<tr><td>5.4</td><td>Emission from construction activities including plant and equipment</td><td>Yes</td><td>Fugitive dust emissions are likely to occur due to earth work during construction phase. Gaseous emission are likely to occur due to vehicular and machineries operations. However the effect of emissions during construction phase will be marginal and for limited period only.</td></tr>
<tr><td>5.5</td><td>Dust or odors from handling of materials including construction materials, sewage and waste</td><td>Yes</td><td>Fugitive dust emissions are likely to occur due to handling of materials during construction phase.</td></tr>
<tr><td>5.6</td><td>Emissions from incineration of waste</td><td>No</td><td>Incineration is not involved.</td></tr>
<tr><td>5.7</td><td>Emissions from burning of waste in open air (e.g. slash materials, construction debris).</td><td>No</td><td>No burning of waste will be involved.</td></tr>
<tr><td>5.8</td><td>Emissions from any other sources</td><td>No</td><td>Emission from other sources is not envisaged.</td></tr>
</table>

II-6. Generation of Noise and Vibration, and emissions of light and heat

<table>
<tr><th>S. No.</th><th>Information / Checklist confirmation</th><th>Yes /No</th><th>Details thereof (with approximate quantities wherever possible) with the source of information.</th></tr>
<tr><td>6.1</td><td>From operation of equipment e.g. engines, ventilation plant, crushers</td><td>Yes</td><td>Various equipments / HEMMs (Heavy Earth moving machineries) will be used for construction activities. The tentative noise specifications for various equipments are as follows:
<table><tr><th>Name of Source</th><th>Noise Level at 1 m from source [dB(A)]</th></tr></table></td></tr>
</table>

S. No.	Information / Checklist confirmation	Yes /No	Details thereof (with approximate quantities wherever possible) with the source of information.
			Hot mix Plant: 40 Roller: 74 Water Tanker: 88 Bitumen Sprayer: 80 JCB: 99 Tractor: 84 Vacuum Excavator: 85 Loader/Tipper: 85 Compactor: 82 Concrete Mixer: 85 Air Compressor: 81 Paver: 89 The specifications are subjected to change as per the manufacturer design. Both during construction as well as operation phase, necessary PPEs will be given and requisite safety measures will be taken to those who are exposed to high noise generating areas.
6.2	From industrial or similar processes	Yes	Noise may be generated from few facilities of the aerospace manufacturing facility. However, these facilities are often enclosed and isolated to prevent exposure to personnel and to limit hearing protection requirements within the overall assembly space.
6.3	From construction or demolition	Yes	Various equipments / HEMMs (Heavy Earth moving machineries) will be used for construction activities. However, the impact will be marginal and for short term only. Necessary PPEs will be given and requisite safety measures will be taken to those who are exposed to high noise generating areas.
6.4	From blasting or piling	No	No blasting or piling is involved.
6.5	From construction or operational traffic	Yes	During construction, noise emission will be generated from various equipments. During the operation phase noise will be generated from the Landing and take-off of aircrafts. Utmost care will be taken to limit the noise generation within the specified standards. Mitigation measures will be taken and PPEs will be given to workers exposed to high noise generating areas.
6.6	From lighting or cooling systems	Yes	During welding, cutting, electrical lighting, power circuits, drilling etc. lighting may be produced where workers will be provided necessary PPEs. Air conditioning and ventilation system generates noise and necessary enclosures will be provided.
6.7	From any other sources	No	No other sources could be identified.

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

Sl. No.	Information / Checklist confirmation	Yes /No	Details thereof (with approximate quantities wherever possible) with the source of information.
7.1	From handling, storage, use or spillage of hazardous materials	Yes	ATF storage and related facilities to store 3000 KL of aviation fuel is envisaged. Initially the refueling of the aircraft will be through refueller but at a later stage, the refueling is proposed through hydrants. Few hazardous chemicals will also be used in the aerospace manufacturing facility. Spills are not expected during normal operation from both activities however, in case of accidental spills, land contamination may be expected. To avoid chances of accidental spills, the development of storage tanks and refueling facility will be done in line with applicable national / international standards.
7.2	From discharge of sewage or other effluents to water or the land (expected mode and place of discharge)	No	Treated waste water will be used for horticulture purpose.
7.3	By deposition of pollutants emitted to air into the land or into the water	Yes	Air emissions in the form of PM, SO_X, NO_X, CO from vehicular emission will take place due to traffic increment. Appropriate mitigation measures such as dust suppression systems; greenbelt development etc. will be undertaken. Moreover, only PUC certified vehicles will be allowed inside the premises of the airport.
7.4	From any other sources	No	Contamination from other sources is not envisaged.
7.5	Is there a risk of long term build up of pollutants in the environment from these sources?	No	With proper environmental control measures being installed right from the stage of construction, long term built up of pollutants in the environment is not expected.

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

Sl. No.	Information / Checklist confirmation	Yes /No	Details thereof (with approximate quantities/rates, wherever possible) with the source of information.
8.1	From explosions, spillages, fires etc from storage, handling, use or production of hazardous substances	Yes	Storage of hazardous materials such as welding gases, fuel, paint, oil etc. at site during construction phase may be the source of accident. During operation phase, storage of aviation fuel on site may be the source of accident. However, the storage facilities will be developed in line with applicable national / international standards. Access to such areas will be restricted to authorized personnel

Sl. No.	Information / Checklist confirmation	Yes /No	Details thereof (with approximate quantities/rates, wherever possible) with the source of information.
			only. Necessary risk assessment study for the aviation fuel storage tank farm will be carried out and findings of the same will be included in the EIA report.
8.2	From any other causes	Yes	Risk of accidents is envisaged due to mishandling of machinery equipments, and falling from height, slips etc. during construction phase as well as operation phase. A disaster management plan will be implemented to avoid such accidents. To deal with minor accidents, first aid facility will be provided at site.
8.3	Could the project be affected by natural disaster causing environmental damage (e.g. floods, earthquakes, landslides, cloudburst etc)?	Yes	Probable effects of natural disasters such as cyclone or flood will be studied and included in the EIA report. The project is located in Seismic Zone V as per IS: 1893 (Part-1) 2002. All Civil structures will be made Earthquake Resistant.

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

Sl. No.	Information / Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with the source of information.
9.1	Lead to development of supporting utilities, ancillary development or development stimulated by the project which could have impact on the environment e.g.		
i.	Supporting infrastructure (roads, power supply, waste or waste water treatment, etc.)	Yes	Development of airport project (including aerospace manufacturing facility) will attract migration of people in the surrounding areas as employment opportunities will be generated. Hence such necessary supporting infrastructure facilities will come up in the surrounding areas.
ii.	Housing development	No	No housing facilities are proposed in this project
iii.	Extractive industries	No	No extractive industries are proposed
iv.	Supply industries	No	No supply industries are expected to come up as a result of this project.
v.	Others	No	Development of other utilities is not proposed.
9.2	Lead to after-use of the site, which could have an impact on the environment	No	No such planning has been proposed.
9.3	Set up precedent for later developments	Yes	Contribute to the maximum possible extent for connecting Kutch district

Sl. No.	Information / Checklist confirmation	Yes/ No	Details thereof (with approximate quantities/rates, wherever possible) with the source of information.
9.4	Have cumulative effects due to proximity to other existing or planned projects which similar effects	No	Cumulative effects are not envisaged.

III. ENVIRONMENTAL SENSITIVITY

Sl. No.	Areas	Name/ Identity	Aerial distance (within 15 km.) Proposed project location boundary
1	Areas protected under international conventions, national or local legislation for their ecological landscape, cultural or other related value	No	This project does not involve land protected under any international conventions, national or local legislation for their ecological, landscape, cultural or other related value
2	Areas which are important or sensitive for ecological reasons– wetlands, water-courses or other water bodies, coastal zone, biospheres, mountains, forests	Yes	See nested table below
3	Areas used by protected, important or sensitive species of flora and fauna for breeding, nesting, foraging, resting, over wintering, migration	No	The area was reported not to have any important or sensitive species of flora or fauna. However, such species, if found during baseline survey, will be reported in the EIA report.
4	Inland, coastal, marine or underground waters	Yes	The project site is adjacent to Northern side of Gulf of Kutch. Refer table as per point no. 2
5	State, National boundaries	No	None within 15 km
6	Routes or facilities used by the public for access to recreation or other tourist, pilgrim areas	No	None within 15 km

Particulars	Distance * (km)	Direction
A. Water-bodies		
Gulf of Kutch	1.2	SSE
Bhukhi Nadi	2.2	W
Phot Nadi	5.8	W
Mitti Nadi	9.5	NE
Nagvanti Nadi	11.2	W
Sakra Nadi	11.3	ESE
Babia Nadi	11.7	NNE
B. Forests		
Luni RF	Project Site	NE
Baroi RF	Project Site	NW
Bhadreswar RF	7.0	ENE
Two RF near Borana	7.3	WNW
Mangrove RF	8.0	WSW
Mundra Dhoa RF	13.1	WSW

<table>
<tr><th>Sl. No.</th><th>Areas</th><th>Name/ Identity</th><th colspan="3">Aerial distance (within 15 km.) Proposed project location boundary</th></tr>
<tr><td>7</td><td>Defence installations</td><td>No</td><td colspan="3">None within 15 km</td></tr>
<tr><td rowspan="10">8</td><td rowspan="10">Densely populated or built-up area</td><td rowspan="10">Yes</td><td colspan="3">Settlements within 15 km radius</td></tr>
<tr><td>Name</td><td>Distance (km)</td><td>Direction</td></tr>
<tr><td>Goarsama</td><td>0.6</td><td>NW</td></tr>
<tr><td>Baroi</td><td>2.0</td><td>NW</td></tr>
<tr><td>Luni</td><td>2.4</td><td>NE</td></tr>
<tr><td>Sekhandia</td><td>3.4</td><td>NW</td></tr>
<tr><td>Mundra</td><td>2.0</td><td>NW</td></tr>
<tr><td>Mota Kapaya</td><td>7.0</td><td>NW</td></tr>
<tr><td>Gundala</td><td>6.4</td><td>N</td></tr>
<tr><td>Samudra Township</td><td>4.0</td><td>SW</td></tr>
<tr><td>9</td><td>Areas occupied by sensitive man-made land uses (hospitals, schools, places of worship, community facilities)</td><td>None</td><td colspan="3">The following social infrastructures are present in Mundra, which is located at about 8 km from the site.
• Hospital with ambulance;
• Banks;
• Post office;
• Bus station;
• Fire station;
• Secondary school;
• Police station;
• Shopping complex;
• Sports infrastructure;
• Community halls;
• Primary health care centres.</td></tr>
<tr><td>10</td><td>Areas containing important, high quality or scarce resources (ground water resources, surface resources, forestry, agriculture, fisheries, tourism, minerals)</td><td>Yes</td><td colspan="3">Please refer point no. 2 above</td></tr>
<tr><td>11</td><td>Areas already subjected to pollution or environmental damage. (Those where existing legal environmental standards are exceeded)</td><td>No</td><td colspan="3">No such areas are present within 15 km</td></tr>
<tr><td>12</td><td>Areas susceptible to natural hazard which cause the project to present environmental problems (earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climatic conditions)</td><td>No</td><td colspan="3">Probable effects of natural disasters such as cyclone or flood will be studied and included in the EIA report.
The project is located in Seismic Zone V as per IS: 1893 (Part-1) 2002. All Civil structures will be made Earthquake Resistant.</td></tr>
</table>

AMENDED PRE FEASIBILITY REPORT
JUNE 2017

ENVIRONMENTAL CLEARANCE FOR DEVELOPMENT OF COMMERCIAL AIRPORT AT MUNDRA, KUTCH DISTRICT, GUJARAT

PROJECT PROPONENT
MUNDRA INTERNATIONAL AIRPORT PRIVATE LIMITED

ENVIRONMENT CONSULTANT
GREENCINDIA CONSULTING PRIVATE LIMITED

NABET/EIA/RA014/041

Table of Content

Chapter 1
Introduction

1. INTRODUCTION

1.1 BACKGROUND

Mundra taluka of Kutch, in the Gujarat state, is located 66 km from Bhuj and 350 km from Ahmedabad – the commercial capital of Gujarat. Adani Ports and Special Economic Zone Limited (APSEZ) comprises of an all-weather port as well as port linked multi product Special Economic Zone (SEZ) at Mundra. The ultimate capacity of 225 million tons of bulk, liquid or containerized cargo is projected from APSEZ. The special economic zone is planned for 18000 ha area out of which presently 8481 ha area is notified. The functioning of the port and the SEZ in close proximity of each other provides all that is necessary for establishing a commercial airport to support the movement of cargo and passengers from the region.

Presently Mundra has road connectivity to the National and State highways. Access by rail is available through Broad gauge railway network. Air connectivity into the region is limited only through Bhuj which provides a connection from Mumbai twice a day.

APSEZ has established an airstrip within the SEZ area. The 1,898 m long and 30 m wide runway with a 400 m^2 terminal facility was granted DGCA permission on 24th June, 2007 to conduct aircraft operations under VFR conditions for 'private use'. Mundra airport is licensed to Mundra International Airport Pvt. Ltd. (MIAPL), a subsidiary of APSEZ. Presently only private / Non-Commercial flights are operating at Mundra Airstrip.

APSEZ's proposal for expansion of the existing airstrip into a full-fledged category E airport serving B-747:400 category aircraft will be catalytic for the growth of trade and even tourism into the west/north-west belt of Gujarat. APSEZ provides an unlimited scope for the growth of trade and commercial activities. The plans are to upgrade to a level of an International Air Cargo Hub with night landing facility. The airport has potential to develop commercial modern state-of-the-art international airport capable of serving requirements of cargo hub centre, MRO facilities, passenger/baggage handling facility, fuel refilling, aprons, hangars, assembly line facilities, etc. for various kind of aircrafts.

1.2 PROJECT PROPONENT

APSEZ has incorporated MIAPL on 7th August 2009, which is a 100% subsidiary of APSEZ. Currently, MIAPL manages the development, maintenance and operation of airstrip at Mundra. AAI provides Air Traffic Management (ATM) services at Mundra airstrip to ensure safety of aircraft operations.

1.3 TYPE OF PROJECT

The proposed project is the development of an international airport spread over an area of 522 Ha is to be constructed for air side, Land Side & approach road. The proposed project falls in Category 7(a) of the Schedule vide EIA notification 2006 amended to date involving preparation of Environment Impact Assessment study and Environment Management Plan. However general condition is not applicable to this project. This

project is independent and does not link with other project/s which attracts directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.

1.4 AIRPORT SECTOR PROFILE

The Airports Authority of India (AAI) manages a total of 126 Airports, which include 12 International Airports, 08 Customs Airports, 81 Domestic Airports and 25 Civil Enclaves at Defence Airfields. AAI also provides Air Traffic Management Services (ATMS) over entire Indian Air Space and adjoining oceanic areas with ground installations at all Airports and 25 other locations to ensure safety of Aircraft operations.

The Airports Authority of India (AAI) is currently responsible for 126 airports of which 46 manage at least 100,000 annual passengers.

The first category covers airports operated through joint-ventures with private airport operators and currently includes the two largest airports in the country (Delhi and Mumbai), as well as Cochin, Bangalore and Hyderabad.

The four largest Indian airports (Mumbai, Delhi, Chennai, and Bangalore) each handle more than 10 million annual passengers and accounted for more than 60% of national passenger traffic. India has come through a period characterized by a major expansion of the air transportation industry and proposed to develop 67 domestic airports across country.

Most growth has taken place since 2003/04, averaging 24.4% per year, with particularly high growth in domestic traffic.

1.5 AIR CONNECTIVITY PATTERN

In India, with its geographical spread interspersed with deserts, seas, forests and hilly terrain, regional and remote area air connectivity can play a crucial role in this context. Establishing or relying on railway / road networks for connecting such parts of the country may not be time effective or even viable (technically /financially).

Also, while railway and road networks may be viable connectivity options to other parts of the country (not impacted by issues of terrain, security, etc.), air connectivity provides a key advantage in terms of time saving.

The routes connecting Tier-2 towns / cities to Tier-3 towns / Cities-1, only constitute about 7% of the air transport market in India in terms of seat deployment. While routes can be configured innumerous ways in terms of combination of frequencies, timing of the flights and aircraft sizes, a number of these routes are likely to witness traffic that can be better serviced using small aircraft such that the aircraft could be optimally utilized over the day as well as achieve viable PLF.

1.6 NEED OF THE PROJECT

1.6.1 Traffic Analyses

The first and foremost parameters for planning of an airport is to establish air traffic demand and forecast the growth of traffic to determine the type, adequacy and sizing of facilities to be provided. This would ensure that oversized facilities are not created which then would become a financial liability on the investments.

Traffic forecasts for any infrastructure development, especially a Greenfield airport carries a certain amount of uncertainty. The present day Government policies have encouraged the growth of aviation industry and therefore movement of cargo by air. This healthy growth is likely to continue in the coming years.

1.6.2 Air Traffic in Gujarat- Passenger

Of the existing 10 airports in Gujarat, 2 are not functioning and at 2, operations are carried out from civil enclaves at defense airfields. Ahmedabad handles 75% of the state's passenger traffic and almost the entire cargo traffic.

1.6.3 Traffic Forecast for Mundra- Passenger

The total tourist traffic into Gujarat is estimated at 9.0 million passengers annually of which 7% are assumed to be from outside the country and the rest from within and outside the state. It is assumed that 25% of the foreigners and 5 % of the domestic visitors would use air services into the Kutch region which when distributed equally between Bhuj and Mundra should have delivered 78,750 international and 2,09,250 domestic passengers to Mundra in 2019-2020. The growth rate of 5% up to 2017-2018 and 6% thereafter adopted by AAI in their forecasts for Bhuj is followed for Mundra also.

In addition, there would be business and expatriate traffic into Mundra by virtue of the establishment of the SEZ. The large number of Gujarat's population, settled in America, Europe and Africa, have their roots in Kutch and would also constitute direct travel into Mundra, once airport facilities with direct links are available.

1.6.4 Air Traffic in Gujarat - Cargo

The development of the SEZ would generate high volumes of traffic, after the various industrial Parks are set up. Substantial amount of Cargo is expected to be exported overseas as well as within the country. Import of goods to provide raw material for conversion into finished goods is likely to be in the region of 10 % of total cargo. Cargo exports and imports through the airport would not only be generated from the APSEZ but would also be through several similar facilities in the region.

1.6.5 Traffic Forecasts for Mundra- Cargo

There are no international passengers or cargo originating out of Bhuj. The restricted availability of connections necessitates the several travelers to USA, UK and Africa to travel to Mumbai and Delhi. Within the next ten years, requirement of direct links to these regions would encourage airlines to introduce flights into Mundra.

The basic reason for development of Mundra airport in the SEZ is to provide convenient facilities for the business houses to export goods within the shortest possible time and within convenient distance.

Often lack of proper infrastructure discourages users from utilizing such facilities resulting in shifting of alliances to other outlets, even if inconvenient. Such situation which may result in withdrawals should not be allowed to precipitate.

Considering the possibilities, the evaluation of traffic as briefed above, is considered reasonable to take forward the expansion which is proposed to be commissioned in 2017-2018 to cater for the requirements of 2019-2020 evaluated as 4,40,000 passengers and 11,00,000 tons of cargo. During peak, 218 numbers of departures / arrivals is envisaged daily.

1.7 EMPLOYMENT OPPORTUNITIES

The facility is expected to generate direct employment opportunities for 825 persons and indirect employment for 7500 persons during the operation phase. During construction phase, employment opportunities for 1,200 persons would be generated.

1.8 STRUCTURE OF THE REPORT

The purpose of this report is to establish techno-economic feasibility for the proposed project at Mundra. The report is divided into seven chapters excluding this chapter, the details of which are summarized below:

Chapter 2: Project Description- This chapter discusses the details of the project like location, project salient features, project magnitude, summary of proposed infrastructure and various other requirements like water, power, construction materials etc.

Chapter 3: Site Analysis- This chapter discusses the site profile, landform, and existing land use and drainage pattern. The land details, climate and meteorological parameters are also described in various sections of the chapter. The traffic forecast is also mentioned in this chapter.

Chapter 4: Planning Considerations- This Chapter presents layout drawing and design considerations for construction of new runway with all allied facilities like terminal, Building, Apron, Apron Shoulder, Taxi Track, Runway Shoulder, boundary wall, perimeter roads etc.

Chapter 5: Proposed Infrastructure- This chapter discusses the Concept Plan for aviation support facilities and utilities also provides for the redevelopment & re-planning of existing air strip.

Chapter 6: Rehabilitation and Resettlement (R&R) Plan- There is no R&R due to the proposed project as there are no settlements in the proposed project area.

Chapter 7: Project Schedule & Cost Estimates- This Chapter describes the total investment and cost regarding the project.

Chapter 8: Analysis of Proposal (Financial & social benefits to the locals) - This chapter summarizes the CSR activities undertaken by APSEZ.

Figure 1-1: Airports in Gujarat

Chapter 2
Project Description

2. PROJECT DESCRIPTION

2.1 INTRODUCTION

Mundra International Airport Private Limited (MIAPL) has proposed an expansion of existing airstrip to develop full fledge commercial airport at Mundra

2.2 LOCATION & LINKAGE

The proposed airport is located at a distance of approximately 60 km from Bhuj in North West Direction. Details of location of the proposed airport are given in Table 2.1.

Table 2-1: Project Description

Description	Details			
Project Site	Baroi, Goarsama, Shekhadia, Luni in Mundra Taluka			
Location	Kutch District, Gujarat			
Coordinates	**Points**	**Latitude**	**Longitude**	
	A	22^{0}49'29.2" N	69^{0}44'40.7" E	
	B	22^{0}51'15.6" N	69^{0}47'25.5" E	
	C	22^{0}51'08.1" N	69^{0}47'31.2" E	
	D	22^{0}50'33.4" N	69^{0}47'19.6" E	
	E	22^{0}50'17.0" N	69^{0}47'12.2" E	
	F	22^{0}49'51.9" N	69^{0}46'41.1" E	
	G	22^{0}49'38.7" N	69^{0}46'09.0" E	
	H	22049'29.0" N	69045'54.4" E	
	I	22049'19.5" N	69045'30.7" E	
	J	22049'23.9" N	69044'48.2" E	
Villages & Plot No.	Baroi	244, 207, 238,		
	Goarsama	52, 53, 24/1,2; 25/1,2,3; 26, 34/1; 34/6; 34/7, 34/8; 34/9; 34/10; 23/1,2; 27		
	Shekhadia	81/2; 120		
	Luni	468/4; 468/5		
Total Area in hectares	522 Ha			
Access Road	National Highway-8A		3 km	NW
District Headquarter	Bhuj		60 km	NW
Nearest Town	Bhuj		50 km	NW
Nearest Railway Station	Gandhidham Railway Junction		50 km	NE
Nearest Domestic Airport	Bhuj		70 km	NW
Nearest International Airport	Sardar Vallbhbhai Patel International Airport, Ahmedabad.		360 km	E

Source: Primary Survey, Greencindia Consulting Private Limited, NCR, Ghaziabad;

On the northern side between the airport boundary and APSEZ's private railway line a width of approximately 200m is available through which a 2 lane approach road to the airport is available. On the south there is a large stretch of open barren land between the airport boundary and the coast line of Gulf of Kutch. APSEZ will develop East port under the Waterfront Development Project (WFDP) as

approved by MoEF&CC in the southern direction of the boundary of the proposed project. The eastern and western end, along which the runway is aligned, has clear approaches. There does not appear to be any problem in availability of land for up gradation of the airport to a category 4E airport.

2.3 DETAILS OF ALTERNATIVE SITES

As the proposed project is for expansion of existing airstrip to develop commercial airport for operations of wide bodied aircraft with augmentation of required facilities, hence, no alternative sites were examined. The development of full fledged airport was also visualized as part of master plan for SEZ at Mundra.

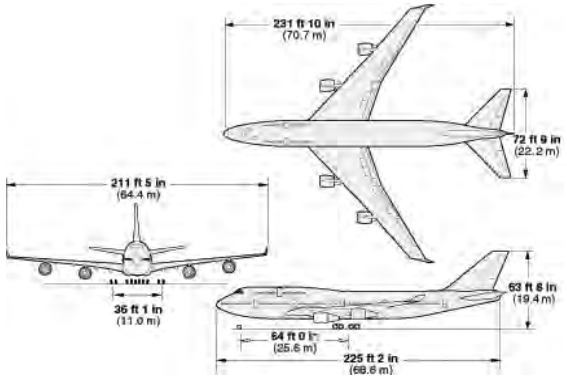
2.4 PROJECT MAGNITUDE

APSEZ proposes to upgrade the existing airstrip in Mundra into a full-fledged airport serving B-747:400 category aircrafts.

The 747-400 is the latest, longest ranging and best-selling model of the 747 family. Boeing launched the 747-400 in October 1985 and the first development aircraft first flew on April 29, 1988.

The 747-400 is developed from Boeing 747-300 but it is a significantly improved aircraft. Changes include a new, two crew digital flight deck with six large CRT displays, an increased span wing with winglets (*the -400 was the first airliner to introduce winglets*), new engines, re-contoured wing/fuselage fairing, a new interior, lower basic but increased max takeoff weights, and greater range.

Dimension: The dimension specifications include Wing span of 64.44m (211ft 5in), length 70.67 m (231ft 10in), height 19.41m (63ft 8in) and wing area 541.2 m^2 (5825 sq ft).



Boeing 747-400

Capacity:

- 747-400 – Flight crew of two. Typical three class seating for 416 (23 first, 78 business and 315 economy class pax). Cargo hold 170.5 m^3 (6025cuft) or 151 m^3 (5332cuft).
- 747-400 Domestic - Two class seating for 568 (24 first and 544 economies).
- 747-400 Combo - Typical arrangement for six or seven pallets and 266 three class passengers.
- 747-400ER - Same as -400, but cargo hold 158.6 m^3 (5599cuft) or 137 m^3 (4837cuft).
- 747-400F - 30 pallets on the main deck and 32 LD1 containers in the lower hold.

2.5 PEAK TRAFFIC DETAILS & TRAFFIC PROJECTION

The peak traffic details are given in Table 2.2.

Table 2-2: Peak Traffic Details

	Peak traffic details					
	International		Domestic		Total	
	Passenger (Numbers)	Cargo (Tonnes)	Passenger (Numbers)	Cargo (Tonnes)	Passenger (Numbers)	Cargo (Tonnes)
Forecasted Annual Traffic	1,20,845	8,96,534	3,21,105	2,38,319	4,41,950	11,34,854
Design Traffic	1,20,000	8,69,000	3,20,000	2,31,000	4,40,000	11,00,000
Average Daily Traffic	329		877		1205	
Peak day Traffic	460		1227		1688	
Total peak Hour Traffic	276		160		436	
Peak Arrivals/ Departures	138		80		218	

Existing project features

Presently, the airport has the following infrastructure:

- Runway – Orientation is 05-23
- Size – 1,898 m x 30 m
- Surface – Flexible
- Apron – 185 m x 90 m
- Taxi – 1 no
- Turning pad – both end
- Terminal – One number (corporate use)

2.6 DESCRIPTION OF PROPOSED PROJECT

The proposed project is the expansion / development of Mundra airport that involves development of the following features:

a. Expansion of runway
b. Construction and development of
   - Over-run
   - Taxiways
   - Apron international
   - Apron domestic

- Isolation bay
- Runway strip
- Drainage
- Navigation/communication aids
- Visual aids
- Fire and rescue services
- ATC equipment
- MET, equipment

c. Civil works include
- Pavements
- Passenger Terminal Building
- Technical block cum control tower
- Fire station
- Cargo terminals
- MRO
- Assembly line facilities
- Fuel Farm

d. Miscellaneous works include
- Water storage
- Sewage treatment plant
- Substation for housing of DG sets
- Security gates
- CCR room
- Horticulture and gardening

e. Electrical & Mechanical Works include
- High intensity Runway Lighting System
- Apron flood lights
- Conveyor belts
- Signage in passenger terminal building
- Cabling

The above mentioned works are given in detail in Chapter 4.

Various buildings that will be constructed along with their coverage area is given in Table 2.3.

Table 2-3: List of buildings with coverage area

Sr. No.	Building name	Coverage area (sq.mt)	Construction area (sq.mt)
1	Passenger terminal building	7,500	7,500
2	Cargo terminal building	1,10,000	1,10,000
3	ATC tower & technical block	500	3,200

Sr. No.	Building name	Coverage area (sq.mt)	Construction area (sq.mt)
4	Fire Station	900	1,500
5	Electrical Substation	500	1,000
6	Administration block	500	1,000
7	GSE storage	1,000	1,000
8	Assembly line facilities	67,700	67,700
9	MRO	23,500	23,500

*The above list may vary during detail design stage.

2.7 CONSTRUCTION MATERIAL

The basic raw materials quantity envisaged for construction is mentioned in Table no. 2.4.

Table 2-4: Construction material (Estimated)

Sl. No	Description	Quantity
1	Cement	15,00,000 bags
2	Sand	11,88,947 cum
3	Aggregates	8,91,710 cum
4	Bricks	20,00,000
5	Reinforcement steel	18,872 tonnes

2.8 POWER REQUIREMENT

The maximum power consumption for the entire airport has been estimated to be 10,000 kW. The electricity will be sourced from Mundra Utility Division.

2.9 WATER REQUIREMENT

The total water requirement for the entire airport will be provided by APSEZ utility division. The quantity is given under **Table no. 2.5**.

Table 2-5: Water requirements of the project

Sr. no	Activities	Construction Phase (KLD)	Operation Phase (KLD)
1	Domestic	60	80
2	Industrial	500	40
3	Fire	-	1500 KL

2.10 WASTE WATER GENERATION AND MANAGEMENT

The wastewater generation (**Table 2.6**) mainly consists of sanitary waste, sewage from airport terminal, flight kitchen, effluent from the workshop etc. The sewage and sanitary waste from the buildings and airport terminal will be treated in Sewage Treatment Plant (STP) of capacity 50 KLD comprising primary, secondary and tertiary treatment facilities. The treated wastewater from the STP will be used for horticulture purposes. It is estimated that about 45 KLD of wastewater will be generated from the proposed airport. The entire wastewater that is generated from the airport will be recycled and reused for non-potable purposes.

Table 2-6: Wastewater generation and reuse

Sr. no	Purpose	Construction phase (KLD)	Operation phase (KLD)
1	Industrial	-	16
2	Domestic	40	45

Standards of drinking water are given in **Table 2.7**.

Table 2-7: Water Quality Criteria as per CPCB

Designated-Best-Use	Class of water	Criteria
Drinking Water Source without conventional treatment but after disinfection	A	▪ Total Coliform Organism MPN/100ml shall be 50 or less ▪ pH between 6.5 and 8.5 ▪ Dissolved Oxygen 6mg/l or more ▪ Biochemical Oxygen Demand 5 days 20°C 2mg/l or less
Outdoor bathing (Organized)	B	▪ Total Coliform Organism MPN/100ml shall be 500 or less pH between 6.5 and 8.5 Dissolved Oxygen 5mg/l or more ▪ Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Drinking water source after conventional treatment and disinfection	C	▪ Total Coliform Organism MPN/100ml shall be 5000 or less pH between 6 to 9 Dissolved Oxygen 4mg/l or more ▪ Biochemical Oxygen Demand 5 days 20°C 3mg/l or less
Propagation of Wild life and Fisheries	D	▪ pH between 6.5 to 8.5 Dissolved Oxygen 4mg/l or more ▪ Free Ammonia (as N) 1.2 mg/l or less
Irrigation, Industrial Cooling, Controlled Waste disposal	E	▪ pH between 6.0 to 8.5 ▪ Electrical Conductivity at 25°C micro mhos/cm Max.2250 ▪ Sodium absorption Ratio Max. 26 ▪ Boron Max. 2mg/l
	Below - E	▪ Not Meeting A, B, C, D & E Criteria

Source: CPCB

Notes: A= Drinking Water Source without conventional treatment but after disinfection; B= Outdoor bathing (Organised); C= Drinking water source after conventional treatment and disinfection; D= Propagation of Wild life and Fisheries; E= Irrigation, Industrial Cooling, Controlled Waste disposal Source: Central Pollution Control Board, Government of India, New Delhi

Water Use Reduction

To estimate the reduction in water use achieved by the building by following the mitigation measures, use following steps: (i) Step 1: Estimate total water demand based on the occupancy and type of building; (ii) Step 2: List various efficient fixtures and other measures and (iii) Step 3: Calculate demand reduction as compared to the BIS per capita water consumption.

Domestic Use for 24 hours

Under normal conditions, water consumption per person for flushing is 45 liters (9 liter/flush with 5 numbers of uses). With efficient fixture (3 and 6 liter/flush), water use is 21 liter (3 liter /flush with 3 uses and 6 liter /flush with 2 uses). Water use per person for washing with normal fixture with a flow rate of 20

liters per minute is 40 liter (assuming use for 2 minutes), while with efficient fixture (flow rate of 7.5 lpm) is 15 liters.

Water Conservation in Landscaping

Landscape forms an important part of the building environment. This is constituted by combination of vegetation, and paving. The vegetation includes lawns, shrubs, herbs and trees. In general, the water demand for lawns and shrubs are higher as compared to trees, which does not require or require less water after establishment. In addition, native species also require less water.

2.11 MEASURES FOR REDUCING WATER DEMAND FOR LANDSCAPE

The water consumption for the gardening depends on the type of plant species and the plant factors. As the plant factor for native species and trees is the minimum, one of the options to reduce the water demand for gardening is to include more native species and low water consuming species. Other options include use of efficient fixtures for watering, following certain best practices to minimize losses and optimize consumption.

2.11.1 Efficient irrigation Equipment:

- **Drip irrigation:** To save water, drip irrigation is an efficient technique as it prevents loss of water due to evaporation, run–off and percolation. Further, it has a better control and facilitates uniform water distribution. However, this system cannot be used for lawns and ground covers but for non – native turf and other non-xerophytes plants.
- **Sprinkler irrigation:** Sprinkler irrigation system requires a network of pipes and pumping system to maintain sufficient pressure for uniform distribution. It is best suited for areas with sandy soils which have high infiltration rates. To prevent water logging, the system should be designed in such a way that infiltration rate exceeds the application rate. Sprinklers which can produce fine sprays are more efficient as compared to those that produce large water droplets. The efficiencies of irrigation systems differ widely. Further, to improve the efficiency certain measures can be followed, which includes use of a pressure regulator for pressures greater than 30 psi which will significantly reduce the loss during watering.

2.12 SOLID WASTE MANAGEMENT

Solid waste generated from the proposed airport mainly comprises of food waste and garbage waste. Further, small quantities of sludge from STP, medical waste and other waste will be generated. Collection and handling of domestic solid waste would be done in line with the provisions of the Indian standards. The waste generated from the airport complex is estimated to be 2539 kg/day which will be collected, segregated and disposed to the integrated solid waste management of the SEZ at Mundra.

Chapter 3
Site Analysis

3. SITE ANALYSIS

3.1 INTRODUCTION

Site analysis is a pre-design research activity which focuses on existing and potential conditions on and around the project site. It is an inventory of the site factors and forces, and how they coexist and interact. The purpose of the analysis is to provide thorough information about the site assets and liabilities prior to starting the design process. The typical site analysis includes the site location and size, neighborhood context, zoning, legal aspects, geology, physiographic (natural and man-made features), hydrology, soils, vegetation, wildlife, climate, culture, pedestrian and vehicular circulation, access, utilities, historic factors, density, sensory stimuli, and any other factor deemed appropriate for the particular site. This chapter discusses the site profile, landform, and existing land use and drainage pattern. The land details, climate and Metrological parameters are also described in various sections of this chapter.

3.2 LOCATION & CONNECTIVITY

Mundra Port, located in the Kutch district of Gujarat state is the largest among all ports of APSEZ and acts as a gateway for north-western India. Gandhidham railway station is the nearest passenger rail head about 50 Km away. Mandvi airstrip (about 30 Km), Kandla airstrip (about 45 Km) and Bhuj airport (about 70 Km) are the airstrips/airports in the vicinity. Mandvi and Kandla airstrips are non-operational at this stage.

LAND FORM, LAND USE & LAND OWNERSHIP

The total land required for developing the airport is about 522 hectares, of which-

- Land owned by APSEZ- 170 ha
- Abandoned salt works- 167 ha
- Forest land- 185 ha

3.3 TOPOGRAPHY

The topography of the proposed expansion facilities is flat. Presently, proposed site for building works consists of short trees in approximately 200 ha area which will be redesigned as per the expansion plan.

3.4 PROPOSED LAND USE PATTERN

The site proposed for airport development will be converted into 'public use' category which is 'private use' category. A residential complex for the essential operational and other staff is also proposed within the airport boundary.

3.5 EXISTING INFRASTRUCTURE

Presently, the airport has the following infrastructure:

- Runway – Orientation is 05-23
- Size – 1,898 m x 30 m
- Surface – Flexible
- Apron – 185 m x 90 m
- Taxi – 1 no
- Turning pad – both end
- Terminal – One number (corporate use)

3.6 SOCIAL INFRASTRUCTURE AVAILABLE

The following social infrastructures are existing in Mundra, which is located at about 8 km from the site is:

- Hospital with ambulance;
- Banks;
- Post office;
- Bus station;
- Fire station;
- Secondary school;
- Police station;
- Shopping complex;
- Sports infrastructure;
- Community halls;
- Primary health care centres.

3.7 GEOLOGY & SOIL

Kutch district consists of Jurassic succession which mainly consists of ammonitic beds over and underlained by plant beds. The basement of this succession is of Achaean contains mainly metamorphic and igneous domain.

3.8 LOCAL GEOLOGY & GROUND WATER CONDITION

Geology controls the occurrence of groundwater in this area. The area is underlain by Quaternary sediments consisting of a succession of clay, silty clay, sand and sand mixed with gravel. The geological set up of the area clearly indicates that groundwater occurs both under unconfined and confined conditions. The deeper zone have greater yield compared to shallower aquifer due to their higher hydraulic conductivity. The shallow aquifers in Mundra area contain saline water.

3.9 METEOROLOGY & CLIMATOLOGY

The data obtained from the Meteorological Department of India for Kutch observatory has been utilized.

Climatic Condition (30-years IMD Data)

Total mean annual rainfall for the period 1970-2000 of the district is 276.4 mm. Summary of 30 years average data is presented in the Table 3.1 below:

Table 3-1: Climate data on IMD for Kutch (1971–2000)

Sl. No.	Parameters	Description of the Season				
1	Rainfall in mm	Total Annual Rainfall is 276.4 mm				
		Winter (Dec to Feb)	**Months**	**Total rainfall (in mm)**		
			December	0.2		
			January	2.0		
			February	0.6		
			Total	**2.8**		
		Summer (Mar to May)	March	1.2		
			April	0.2		
			May	2.6		
			Total	**4.0**		
		Monsoon (June to Sept)	June	34.7		
			July	104.6		
			August	74.4		
			September	43.5		
			Total	**257.2**		
		Post-Monsoon (Oct to Dec)	October	8.1		
			November	4.3		
			December	0.2		
			Total	**12.6**		
2	Temperature (Mean Daily Temp. in ^{0}C)		**Months**	**Max**	**Min**	**Avg**
		Winter (Dec to Feb)	Dec	28.8	9.6	19.2
			Jan	27.4	8.4	17.9
			Feb	30.1	11.4	20.8
			Average	**28.7**	**9.8**	**19.3**
		Summer (Mar to May)	Mar	35.4	17.0	26.2
			Apr	39.2	21.9	30.6
			May	39.7	25.2	32.5
			Average	**38.1**	**21.4**	**29.8**
		Monsoon (June to Sept)	June	37.9	27.2	32.6
			Jul	34.3	26.4	30.4
			Aug	33.0	25.3	29.2
			Sep	34.9	23.9	29.4
			Average	**35.0**	**25.7**	**30.4**

		Post-Monsoon (Oct to Dec)	Oct	36.8	20.7	28.8
			Nov	32.9	14.7	23.8
			Dec	28.8	9.6	19.2
			Average	**32.8**	**15.0**	**23.9**
3	Relative Humidity in per cent	Winter (Dec to Feb)	**Month**	**08.30 hrs**	**17:30 hrs**	
			Dec	71	31	
			Jan	74	30	
			Feb	70	26	
			Average	**71.7**	**29**	
		Summer (Mar to May)	Mar	67	26	
			Apr	66	26	
			May	70	36	
			Average	**67.7**	**29.3**	
		Monsoon (June to Sept)	Jun	73	50	
			July	80	63	
			Aug	82	64	
			Sep	80	52	
			Average	**78.8**	**57.3**	
		Post-Monsoon (Oct to Dec)	Oct	71	33	
			Nov	69	30	
			December	71	31	
			Average	**70.3**	**31.3**	
4	Wind-speed	Winter (Dec to Feb)	**Month**	**Speed (kmph)**		
			Dec	5.8		
			Jan	6.1		
			Feb	6.9		
			Average	**6.2**		
		Summer (Mar to May)	Mar	8.0		
			Apr	11.0		
			May	15.6		
			Average	**11.5**		
		Monso17on (June to Sept)	Jun	17.2		
			July	16.7		
			Aug	14.6		
			Sep	10.8		
			Average	**14.8**		
		Post-Monsoon (Oct to Dec)	Oct	6.5		
			Nov	5.6		
			Dec	5.8		
			Average	**6.0**		

Source: Climatological Table 1971 – 2000, Indian Meteorological Department, Govt. of India, New Delhi

Chapter 4
Planning Consideration

4. PLANNING CONSIDERATION

4.1 INTRODUCTION

The purpose of this chapter is to present the Planning Concepts for Mundra Airport, in terms of both their vision and reasoning. Therefore, several basic assumptions have been established, which are intended to direct the future planning of the Airport. These assumptions are supported by the aviation activity forecasts and include a commitment for continued airport operation, which supports local and regional needs.

Airport planning and design primarily depends upon availability of land, its topography, orientation, accessibility, etc. Traffic is the other major factor that decides the size of runway, terminal building and other related infrastructure required for the proposed airport. The site and traffic studies have been discussed in the preceding chapters. Based on the site and traffic studies the planning and conceptual design of the proposed airport is discussed in this chapter.

4.2 PLANNING CONCEPT

Because all airport functions relate to and revolve around the basic runway/ taxiway layout, airside planning recommendations must first be carefully examined and evaluated. It is essential that the initial development of the Airport be commensurate with the anticipated needs and requirements of the airport users; however, the long-term expansion capabilities of the facility must also be considered and planned for to ensure the future success of the project. The main objective of the proposed project is to ensure design requirement to cater to the cargo as well as passenger demand.

The airport is not only for Gujarat interstate transportation but also national and international transportation and also carriage transport. Aerodrome code of Mundra airport is 4E. Aerodrome Reference Code is defined by the characteristics of the aircraft intended to use the airport. The parameters to categorize the Aerodrome reference code by ICAO are mentioned in Table 4.1

Table 4-1: Categories of Aerodrome based on Aeroplane Reference Field Length

Code Number	Aero plane reference field length
1	Less than 800m
2	800m up to 1200m but not including 1200m
3	1200m up to 18000m but not including 1800m
4	Over 1800m

Source: ICAO

Table 4-2: Categories of Aerodrome based on Wing Span & Outer Main Gear Wheel Span

Code Letter	Wing span	Outer main gear wheel span
A	Up to and not including 15m	Up to and not including 4.5m
B	15m up to and not including 24m	4.5m up to and not including 6m
C	24m up to and not including 36m	6m up to and not including 9m
D	36m up to and not including 52m	9m up to and not including 14m
E	52mup to and not including 65m	9m up to and not including 14m
F	65m up to and not including 80m	14m up to and not including 16m

Source: ICAO

4.2.1 RUNWAY ORIENTATION

The most suitable orientation of the runway for Mundra airport is 05-23, NW-SE direction. The data on intensity and prevailing wind directions for Mundra, noted from climatological tables by Meteorological Department of India for nearest observatory at Kutch have been analyzed.

4.2.2 RUNWAY LENGTH:

MIAPL proposes one runway with the following dimensions:

Table 4-3: Dimension of various parameters of Proposed Airport

Name	Dimension
Length	3500m extendable to 4000m
Width	60m including shoulder
Basic Strip	150m on either side of runway centre line
Runway End Safety Area(RESA)	2nos.x240mx90m
Runway overrun	2nos.x60mx60m

4.2.3 RUNWAY GEOMETRY

The runway is planned for Code 4E. The proposed width of the runway is 60 m and length of 4000 m. The orientation of the runway for Mundra airport is 05-23, SW-NE direction. The permissible values of slopes as per ICAO are given in Table 4.4 below:

Table 4-4: Permissible values of slopes as per ICAO

Name	Slope	Permissible
Runway	Longitudinal	1.25% (Max.) with Max. slope of 0.8% in the last quarters on both ends and overall slope not to exceed 1.00%
	Transverse	1.50% (Max.) 1.00% (Min.)
Runway Strip	Longitudinal	1.50% (Max.)
	Transverse	2.50% (Max.)
Taxiway	Longitudinal	1.50% (Max.)
	Transverse	1.50% (Max.)
Taxiway Strip	Transverse	2.50% (Max. Downward) 0.50% (Max. Upward)
Apron	Longitudinal	1.00% (Max.)
	Transverse	1.00% (Max.)

4.2.4 TAXIWAY

The taxiway system is planned with the flexibility for future demand. Space for a parallel taxiway along the length of the runways is provided. The initial phase will only have an apron taxiway and two perpendicular exit taxiways connecting the apron. Details of dimension of taxiway are given in Table 4.5.

Table 4-5: Dimension of taxiways

Parameter	Measurement
Length	Approximately 5000m
Width	23m+21m

4.2.5 APRON

Three type of Apron of the Mundra airport is proposed.

Passenger Apron: Dimension is 294 m x 140 m

Cargo Apron: Dimension is 543 m x 145 m x 2nos

MRO Apron: Dimension is 435 m x 140 m

4.2.6 ISOLATION BAY

Isolation Bay is constructed with the dimension of 80 m x 80 m.

4.2.7 PAVEMENT

Aprons and aircraft stands shall be constructed as rigid pavement. Concrete pavements are necessary on aprons since fuel spillage during re-fueling is likely to occur. Flexible pavements are not able to withstand fuel spillage or high temperatures of summer in combination with static loads from aircraft without being damaged.

Taxiways can be constructed both as rigid and flexible pavements. Both pavement types have advantages and disadvantages but none of the disadvantages are of such a character that one type is preferred over other. It should therefore be left to the detailed design to find the most economically beneficial pavement type.

4.2.8 PARKING SPACE

Parking for 150 cars & 5 Buses, VIP car park (20 cars), AAI and Airlines staff car / scooter parking area at 100 m away from any building as per BCAS norms.

4.2.9 CIVIL WORKS

a. Pavements

- Extension of existing runway 05/23 of length 1,898 m x 30 m to make the total dimensions of 4,000 m x 60 m for operation of B747-400 type of aircraft. The centre line of the runway remains the same and expansion of runway width is proposed equally on both sides. The extension of the runway

length is proposed at both ends.

- New aprons for cargo, MRO and passenger terminals are proposed. A defined and dedicated isolation bay is also planned.
- New taxiways linking to isolation bay, passenger terminal, MRO apron and cargo apron. A parallel taxiway is also proposed.
- Provision of Runway End Safety Area of dimensions, Length 240m x Width 90m for both the Runway 05 and 23.
- Levelling, Grading and Development of Runway Basic strip (150m on either side of runway centre line). The soil of Runway strip should be flush with the edges of pavements and appropriate slope to facilitate draining of rain water into drainage system beyond the basic strips.
- Levelling of ground beyond Runway Strip up to Boundary Wall.
- Levelling & grading of Taxiway strip for taxiway & apron taxi lanes.
- Provision of Isolation Bay of dimensions 80 m x 80 m along with link taxi track of 23 m width & shoulders of width 10.5 m, at a distance of 220m from the centre line of Runway and construction of cooling Pit.
- Construction of drainage system for the runways, beyond Runway strip.
- Construction of Signal Square Area, provision of Turn Pads, landing 'T', and windsock etc.
- Removal or reduction in height of identified manmade obstacles including trees, HT/LT power lines, water / gas pipelines and diversion of road, if passing through development area and approach funnel area
- Construction of building for housing DVOR/DME.

b. Passenger Terminal Building

- Construction of new passengers terminal building of total area 7,500 sq. m and features of Low Cost Terminal Building with modular design for handling 150 arriving and 150 departing passengers at a time with a scope for future expansion. The building shall be provided with essential amenities for passengers, airlines such as check-in counters, conveyor belt for departing baggage, one number of oval shape conveyor belt in the arrival baggage collection area with provision/space for future installation of additional conveyor with minimum spacing of 11 m, space for storage of baggage trolleys (300 nos.), toilet facilities for passengers including those for physically challenged persons, adequate number of signage's, Fire Fighting/ alarm system, Drinking Water Coolers/Purifiers, adequate lighting inside & kerb side of the terminal building, provision of Renewable Energy System etc.
- Covered Kerb Area on city side with three lanes each for arriving and departing passengers,

covered baggage make-up and break-up area on air side.

- Car park for 150 cars & 5 Buses, VIP car park (20 cars), AAI and Airlines staff car / scooter parking area at 100m away from any building as per BCAS norms

c. Construction of new technical block cum control tower

- Construction of new Control Tower cum Technical Block.
- Construction of Control Tower as per NOC for height clearance with minimum height of 25m AGL.
- Provision of control tower table and other equipment, furniture, fixtures as per requirement of ATM, CNS & Met etc.

d. Construction of fire station

Construction of Fire Station Cat. VIII, to house 4 fire tenders and 2 ambulances.

e. Construction of Cargo terminals

Construction of two cargo terminals in stages.

f. Construction of MRO

Construction of MRO hangars and facilities.

g. Construction of Assembly line facilities

Provision is kept for construction of assembly line facilities.

h. Construction of Fuel Farm

Construction of ATF storage tanks and facilities. The fuel depot will be of 3,000KL capacity. The fuel will be received from refineries in Jamnagar and nearby areas, through tankers. Applicable statutory regulations as per Petroleum rules 2002 and OISD RULES: 117 & 118 shall be followed for the proposed facility. Initially the refueling to the aircrafts would be through refueller, but at a later stage, the refueling is proposed to be through hydrants.

i. Miscellaneous civil works

- Provision of water storage and water supply, pump house for overhead water tanks and sump etc. for terminal building and residential colony, preferably by pressurizing system and rain water harvesting system
- Construction of sewerage treatment plant with facility for future expansion.
- Construction of regular boundary wall of height as per BCAS norms around periphery and crash gates at either end of runway direction to provide for outside access to RFF vehicles in case of emergency. Provision of watch towers as per requirements.

- Construction of sub-station for housing DG sets, stepping down main power supply, transformers etc., storage facility for diesel, equipment, spare parts etc.
- Provision of gates to segregate air side and city side area with security guard posts at the entry gate and additional security posts inside the operational area at appropriate location in consultation with ATM and Security Dates.
- Construction of approach road from fire station to runway and apron through shortest distance and runway end to boundary of airport in the approach path of runway, of sufficient strength to withstand twice the weight of the heaviest CFT or 60 tons, whichever is greater.
- Construction of CCR room at appropriate location as per Master Plan.
- Procurement of furniture, chairs and baggage trolleys.
- Provision of culvert (pipe / box) at appropriate location in the operational / non-operational area for crossing of electrical, communication cables, draining of storm water from runways, apron, terminal building and car park area. The strength of culverts must be designed for highest category aircraft of Code 'E' to facilitate long term usage without need for dismantling& reconstruction.
- Horticulture and gardening works on city and airside.
- Construction of residential quarters, transit accommodation for AAI& CISF staff. Presently the area identification and utilities demand is planned for and identified within the airport premises. Looking to the nearby residential development works, a decision may be taken to have this facility outside the airport premises.
- The soil investigation carried out by M/s Geotech, in August 2005, reveals that a CBR of 15% is available for pavement design works.

4.2.10 ELECTRICAL AND MECHANICAL WORKS

- High intensity Runway Lighting System (HIRL) comprising runway edge lights, runway end lights, threshold lights, simple approach lights at RWY05, CAT-I approach lights at RWY23, PAPI at both ends on Runway05/23, lighted landing 'T', lighted windsock, aerodrome rotating beacon, taxiway edge lights, apron edge lights and apron flood lights, Mandatory and informative signage etc. Internal and external electrification for all buildings and consideration of Energy Efficient solutions including renewable energy like Solar Power.
- Procurement and Installation of standby DG sets of adequate capacity, to provide essential 50% power supply to terminal building and 100% to control tower and equipment room and fire station and 100% for airfield lightings.300 litres/hour is the estimated consumption of diesel.
- Unitary AC/Packaged ACs etc. of adequate capacity for Terminal Building, Technical Block & Control Tower, centralized Fire Control System and Building Management System for Terminal Building.

- Provision of Apron Flood Lights at appropriate locations without infringing apron safety lines/clearance area for safety of aircraft operating on the apron with power-in/power-out parking stands.
- Lighting on car park, approach road, around terminal building area, Perimeter road and Watch Towers.
- Procurement, installation and commissioning of conveyor belts behind the check-in counters and baggage collection area.
- Procurement, installation of additional split air-conditioners for reserved lounge, and Equipment Room, Control Tower, DVOR building etc.
- Installation of signage in the passenger Terminal Building.
- Necessary electricity supply to DVOR building and other operational buildings.
- Substation equipment, cabling, augmentation of power supply including deposits to State Electricity authorities / Mundra Utilities etc.
- Substation equipment, cabling, augmentation of power supply including deposits to State Electricity authorities / Mundra Utilities etc.

4.2.11 C.N.S WORKS

- Provision of DVOR / DME, VHF and other associated communication and navigation aids including calibration and commissioning of DVOR/ DME, at the location indicated in the Master Plan.

4.2.12 IT AND AIRPORTS SYSTEM

- Public address system and car calling system.
- Surveillance Close circuit TV system (SCCTV) and provision of adequate number of close circuit TV monitors, Security Surveillance System with monitoring facilities in the Terminal Manager Room, Security Control Room, APD Office etc.
- Provision of Flight Information Display System (FIDS) with adequate number of plasma TV's in departure, arrival and security hold area for passenger facilitation/ entertainment
- Provision of adequate no. of X-ray machines for scanning hand/checked-in baggage, including provision of required number of ETDs, DFMDs & HHMDs, as per BCAS norms.
- Computer cable data networking.
- Provision of adequate no. of VHF FM Sets (Walkie Talkie, Base Stations & Mobile Stations).
- Provision of Telephone Exchange / digital EPABX system for Terminal Building including telephone/ intercom instruments, wiring etc.

4.2.13 AEROSPACE MANUFACTURING FACILITY

The Proposed Aerospace Manufacturing Facility will encompass the complete production process for Aircrafts & Unmanned Aircraft Vehicles beginning with the process of sheet metal to the final delivery hangar wherein the final product shall be delivered to the customer. The Manufacturing Process shall essentially comprise of the following processes:

a. Parts Manufacturing

a. Sheet Metal Processing: Smallest building blocks of the aircraft are manufactured using sheet metal through the following processes:

i. Heat Treatment of Titanium, Aluminum & various alloys

ii. Forming & straightening of sheet metal.

b. Metal Machining

c. Composite Systems: Curing, bonding, nesting, contour machining, NC-machining.

b. Surface Treatment & Special Processes

a. Surface Treatment: Computer controlled lines for chromic acid & phosphoric acid anodizing of sheet metal & machined parts

b. Painting of Sheet Metal Parts

c. Sub-Assembly Process

a. Tubes & Welding: Fusion welding of titanium, light metal alloys & Stainless steel

b. Harnesses & Panel: Laser markings & cutting of panel, connector markings, sleeve marking, spinning of environmental screen

d. Final Assembly

a. Mating of the Fuselage: Mating of the forward fuselage, gun unit, mid-fuselage, rear fuselage, wings for creating the final air-frame

b. Component Installation: Fitting of critical com engine, radar, landing gear, avionics etc. (approx. 22,500 parts)

c. Painting: Painting of the aircraft with decals & symbols

e. Delivery Hangar

a. Fuel System Testing:

i. Fueling & De-Fueling: Hardware Verification

ii. Weighing & Determination of Center of Gravity

b. Power Plant Verification:

i. APU & Engine Ground Testing

ii. Verification of General Aircraft Systems

c. Verification Flights & Delivery of Aircraft.

The Manufacturing Facility shall comprise of the following facilities:

A. Main Production Facility

a. Arrival & Storage

b. Sheet Metal Processing

c. Composites Processing

d. Machining

e. Sub-Assembly

f. Special Processes

g. Structural Assembly

h. Final Assembly

i. Painting

j. Delivery Hangar

k. Fuel Verification

l. Engine Verification

B. Operational Buildings

a. Main Gate House

b. Logistics Gate House

c. Security

d. Office & Administration

e. Canteen

f. Data Centre

g. Tools & Equipment

h. Explosive Store

i. Central Plant

j. Waste Collection

k. Sub-station

l. Back-up Generator

C. Airside Facilities

a. Fire & Rescue Station

b. Control Tower

c. Bondage Storage

4.3 SUPPORT AMENITIES

The following facilities will be available in the proposed airport

- Baggage handling system
- Passenger boarding bridges
- Flight information and displays
- Sewage treatment facility
- Firefighting system
- Security equipments
- Bookshop
- Restaurant

4.4 LAND BREAK-UP

The previous airstrip is constructed on 45 ha land. Additional 477ha land is required for the proposed expansion. The proposed land-use break-up of the 522 ha land is given in **Table 4.5.**

Table 4-5: Land-use Break-up of the Proposed Airport

Construction	Area (m^2)	Area (Ha)
Runway Strip	1203000	120.3
Fuel dump	25000	2.5
ELE MRSS	16000	1.6
Taxiway & Apron	594000	59.4
Area reserved	550000	55
Cargo complex	560000	56
Technical block	24000	2.4
Passenger terminal & facility	70000	7
MRO	200000	20
Road	180000	18
Landscaping & open area	1798000	179.8
Total	**5220000**	**522**

Chapter 5
Proposed Infrastructure

5. PROPOSED INFRASTRUCTURE

5.1 THE PLAN

The Concept Plan for the proposed airport defines the ultimate scope of the proposal and the development of facilities in accordance with the requirements of traffic. Earlier discussion on Traffic Analysis and Project Sizing are used as the basis for planning of the various components.

It is the overall objective of this effort to produce a balanced airside and landside complex to serve forecast aviation demands. However, before defining and evaluating specific alternatives, airport development objectives need to be outlined. The primary goal of the Master Plan is to define a development concept which allows for the airport to be marketed, developed, and safely operated for the betterment of the region and its users. With this in mind, the following development objectives have been defined for this planning effort:

- Maintain an attractive, efficient, and safe aviation facility in accordance with government, state, and local regulations.
- Develop facilities to efficiently serve general aviation users and encourage increased use of the airport, including business and corporate activity.
- Provide sufficient airside and landside capacity, efficiency, and safety through additional facility improvements which will meet the long term planning horizon level of demand for the airport and region.
- Identify any future land acquisition needs.
- Ensure that any recommended future development is environmentally compatible.
- Enhance local economic development through maximizing the use of available property.
- Identify opportunities for approved non-aeronautical use of certain areas on the airport to further diversify airport facility revenue generating potentials.

The proposed project involves construction and development of a number of facilities which are outlined in Table 5.1.

Table 5-1: Proposed Infrastructure

Component/ Facility	Key Specification	Proposed Size/ Standards	AREA (m^2)	Area (Ha)	Remarks
Runway	Orientation	5-23			Based on existing Runway
	Length	3946 m	236760 m^2	23.676 Ha	Calculated

Component/ Facility	Key Specification	Proposed Size/ Standards	AREA (m^2)	Area (Ha)	Remarks
	Width	60m including shoulders			Mandatory
	L-Slope	0.75%			Assumed
	X-Slope	1.00%			Assumed
Overrun	Length	60m at either end.	3600 m^2	0.36 Ha	Mandatory
	Width	60m including Shoulders			Mandatory
Taxiways	Length	5290m	2,30,000 m^2	23 Ha	Calculated
	Width	23m + 21m Shoulders			Mandatory
	Location and Type	Full length parallel to R/W			Designed
		1 Rapid Exit			
		2 End Exits			
		2 Taxiways to Apron			
		1 Taxiway to Isolation Bay			
Apron International	Length	459 m	50000 m^2	5 Ha	Power in push out Configuration
	Width	120 m			
Apron Domestic	Length	181 m	23,530 m^2	2 Ha	Power in push out Configuration
	Width	130 m			
Isolated Bay	Length	80.0 m with Shoulder	6400 m^2	0.64 Ha	
	Width	80.0 m with Shoulder			
Runway Strip	Length	4066 m	1219800 m^2	121.98 Ha	
	Width	300 m			
	X-Slope	2.50%			
Drainage	Open Drain	Concrete/ Lined			Parallel along basic strip
Nav/ Comm Aids	Non Visual aids communication Facilities	DVOR/ DME			
		ILS- CAT II			
		VHF DF			
		VHF-RT (Air to ground)			
		AMSS linked to AFTN			
		ATS DS circuits			
		Voice Logging System			
		VCCS			
		PABX Telephones			
Visual Aids	Category I	Simple Approach Lights PAPI			R/W 05
		Approach Lights			R/W 23
		Runway Centreline Lights			

Component/ Facility	Key Specification	Proposed Size/ Standards	AREA (m^2)	Area (Ha)	Remarks
		Threshold Lights			
		Touch down lights			
		PAPI			
		Runway End Lights			
		Lighted Landing 'T'			
		Lighted wind Sock			
		Aerodrome Beacon			
		Obstruction Lights			
		Apron Flood lights			
		Apron / Taxiway edge lights			
Fire and Rescue Services	Category 8	Crash fire tenders (CFT) 4 Nos.			
		Ambulance 2 Nos			
ATC Equipment		Controllers Consoles			
		Flight data Display System			
		Control System			
		VHF-RT remotely operated Facility			
		Remote Control Unit of airfield lightning			
		Standby battery operated VHF-RT			
		Signalling Lamps			
		Communication Network			
		Wind Direction and speed Indicator			
		Clock			
		Nav. Aids Monitoring panel Notam Displays			
MET, Equipment	Forecasting Station	Barometer			
		Barograph			
		Anemometer			
		Rain Gauge			
		Sunshine Recorder			
		Stevenson Screen			
		Thermo Hygrograph			
		Ballooning Station			
		Met Communication			
		Station Linked with AMSS			

Chapter 6
Rehabilitation & Resettlement

6. REHABILITATION & RESETTLEMENT PLAN

Area required for the expansion of airport consists of land owned by APSEZ, abandoned salt works and forest land where no habitation is present. Hence, no Resettlement and Rehabilitation is envisaged for the proposed expansion of airport.

Chapter 7
Project Schedule & Cost Estimate

7. PROJECT SCHEDULE & COST ESTIMATES

Preliminary estimated cost of work for Development of Mundra Airport is worked out as INR 1,400 Crores. Construction time will be around 24 months.

7.1 BREAKUP OF TOTAL PROJECT COST

A brief breakup of the capital expenditure (excluding any land cost) is mentioned below

Table 7-1: Showing Breakup of the Project Cost

Sl. No.	ITEM	Amount (Rs.) in Cr
1.0	**AIRFIELD PAVEMENTS**	
1.1	Runways/ Parallel Taxiway/ Rapid exits & Link Taxiways	185.90
1.2	Runway/ Taxiways/ Apron Shoulders and overruns	41.81
1.3	Apron- Cargo (phase-1)	17.90
1.4	Apron- Passenger	7.32
1.5	Isolation Bay	4.00
1.6	Drainage	3.00
	SUBTOTAL	**259.94**
2.0	**AIRFIELD LIGHTING**	
2.1	Runway lights including Approach lights, edge lights, Threshold lights, PAPI, Taxiway lights	22.00
2.2	Apron Lighting	1.68
	SUBTOTAL	**23.68**
3.0	**CNS ATM Equipment for CAT-II Airport**	
3.1	Navigational aids-DVOR/DME, NDB, ILS CAT-II	10.00
3.2	Radar (ASR)	25.00
3.3	Communication Equipment	8.00
3.4	Meteorological Equipment	4.00
3.5	Approach Control Centre	10.00
	SUBTOTAL	**57.00**
4.0	**PASSENGER TERMINAL BUILDING**	
4.1	Civil works including facilities/instrumentation	75.00
	SUBTOTAL	**75.00**
5.0	**CARGO TERMINAL BUILDING**	
5.1	Civil works including facilities/instrumentation	770.00
	SUBTOTAL	**770.00**

Sl. No.	ITEM	Amount (Rs.) in Cr
6.0	**ATC TOWER AND TECHNICAL BLOCK**	
6.1	Civil works	8.00
	SUBTOTAL	**8.00**
7.0	**FIRE STATION**	
7.1	Civil works	3.75
7.2	Equipment (4 Nos. Crash Fire Tenders and other support vehicles	12.00
	SUBTOTAL	**15.75**
8.0	**ELECTRICAL SUB STATION**	
8.1	Civil works	3.00
8.2	Generators	3.00
8.3	Power supply and Grid station	14.50
	SUBTOTAL	**20.50**
9.0	**ADMINISTRATIVE BLOCK**	**2.00**
10.0	**A/C PLANT ROOM**	**4.00**
11.0	**GSE STORAGE**	**1.00**
12.0	**WATER TREATMENT**	**4.00**
13.0	**SEWAGE DISPOSAL**	**6.00**
14.0	**CAR PARKING**	**6**
15.0	**INTERNAL ROAD**	**2.8**
16.0	**SITE DEVELOPMENT**	
16.1	Earthwork	10.00
16.2	Drainage	5.00
16.3	Landscaping, Agriculture, Environmental Improvement	2.00
16.4	Provision of water Lines	4.00
	SUBTOTAL	**21.00**
17.0	**FENCING, BOUNDARY WALL RETAINING WALL**	**8.957**
18.0	**BULK SERVICES**	**20.00**
	TOTAL	**1305.62**
	7% CONTINGENCIES	**94.00**
	TOTAL INVESTMENTS	**1,400.00**

** Infrastructure CAPEX for establishing Aerospace Manufacturing facility & MRO facilities are not considered in above figure.

Chapter 8
Analysis of Proposal

8. ANALYSIS OF PROPOSAL (FINANCIAL & SOCIAL BENEFITS TO THE LOCALS)

The Adani Foundation is the Corporate Social Responsibility arm of Adani Group, an integrated infrastructure conglomerate that is committed to inclusive growth and sustainable development in not only the communities it operates in, but also in contributing towards nation building. The focus of the activities are mainly on three major dimensions of human development which include expansion of sustainable livelihood opportunities, improving the status of health and education and broadening the range of choices by creating rural infrastructure. The aim is to walk with the communities, help people look ahead, make the right choices and secure a bright and beautiful future, together. The Foundation conceptualizes its purpose by consolidating the activities under four broad working areas that are as follows:

- Education
- Community Health
- Sustainable Livelihood Development
- Rural Infrastructure Development

Adani Foundation has already done extensive work in this region considering the above thematic areas. However, need based assessment will be a continual action during the entire construction as well as operation phases of the proposed project. On the basis of the outcomes of the assessment, support for the above mentioned core areas will be provided to the locals.

ADDITIONAL ATTACHMENTS

Sensitive Features

Sensitive Features in 15 km Radius			
Sl. No.	Features	Distance (km)	Direction
A. Water-bodies			
A-1	Gulf of Kutch	1.2	SSE
A-2	Bhukhi Nadi	2.2	W
A-3	Phot Nadi	5.8	W
A-4	Mitti Nadi	9.5	NE
A-5	Nagvanti Nadi	11.2	W
A-6	Sakra Nadi	11.3	ESE
A-7	Babia Nadi	11.7	NNE
B. Forests			
B-1	Luni RF	Project Site	NE
B-2	Baroi RF	Project Site	NW
B-3	Bhadreswar RF	7.0	ENE
B-4	Two RF near Borana	7.3	WNW
B-5	Mangrove RF	8.0	WSW
B-6	Mundra Dhoa RF	13.1	WSW
C. Settlements			
C-1	Goarsama	0.6	NW
C-2	Baroi	2.0	NW
C-3	Luni	2.4	NE
C-4	Sekhandia	3.4	NW
C-5	Mundra	2.0	NW
C-6	Mota Kapaya	7.0	NW
C-7	Gundala	6.4	N
C-8	Samundar Township	4.0	SW
D. Existing Industries			
D-1	Mundra Port	5.5	SW
D-2	Bhadreswar Thermal Power Plant	11.0	E

NOC-Defense

No.3 (63)/2005-D (Air-II)
Government of India
Ministry of Defence

New Delhi, the 3rd Nov., 2005

To

M/s Gujarat Adani Port Ltd.,
'Adani House',
Near Mithakhali Circle,
Navrangpura,
Ahmedabad-380 009.

Subject:-Issue of No Objection Certificate for construction of private air landing strip at Mundra, District Kutchh, Gujarat by Gujarat Adani Port Ltd., Ahmedabad.

Sir,

I am directed to refer to your letter dated 29th April, 2005 on the above subject and to say that Air Hqr. has no objection from security angle for construction of private air landing strip at Mundra, District Kutchh, Gujarat by Gujarat Adani Port Ltd., Ahmedabad subject to the following conditions: -

(a) The runway orientation be 05/23 to keep it parallel to the Bhuj runway. Aerodrome traffic zone be limited to 10 km diameter and upto vertical limit of 2000' only.

(b) The approach control authority and responsibility be vested with Bhuj ATC for optimum utilisation of Bhuj LFA for military aviation. This will ensure adequate freedom to military traffic (Helicopters and fighters) to and from Sarmat range also.

(c) The flight operations be restricted to Bhuj ATC watch hours i.e. Dawn to Dusk.

(d) All arrivals and departures to the proposed airstrip, be via ATS route W-74 (Rajkot-Bhuj) and Morvi to ensure least interference with military aviation. Furthermore, all traffic from the proposed airstrip should turn right after take off from runway 05 and turn left after take off from runway 23 to join ATS route W-74 at Morvi.

(e) The company shall establish communication link with ATC Bhuj, Area Control Centre Ahmedabad, FIC Mumbai, AFMLU Mumbai, ATC Naliya, ATC Jamnagar and 77 SU (Air Defence Unit). The radiotelephony frequency be decided in consultation with AAI and Air HQ to avoid interference with Air Defence and ATS units in the vicinity.

(f) The scope, size and scale of air operation from the proposed airfield will remain same.

(g) The company will not at a later stage seek further NOC to expand the runway.

(h) No schedule operation will undertake from this airfield.

(j) All take off from airfield will be only after positive clearance from Bhuj airfield.

(k) Any other clearance from Army/Navy & other security agencies shall be obtained directly by the Company.

Yours faithfully,

(S. K. Jha)
Under Secretary to the Govt. of India

NOC-GPCB

GUJARAT POLLUTION CONTROL BOARD
Paryavaran Bhavan
Sector-10-A, Gandhinagar - 382 010.
Phone : 23222756, 23222095, 23222096
Gram : CLEANWATER Fax : (079) 23232156
Website : www.gpcb.gov.in

NO: UNIT-3/FT-263 5983

TO.
MUNDRA SPECIAL ECONOMIC ZONE LTD.,
ADANI HOUSE, MITHAKHALI CIRCLE,
NARRANGPURA,
AHMEDABAD-380009.

Dt. 4 MAR 2006

SUB: SITE CLEARANCE CERTIFICATE
REF: Your NOC application dated 10/11/05

Sir,

We are in receipt of your application under reference requesting us to grant **Site Clearance Certificate** to establish an airstrip at survey no. 52/53. Village: Goersana. Mundra S E Z. Tal: Mundra. Dist:.Kutch.

We have scrutinized the information furnished by you and the proposal for the control of pollution. We would like to inform you that the proposed location for this air strip acceptable to us provided that you

1) obtain permission of Director General of Civil Aviation for development of air strip.
2) obtain permission from defence authorities in the name of Mundra SEZ.
3) obtain permission required from any other authority.
4) There shall be no environment pollution from construction of this air strip.

For and on behalf of
Gujarat Pollution Control Board

(J.K.VYAS)
Environmental Engineer

Mundra Special Economic Zone Ltd. Ahmedabad

DGCA Clearance

सभी पत्रादि महानिदेशक नागर विमानन के पदनाम से संबंधित होने चाहिएं, नाम से नहीं।
तार : "एयर सिविल"

All communications should be addressed to the Director General of Civil Aviation, by title. NOT by name
Telegram : **"AIRCIVIL"**

भारत सरकार
नागर विमानन विभाग
कार्यालय, महानिदेशक नागर विमानन
तकनीकी केन्द्र, सफदरजंग एयरपोर्ट के सामने
नई दिल्ली-110003

GOVERNMENT OF INDIA
CIVIL AVIATION DEPARTMENT
OFFICE OF THE
DIRECTOR GENERAL OF CIVIL AVIATION
TECHNICAL CENTRE, OPPOSITE SAFDARJUNG AIRPORT
NEW DELHI-110003
Telephone No. 4622495, 4622499, 4622500

संख्या/No. 20024/20/2006-AL

तारीख/Dated the 24.1.2007

Mundra Port and Special Economic Zone Ltd.
Adani Houise, Near Mahakali Circle'
Navarangpura,
Ahmedabad – 380 009

Sir,

Reference may please be made to your letter no. MPSEZ/Airstrip/2007 dated 22-1-2007 regarding permission to operate from Mundra aerodrome.

It is to intimate that pending the issue of aerodrome license, this office has no objection for conduct of aircraft operations during day VFR conditions only, to/from Mundra Aerodrome by company's own aircraft & used for private purposes. The licensing of the aerodrome as per Rules shall be subject to the Govt. clearance, when received.

This no objection for aircraft operation as at above will not absolve the aerodrome operator from meeting all requirements, necessary for safe aircraft operation to/ from Mundra aerodrome.

Yours faithfully,

(J.S. Rawat),
Director of Operations (Aero. Stds.),
for Director General of Civil Aviation

Brig. S. S. Bhatti, VSM
President (Aviation)
Mundra Port and Special
Economic Zone Ltd.

Circular-21.11.2006

F.No.J-11013/41/2006-IA-II (I)
Government of India
Ministry of Environment and Forest
IA Division

Paryavaran Bhawan, CGO Complex
Lodi Road, New Delhi-110 003

Dated the November 21, 2006

CIRCULAR

Subject: **EIA Notification dated 14th September, 2006 - Interim Operational Guidelines till 13th September, 2007 in respect of Categories of Projects which were not in EIA Notification, 1994.**

Pursuant to the new Environment Impact Assessment Notification of 14th September 2006 (EIA 2006) replacing the EIA Notification of 27th January 1994 and its various amendments (EIA 1994) and in terms of the provisions of Para 12 of EIA 2006, the Ministry had earlier issued Interim Operational Guidelines on 13th October 2006. Further to these guidelines, the following guidelines are issued for the Categories of Projects, which did not require EIA Clearance under EIA Notification, 1994 and now require the same under EIA Notification, 2006:

i. No NOC from the State Government/SPCB is required for Environmental Clearance Process. Consent to Establish (NOC) and prior Environmental Clearance are separate legal requirements, any project proponent has to fulfill. NOCs required under Water and Air Acts are mandatory requirement under those Acts and will have to be taken as required and do not require to be linked to environmental clearance.

ii. Such projects for which NOCs issued before 14th September, 2006 will not be required to take Environmental Clearance under the EIA Notification, 2006.

Contd....

iii. Applications received for NOC by the State Pollution Control Boards before 14th September 2006 may be considered as per provisions of the said Acts. However, they will have to obtain the environmental clearance from the relevant Authority by 30th June 2007, if the category requires EIA Clearance as per the new Notification. In such cases, the unit can meanwhile carry on with the commencement of their project activities. Projects not seeking clearance under EIA Notification, 2006 by 30th June 2007 will be treated as violation cases under Section 15 of Environment (Protection) Act, 1986.

iv. Applications received for NOC after 14th September 2006 will have to obtain EIA Clearance from the relevant Authority before starting the project activities. Application for EC (TORs / Scoping) may be submitted simultaneously to the relevant Authority/ies.

(Sanchita Jindal)
Additional Director

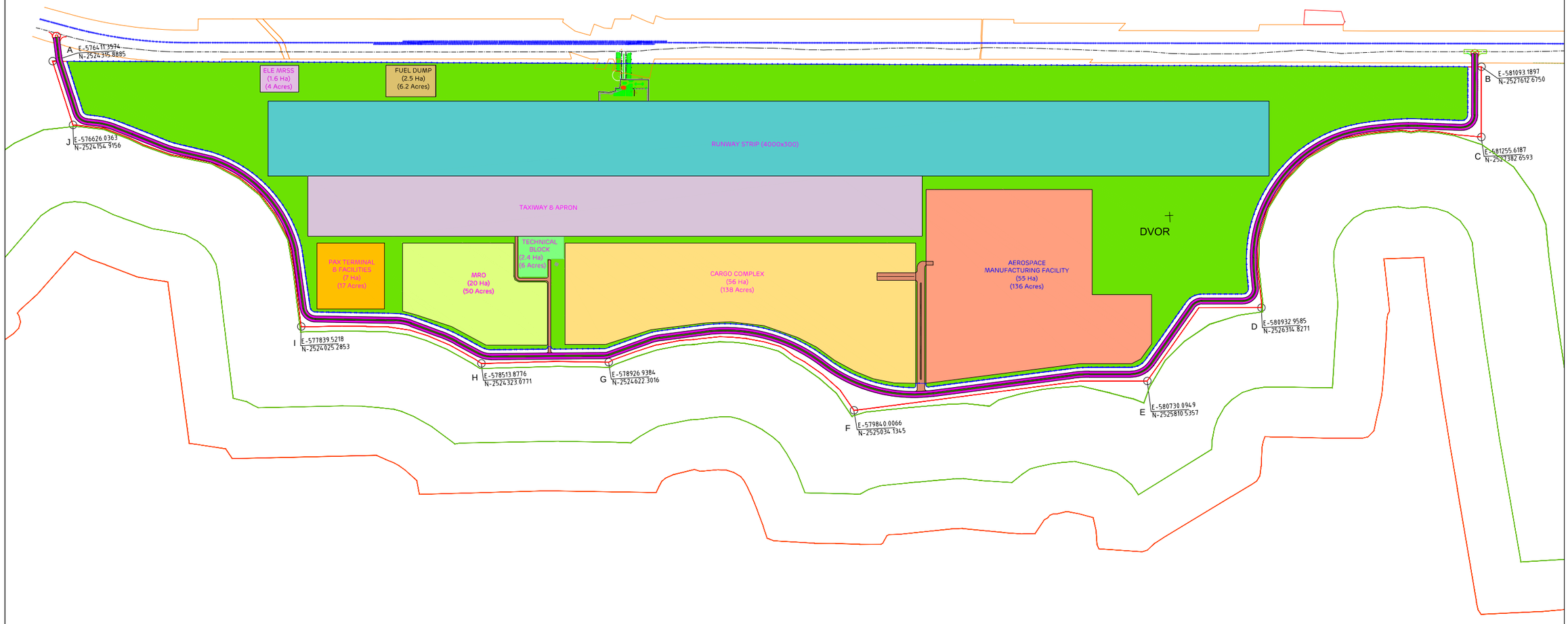
To:

1. All State Environment Departments
2. All State Pollution Control Boards
3. All Officers of IA Division, MoEF
4. UT Administrations

Copy to:

1. PPS to Secretary (E&F)
2. PPS to AS (CC)
3. PPS to JS (CC-II)

Revised Layout Plan

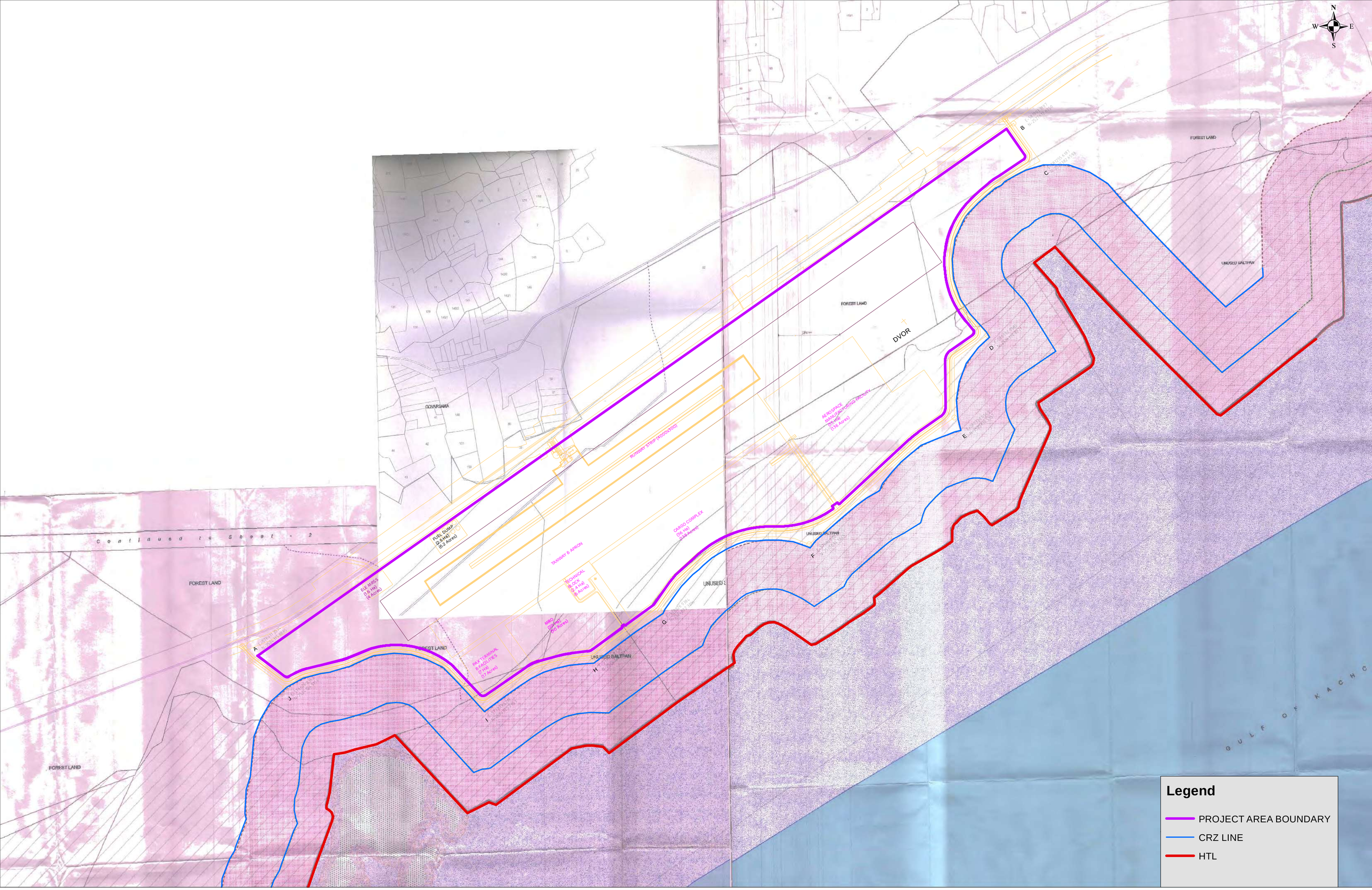


ANNEXURE - I

Layout of Proposed Commercial Airport at Mundra

SCALE = NTS

Layout Superimposed on CRZ Map



Layout for Proposed Commercial Airport at Mundra on CRZ map

NTS