Patrick Environmental Inc

Patrick Environmental Inc
2234 North End Road
Salt Spring Island, BC

Phone 250-538-0215
Cell 250-538-8170

Environmental Impact Assessment

Lynden Pindling International Airport Airport Expansion Project

September 2009

EXECUTIVE SUMMARY

Nassau Airport Development Company Limited (NAD) is a wholly owned subsidiary of The Airport Authority and has leased the airport under a 30 year agreement that commenced on April 1, 2007.

NAD is managed by Vancouver Airport Services (YVRAS) through a ten year Management Agreement and a shorter term Project Management Agreement. Through these agreements, YVRAS is responsible for the daily management and operation of the airport as well as the project management of an estimated $400 million, approximate 66 month development program that will transform the airport into a world class facility.

NAD will comply with all Bahamian environmental laws, regulations and permits and has adopted the IFC General Environmental and Social Guidelines (2007) and the specific industrial sector Environmental and Social Guideline for Airports (2007) as minimum standards. Other jurisdictional standards, for example Florida State, have been adopted where appropriate.

Development Project

The Project will consist of a new U.S. Pre-Clearance Terminal Building including a new departure and arrivals pier for U.S. flights to be located north of the existing terminal buildings and reconstruction of the existing Terminal 2 (existing US Terminal) and the Arrivals Hall. The current expansion plan will maximize the use of the existing buildings and aprons. Included in the Project will be related airside and landside works and associated ancillary and supporting facilities. The expansion of the airport will occur within the existing airport boundary.

The existing fuel hydrant system will not be expanded to service the new gate positions but will be modified in the existing apron areas to service the revised gate positions for the new international pier and be removed at the existing international pier when it is demolished.

Programming, Planning and Staging

The design will result in an airport terminal that in summary will comprise the following three key components:

- Stage 1: The US Departures Terminal will be a completely new structure,
- Stage 2: The existing US Terminal will be entirely renovated, modernized and reconfigured to serve as the new international arrivals area, and
- Stage 3. The Domestic/International Departures and Domestic Arrivals Terminal will be a completely new structure.

Staging of construction can be reasonably achieved while minimizing disruption to ongoing operations. The design will meet the programmatic needs of the airport to accommodate the projected passenger demand for the 2020 planning year, and will do so to deliver an international level of customer satisfaction and architectural quality. The design eliminates mixing of arriving and departing passengers and provides gating flexibility through an innovative interstitial international arrivals corridor.

Sustainability

The terminal will be designed to be energy efficient and to incorporate sustainable design concepts. From an architectural perspective, heat-gain will be minimized by providing roof overhangs. Mechanical and electrical energy efficiency will be achieved through use of current technologies such as solar power, day lighting strategies, computer controls and a deep well cooling system (geothermal).

Environmental Impacts

An environmental impact assessment (EIA) was initially completed as part of the LPIA Expansion Project Definition Report, to identify environmental and social impacts associated with both the existing airport operation and the LPIA Expansion Project. A systematic approach was taken in order to:

- support the goals of environmental management and sustainable development,
- integrate environmental management into the earliest phase of LPIA Expansion Project planning and design,
- predict the Project's impact on and consequences for The Bahamas in terms of environmental, social, economic and cultural perspectives, and
- develop plans to mitigate any predicted adverse impacts.

The standards applied to the Project include Bahamian, Florida State, International Finance Corporation and best management practices. The following table summarizes the impacts and the planned mitigation for the Project.

The LPIA Expansion Project is occurring within the boundaries of an existing operating airport. Therefore, an environmental baseline survey (Baseline Report) was completed to record the present environmental condition of the airport lands and facilities and assess the level of compliance with applicable environmental, health and safety requirements. The survey also included an evaluation of the facilities' compliance with social matters relevant to The Bahamas.

The Baseline Report revealed a number of opportunities for improvement to existing environment and social management practices at LPIA, including the potential for a number of contaminated sites associated with the fuel hydrant system and numerous fuel storage tanks. NAD has recently developed an Airport Operations Environmental and Social Management Plan, in conformance with ISO14001 - Environmental Management System, to address the findings of the Baseline Report.

Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
Physical changes in the locality (topography, land use, changes in water bodies, etc) There are no specific issues for LPIA as the project is within the existing airport boundary.		The project will not change the topography or land use as it is within the existing airport boundary.	
The use of natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply Specific issues for LPIA include: • Use of potable water • Use of energy (fuel and electricity)	A **resource management program** will be developed and implemented to take advantage of any feasible opportunities to reduce consumption of electricity, fuels and potable water.	The project design will minimize natural resource consumption through the use of natural lighting, energy efficient equipment, low flow devices, and dual water systems. The design will utilize solar photovoltaics to provide electricity to power hot water heaters. The project design will consider highest and best use of existing facilities. The project design will minimize the creation of excess overburden. The impact of sourcing material will be considered (distance to travel etc). New generators will be certified to be capable of running on bio-diesel, if technically possible.	The contractor will take measures to minimize resource use.
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 Specific issues for LPIA include: • Use of hazardous materials, such as fuel, oils, paints, pesticides and solvents • No Asbestos containing building materials were found in existing buildings	Existing practices of handing harmful substances, such as waste oil, by tenants and airport maintenance are poor. A **hazardous materials management program** (to include pesticide use) will be developed and implemented consisting of proper use, collection and disposal programs, spill response plans, procedures, equipment and training. Both of these programs will address health and safety issues, such as	Fuel storage systems (e.g., diesel tanks for emergency generators and hydrant systems) will be designed in accordance with best industry practices. All new fuel storage systems will have leak detection. A separate environment impact assessment will be completed by the Joint Operator for the expansion to the existing hydrant system.	Strict requirements will be placed on the contractor to handle and dispose of harmful substances. The contractor will have a spill response plan, spill kits and trained personnel. The contractor will be required to maintain records.

Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
• Fuel storage tanks (diesel, gasoline, propane, jet A, and avgas) • Generation of hazardous wastes	personal protective equipment (PPE).		
Production of solid wastes during construction, operation or decommissioning Specific issues for LPIA include: • Demolition of existing buildings during construction • Excess overburden from construction • Generation of domestic garbage • Generation of international waste from aircraft operation	A **solid waste management program** will be developed and implemented. Reduction of solid waste will be a key objective for the program. Finding a solution for the proper handling and disposal of international waste is the highest priority for the program.	The design will consider the handling of solid waste, separation of domestic and international aircraft waste and facilitate recycling.	The contractor will be required to minimize the production of solid waste, segregate wastes and maintain areas in a clean pest free state. Excess excavated overburden will be used on-airport lands. There will be considerable demolition waste that will need to be separated and reused to the extent possible to minimize the amount-requiring disposal.
Release pollutants or any hazardous, toxic or noxious substances to the air Specific issues for LPIA include: • Operation of vehicles • Taxi, idling and aircraft takeoff and landings • Use of ozone depleting substances • Operation of temporary concrete and asphalt batch plants • Generation of dust from construction activities • Installation and operation of emergency backup generators • Mould and mildew in cooling systems and in areas subject to water leaks	Fuel burning aircraft, generators and vehicles (on-airport and visiting) contribute to air emissions. An **air quality program** will be developed to understand airport emissions and to develop priorities to target improvement. This will include an inventory of equipment containing ozone depleting substances and implementing a plan to remove or replace. A **maintenance program** will be developed to regularly inspect and maintain cooling systems to prevent mould and mildew. A **maintenance program** will be developed to regularly inspect and maintain areas susceptible to water leaks.	The design will require diesel back up power generator emissions meet at a minimum IFC standards or Florida State standards, whichever is stricter. The design will require that no ozone depleting substances be used within cooling systems.	The contractor will be required to take steps to minimize air emissions from equipment and the generation of dust. Any use of mobile concrete or asphalt plants will be subject to local permitting requirements.

Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
Noise and vibration or release of light, heat energy or electromagnetic radiation Specific issues for LPIA include: • Taxi, idling and aircraft takeoff and landings • Construction activities, such as heavy equipment operation, pneumatic equipment use, truck traffic • Outdoor lighting	An **aeronautical noise management program** will be developed and implemented. Existing and future noise footprints will be developed and the airport will work closely with local planners to avoid conflicting land developments with aircraft operations. A compliant management system will be developed to monitor and understand complaints relating to aircraft operation.	Natural lighting will be utilized as much as possible in the design. New outdoor lighting will be reviewed to ensure it is shielded or directed to minimize excess light.	The contractor will be required to minimize construction noise, vibration and lighting. Nighttime noise will be kept to a minimum and truck routes will be planned in advance to minimize impacts on the community.
Risk of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal waters or the sea. Specific issues for LPIA include: • Spills or leaks of hazardous materials, such as fuel, hydraulic oils, and motor oils from activities, such as storage, fueling, vehicle and aircraft maintenance, and painting • Surface water runoff high in suspended solids from construction and operation activities reaching Lake Killarney and/or surrounding wetlands • Surface water discharge to deep wells • The airport is susceptible to flooding during periods of heavy rain • Proximity of the Windsor Well fields, a potable water source • Disposal of sewerage from the terminals to a sanitary treatment plant that is nearing capacity • Disposal of aircraft lavatory waste in a sewer dump that is connected to the treatment plant • Some existing airport buildings	A **spill prevention and response plan** will be prepared, maintained and practiced. Spill response equipment inventories will be improved. A **surface water quality program** will be developed to ensure surface waters draining from airport surfaces meet IFC or Florida State standards, whichever is stricter (including discharges to deep wells). A reverse osmosis (RO) drinking water plant is located adjacent to the airport. It is reported that this plant gets its water from deep wells. Existing on and adjacent to the airport are surface trenches that collect surface water for drinking water. The water collected from this system is mixed with the water generated at the RO plant. A **Phase II Site Assessment** concluded that the airport is not impacting Windsor Field water collection system. A **sewer effluents program** will be developed and implemented to assess	The design will require that new fuel storage tanks, associated with diesel back up power generators, meet appropriate standards and have leak detection systems. Apron drainage will be pre-treated via oil/water separators before being discharged to swales. Flooding of the buildings and parking lots has been an issue. However, flooding has not occurred since the deep storm water disposal wells in the parking lot were maintained. The design will consider the impact of increasing the flow to the airport sewage treatment plant. The design will consider improvements to the aircraft lavatory dump.	Strict requirements will be placed on the contractor for handling and disposing of harmful substances. The contractor will have a spill response plan, spill kits and trained personnel. The contractor will be required to maintain records. The contractor will be required to remediate any spills of hazardous substances caused by the construction project. The contractor will be required to have a plan in place to manage, treat and dispose of hydrocarbon-contaminated groundwater extracted during dewatering activities. The contractor will be required to have an erosion control plan. Access to the aircraft lavatory dump must be maintained during construction.

Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
disposing of sewerage into cess pits	sanitary disposal practices at all airport buildings to identify systems that do not meet acceptable practices.		
Risk of accidents during construction or operation of the Project which could affect human health or the environment Specific issues for LPIA include: • Accident prevention • Emergency preparedness and response Coordination with emergency response services and agencies.	A **public and employeehealth and safety program** will be developed and implemented. The focus of the program will be on accident prevention. **Emergency response plans** will be developed so that the airport and surrounding response agencies are prepared to respond to larger emergencies.	The design will consider life safety and building evacuation.	The contractor will be required to have a health and safety program in place. Emphasis will be placed on preplanning all high-risk activities so that accidents can be avoided and response agencies are notified and prepared in the event of an emergency.
Social changes, for example, in demography, traditional lifestyles, employment Specific issues for LPIA include: • Employment opportunities • Shortage of construction workers in The Bahamas	No social changes are anticipated other than increased employment opportunities	No social changes are anticipated other than positive employment opportunities	No social changes are anticipated other than positive employment opportunities. Any foreign workers will be retained following strict adherence to Bahamian requirements.
Consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality Specific issues for LPIA include: • Increase in the number of passengers • Numerous large development projects occurring at the same time on New Providence Island	Tourism generates approximately 60% of the gross domestic product in The Bahamas. Because of this dependence on tourism, growth in this sector is essential. The airport has been lagging growth and is in need of expansion to accommodate existing and predicted growth.	There are numerous large construction projects planned: Residential development; Resort development; New east/west highway; and a New deep port. With the addition of the airport project, there will likely be a strain on resources, in particular, workers.	The contractor will need to consider the impacts on resource availability as a result of several large construction projects that are ongoing on New Providence Island.
Areas on or around the location which are protected under international, national or local legislation for their ecological importance, or are important or sensitive for reasons of their ecology e.g., wetlands, watercourses or other water	A **habitat and wildlife management plan** will be developed to minimize the risk of wildlife interaction with aircraft.	A **flora and fauna assessment** was undertaken within the project site to identify impacts and mitigation. The design of the gardens will reflect the natural beauty of The Bahamas. The	The contractor will undertake any required mitigation and obtain a permit for the removal of pine trees.

Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
bodies, the coastal zone, forests or woodlands, which could be affected by the Project landscape, cultural or other value, or protected, important or sensitive species of fauna or flora e.g., for breading, nesting, foraging, resting, over wintering, migration, which could be affected by the Project Specific issues for LPIA include: • Loss of habitat from construction • Interaction of wildlife and aircraft operation • Proximity of Lake Killarney, pine forests and wetlands		Bahamas National Trust will be consulted regarding the design of the gardens. The design will consider opportunities to showcase within the terminal national parks and preservation activities of The Bahamas National Trust.	
Areas or features of high landscape or scenic value on or around the location which could be affected by the Project Specific issues for LPIA include: • Proximity of Lake Killarney and wetlands		Bird watching on Lake Killarney is important. Neither the lake, nor views from the lake will be impacted by this project.	
Transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the Project Specific issues for LPIA include: • Construction vehicle use of public roads	Current roadways leading to the airport are not congested.	Entrances and exits to parking lots will be improved.	The contractor will be required to plan and use approved transportation routes.
Areas or features of historic or cultural importance on or around the location which could be affected by the Project Specific issues for LPIA include: • Plaques, cornerstones and other historic items within buildings to be demolished • Face rock used on existing terminal	All future development projects will be reviewed through **impact assessment and construction monitoring program** to ensure there are no impacts on cultural heritage and archaeology.	The face rock used on the existing terminals will not be harmed by the Expansion Project. Cornerstones and plaques will be salvaged and displayed, if possible in the new building. Historical photographs and information about the airport to be displayed in the new building, if possible.	Items of historic and cultural value to be salvaged during demolition activities. The contractor will follow procedures from the Antiquities, Monuments and Museum Corp. in the unlikely event a historic or

Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
buildings is of cultural importance			culturally significant item is found
Project located in a previously undeveloped area where there will be loss of Greenfield land There are no specific issues for LPIA as the project is within the existing airport boundary.		A green field option was evaluated and rejected. The project will expand and renovate the existing facilities	
Plans for future land uses on or around the location which could be affected by the Project Specific issues for LPIA include: • Protection for airport expansion to accommodate an increase in aircraft operation and passengers	See noise and vibration above	The project will not impact on surrounding land use as it is within the airport boundary.	
Areas on or around the location which are occupied by sensitive land uses e.g., hospitals, schools, places of worship, community facilities, which could be affected by the Project There are no specific issues for LPIA as the project is within the existing airport boundary.		There are no sensitive land uses near the project.	
Existing land uses on or around the location e.g., homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the Project There are no specific issues for LPIA as the project is within the existing airport boundary.	See noise and vibration above		The contractor will be required to use approved operating quarries or import fill materials.
Existing areas on or around the location which are already subject to pollution or	A **contaminated sites program** will be developed and implemented to monitor	The Baseline Report identified a high likelihood for soil and groundwater	The contractor will be required to be prepared to contain and remediate

Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
environmental damage e.g., where existing legal environmental standards are exceeded, which could be affected by the Project Specific issues for LPIA include: • Existing contaminated sites • Existing monitoring wells	and manage existing contaminated sites to ensure no off-site migration is occurring.	contamination within the project boundary. A **Phase II Site Assessment** was undertaken to identify the areas of potential impact.	any contaminated soils or groundwater discovered during excavation or dewatering. The contractor will need to decommission monitoring wells in a specified manner within areas where they exist and will likely be damaged (i.e., existing apron).
Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climate conditions e.g., temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems Specific issues for LPIA include: • The Bahamas susceptible to hurricanes and other tropical storms leading to flooding and other damage. • Pine forests, located near the airport, are susceptible to wildfires	**Emergency plans** will be developed to prepare for emergency events.	The design will take into consideration the impact of severe weather and flooding.	The contractor will be required to develop and implement emergency plans in accordance with project requirements.

A high-level consultation process was undertaken to ensure that the views and concerns of interested and affected parties were given due consideration during the EIA process. Groups and organizations consulted include: BEST Commission, Bahamas National Trust, Water and Sewerage Corporation, Antiquities, Monuments and Museum Corp., Environmental Health Services, Airport Authority and tenants. A public meeting was held in October 2007 and the project received extensive press coverage. The design team consulted many additional stakeholders.

The protection of the Windsor Well Fields is one of The Bahamas' and LPIA's greatest environmental priorities. A Phase II Site Assessment, undertaken as part of the EIA work, confirmed that there is a plume of pure phase hydrocarbons under the existing International Pier and apron. A groundwater monitoring system was successfully installed in August 2007 that demonstrates protection of the Windsor Well Fields can be achieved during and after the LPIA Expansion Project. In fact, the demolition of the International Pier and the apron upgrades to be undertaken as parts of the LPIA Expansion Project will provide opportunities for the Nassau International Airport Fuel Consortium to accelerate remediation.

A small area of Caribbean Pine Forest habitat will be impacted by the Project. NAD is committed to mitigating this loss of trees by establishing gardens that represent native vegetation to The Bahamas.

The hazardous building materials survey undertaken as part of the EIA work found the roof caulk/sealant on the metal roof panel seams of the International Terminal as non-friable asbestos containing material. If the material is removed, it only requires segregation and care during disposal. The survey also found that only the exterior canopy paint on the International Terminal may have elevated lead levels, but below levels requiring special attention during the renovation of that facility.

All other impacts described in the EIA are predicted to be short term and manageable with good construction, environmental and social practices and procedures, such as proper procedures for transportation of materials on public roads and well thought out practices for the employment and housing of workers. In addition, the project will generate a significant amount of demolition waste. However, with careful segregation and maximizing reuse, the amount of waste ending up in Bahamian landfills will be greatly reduced.

The environmental and social requirements identified for the contractor in the EIA will be carefully specified in the construction tenders and contract documents, and will carry weight in the choice of the construction contractor(s). The prime construction contractor will prepare a construction environmental management plan. An independent environmental consultant will perform construction monitoring. The environmental monitor will prepare monthly reports of inspections and corrective and preventive actions during the construction phase for submission to the Project Team and the BEST Commission. Project Team and NAD staff will perform further inspections of high-risk activities to ensure the prime contractor and sub-contractors are managing the environmental impacts in accordance with contract documents and to NAD's satisfaction.

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1.0 INTRODUCTION

Nassau Airport Development Company Limited (NAD) is a wholly owned subsidiary of the Airport Authority and has leased Lynden Pindling International Airport (LPIA) under a 30 year agreement that commenced on April 1, 2007.

NAD is managed by Vancouver Airport Services (YVRAS) through a ten-year Management Agreement and a shorter term Project Management Agreement. Through these agreements, YVRAS is responsible for the daily management and operation of the airport as well as the project management of an estimated $400 million, approximate 66 month development program that will transform the airport into a world class facility.

This document is the environmental impact assessment (EIA) for the LPIA Expansion Project (Project). A broad definition of environment is used that includes social issues. Patrick Environmental Inc. prepared the EIA with tremendous support from Islands by Design. A number of technical studies were undertaken and the results have been incorporated into the impact assessment and the individual studies appended to this report. The EIA is intended to address the requirements of The Bahamas Environment Science & Technology (BEST) Commission.

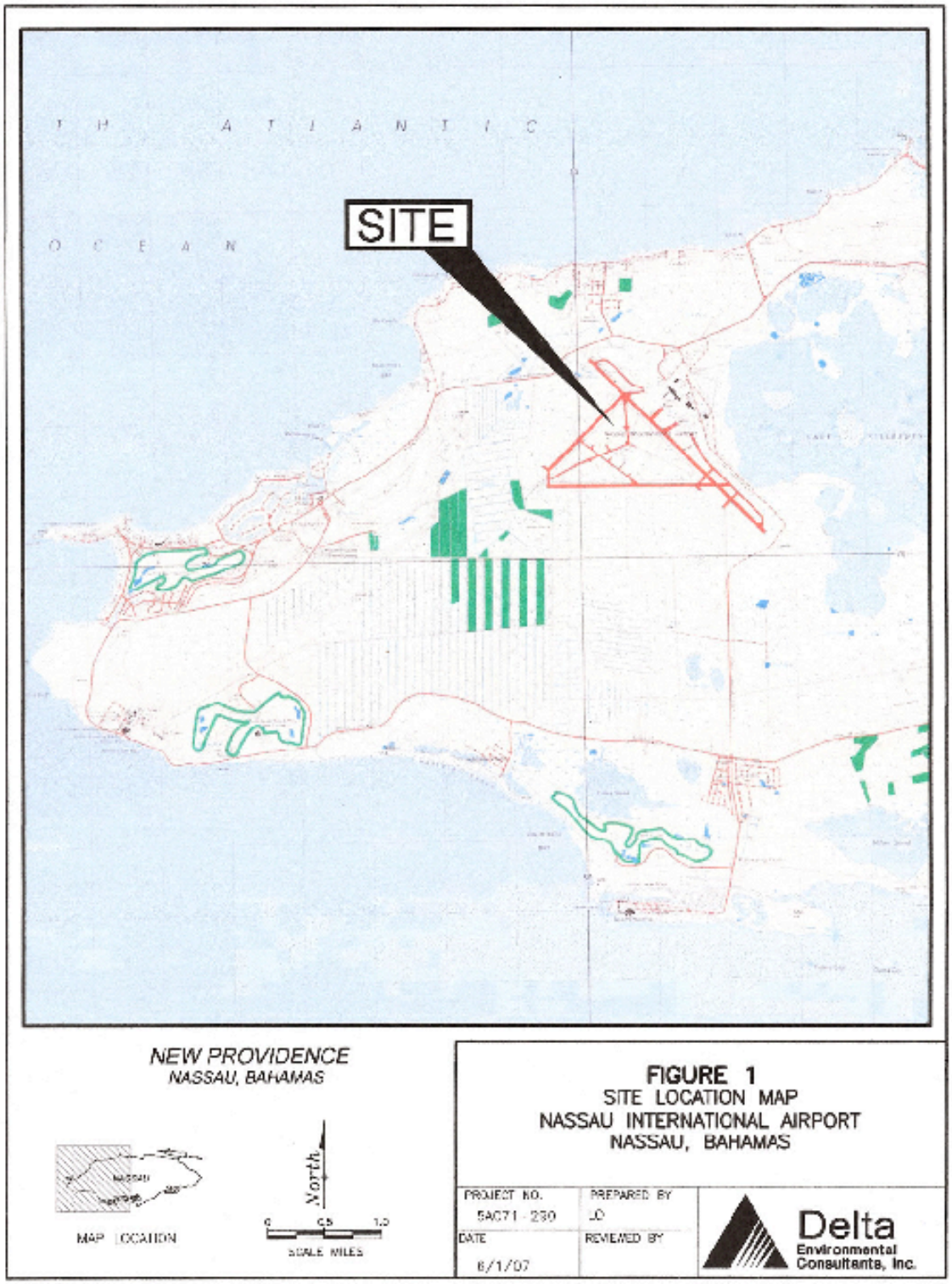
Under the Equator Principles, participating international finance institutions require projects, at a minimum, comply with the IFC Environmental, Health and Safety Guidelines (revised in April 2007). In accordance with these guidelines, this project would be classified as Category B, as the impacts are site-specific; few if any of them are irreversible and in most cases mitigation measures can be readily designed.

1.1 Airport Setting

The United States entered the Second World War in 1941. Because of The Bahamas strategic position, New Providence Island was chosen for a joint training base and to support the Royal Air Force Transport Command. Construction of Windsor Field began in May 1942 by the American company Pleasantville Inc. under the supervision of the U.S. Corps of Engineers. Windsor Field was abandoned after the war in 1946. It was reopened in 1957 as Nassau International Airport. There were significant upgrades in the mid 1960s and the U.S. Terminal was completed in 1993. A recent airside improvement project for the runways and taxiways was completed in 2005.

The existing airport covers an area of approximately 1,237.5 acres (Roland John Survey – October 2000). It is located on the west side of New Providence Island in The Bahamas; at a location approximately 15 miles to the west of the City of Nassau (see Figure 1).

The airport has two asphalt runways (one is 8,235 ft and the other is 11,500 ft). There are ten taxiways at LPIA. Former Runway 5-23 is now used as a taxiway. Taxiway Hotel runs parallel to and serves the full length of Runway 14-32. Runway 14-32 is currently the only runway equipped with a parallel taxiway. The remaining taxiways are either runway exits or connectors. The airport has five main apron areas: the US Pre-Clearance Terminal Apron, the International Terminal Apron, the Domestic Terminal Apron, the General Aviation Apron, and the MillionAir Apron.


THE ATLANTIC
OCEAN
SITE
NEW PROVIDENCE
NASSAU, BAHAMAS
MAP LOCATION
North
0
0.5
1.0
SCALE MILES
FIGURE 1
SITE LOCATION MAP
NASSAU INTERNATIONAL AIRPORT
NASSAU, BAHAMAS
PROJECT NO.
5AC71-230
PREPARED BY
JD
DATE
8/1/07
REVIEWED BY
Delta
Environmental
Consultants, Inc.

LPIA currently has three primary terminal buildings that are used for the processing of commercial passengers. They are Terminal 1, Terminal 2 (US Terminal) and the Arrivals Hall:

- Terminal 1: At the south end of the terminal area, Terminal 1 handles departing and arriving domestic passengers as well as non-US international departures. This Terminal houses the domestic operations of Bahamasair, the National Airline, about ten other small domestic charter airlines as well as international flights departing to all areas of the world including Europe, Canada, Caribbean and Latin America. It is used by airlines such as Air Canada, British Airways, Cubana, Air Jamaica and numerous charter airlines.

- Terminal 2 (US Terminal): At the north end of the terminal area, the U.S. Pre-Clearance Terminal processes departing passengers to the United States. This facilityhouses U.S. Customs and Border Protection who areunder the control of Homeland Security Department. Once a flight is cleared here in The Bahamas, it operates like a domestic U.S. flight. The terminal houses U.S. Customs, Immigration, Agriculture and airline offices.

- Arrivals Hall: Between Terminal 1 and Terminal 2 lies the Arrivals Hall. The Arrivals Hall handles all international passenger processing regardless of origin and includes The Bahamas Immigration and Customs Processing.

Car rental facilities are located adjacent and northeast of the terminals. The airport maintenance building, hangars, and fixed base operators are located east and southeast of the terminals. The fuel tank farm is located to the north of the terminal area.

Surrounding land uses are as follows:

- North: the reverse osmosis water treatment plant, JFK Drive, wetlands and residential housing
- East: Lake Killarney, a large shallow lake, which receives some surface drainage from the airport.
- West: a commercial greenhouse and Caribbean pine forest.
- South: Coal Harbour Road and Caribbean pine forest. Also located south of the terminal area are two fixed base operations and a small General Aviation terminal.

The Water and Sewerage Corporation withdraws surface water at many locations on and surrounding the airport.

1.2 Topography

The topography at the airport and its immediate vicinity is generally flat with elevations of an average 13-15 feet above mean sea level. The Bahamas is an extensive archipelago of carbonate islands and shallow banks. According to soils information provided by the Department of Agriculture, Bahamian soils are classified into three basic physical classes, sand, silt, and clay, graded by the size of the soil particle size in decreasing order. All soils, except organic soils that are derived from peat, are one of these classes or some combination. The typical nature of soils occurring in The Bahamas is that of an alkaline reaction dominated by the bedrock or parent material, which is limestone. The pH is often 7.9 to 8.4, except for organic soils occurring in marshes. In the vicinity of the airport, soils and substrate generally consist of limestone bedrock and sandy loams of the pine forest and marls or limestone mineral clays of the wetlands areas.

1.3 Regulatory Setting

Environmental impact assessments are conducted in The Bahamas under guidance from the BEST Commission. A draft of the LPIA EIA was submitted to the BEST Commission in September 2007. The BEST Commission imposed a fee on the Project and retained SENES Consultants from Richmond Hill, Ontario, Canada to undertake a review on behalf of the BEST Commission. Comments on the draft were provided to NAD in July 2008. A site meeting was held in August 2008 to provide BEST and SENES a site tour and review the comments. A second draft of the EIA was submitted to BEST in January 2008. A series of comments and draft submissions followed culminating in this final LPIA EIA.

The Project will comply with all legally applicable laws, regulations and industry codes of practice. NAD will ensure adherence, where applicable, to the Equator principles that adopt the International Finance Corporation's (IFC) performance standards on Social and Environmental Sustainability and the IFC General Environmental and Social Guidelines (2007) and the specific industrial sector Environmental and Social Guideline for Airports (2007).

The IFC General Environmental and Social Guidelines (2007) and the specific industrial sector Environmental and Social Guideline for Airports (2007) are applied to the project as minimum standards. NAD has worked and will continue to work with regulatory authorities to identify and adopt the most appropriate standards for design, construction and operation.

Many Bahamian acts, regulations and orders apply to the project, the following are key for environmental matters:

- Antiquities, Monuments and Museum Act, 1999
- Antiquities, Monuments and Museum Regulations, 1999
- Environmental Health Services Act, 1987
- Wild Birds Protection Act, 1952
- Conservation and Protection of the Physical Landscape of The Bahamas Act, 1997
- Declaration of Protected Trees Order, 1997
- Conservation and Protection of the Physical Landscape of The Bahamas Regulations, 1997

The Bahamas recognize many international conventions; the following are important environmental conventions:

- Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar);
- Vienna Protocol for the Protection of the Ozone Layer;
- Montreal Protocol on Substances that Deplete the Ozone Layer;
- Basel Convention on the Control of Transboundary Movements of Hazardous Wastes an their Disposal;
- International Convention on Oil Pollution Preparedness, Response and Cooperation (OPRC);
- United Nations Framework Convention on Climate Change; and
- Convention on Biological Diversity.

For contaminated site related standards, the State of Florida regulations will apply. These include:

- Chapter 62-770 Petroleum Contaminated Site Cleanup Criteria
- Chapter 62-780 Contaminated Site Cleanup Criteria
- Chapter 62-762 Aboveground Storage Tank Systems
- Chapter 62-761 Belowground Storage Tank Systems

2.0 METHODOLOGY

The environmental impact assessment (EIA) was conducted in accordance with the requirements of the BEST Commission's *General Components of an Environmental Impact Assessment*, The Bahamian draft *Environmental Impact Assessment Regulations* (Draft May 18, 2005) and the in accordance with the requirements of World Bank / International Finance Corporation (IFC), and in particular the IFC's Performance Standards 1-8. The key elements of the environmental impact assessment are described below.

An EIA generally includes the following:

- Project definition
- Screening of the project and scoping of the assessment
- Stakeholder identification
- Identification and gathering of social and environmental baseline data
- Impact identification and analysis
- Development of mitigation and / or management measures and actions
- Public Disclosure

2.1 Project Definition

A detailed description was prepared for the project. It describes the existing airport facilities and operation along with the proposed construction of new facilities and the plans for operation following the construction of the new facilities. Existing facilities and proposed facilities are expected to meet the IFC performance standards 1-8.

2.2 Screening

The project was reviewed against applicable legal requirements, additional requirements imposed by NAD, the BEST Commission and the IFC performance standards 1-8. Key stakeholders were identified and contacted during this phase. The results of the screening were used to identify potential adverse impacts and to identify further assessment.

2.3 Stakeholder Identification

The following organizations and individuals have been interviewed to identify environmental impacts. They were requested to identify any issues or concerns with the project, identify appropriate standards and identify further parties for consultation. Summaries of the meetings are provided in **Appendix A**.

- The BEST Commission. Stacey Moultrie – November 25, 2006. Rochelle Newbold - March 22, 2007. Rochelle Newbold and Berkley King – August 3, 2007.
- The Bahamas National Trust. Eric Carey – November 25, 2006. Tamica Rahming and Janeen Bullard – July 31, 2007.
- Water and Sewerage Corporation. Dr. Richard Cant and John Bowleg – July 30, 2007.
- Antiquities, Monuments and Museum Corp. Dr, Tinker, Dr. Miller and Mr. Pateman – August 3, 2007.
- The Airport Authority. Wellington Neely and Alvin Edgecombe – November 24, 2006.
- Environmental Health Services. Winston Sweeting – July 31, 2007.

The Design and Project Team have met with several government departments and agencies, including but not limited to, the Water and Sewerage Corporation, Ministry of Public Works & Transport, Department of Physical Planning, Civil Engineering Department, Department of Environmental Health Services, The Royal Bahamas Police Force, Building Control Division, The Bahamas Electricity Corporation, St. Margaret's Hospital, Bahamas Customs, Bahamas Immigration, Ministry of Tourism, Department of Civil Aviation, Meteorological Department, Airport Authority, Antiquities, Monuments and Museums, Hotel Association, Out Island Promotional Board, Bahamas Contractors Association, Disability Affairs, Bahamas Cable, Bahamas Telecommunication, andBahamas National Trust.

2.4 Identification and Gathering of Social and Environmental Baseline Data

Baseline data was gathered to describe the existing physical, biological and socio-economic conditions. The following technical studies were conducted to collect additional baseline data:

- **Baseline Assessment** – establish baseline conditions and compliance with requirements
- **Phase II Site Assessment** – establish nature and extent of contamination within the Project area
- **Flora and Fauna Assessment** – identify any risks within the Project area and collect information to support the development of a wildlife and habitat management plan to reduce the risk of wildlife and aircraft interaction
- **Hazardous Building Materials Assessment** – identify risks of hazardous building materials in the existing buildings
- **Stormwater Considerations / Alternatives** – identify opportunities to improve existing drainage and accommodate additional drainage loads from the Expansion Project

2.5 Impact Identification and Analysis

All potential risks and impacts were documented and analysed. All phases of the project including design, construction, operations, and decommissioning were considered.

Table 1 is extracted from Canadian Environmental Assessment Agency guidance material on the Canadian Environmental Assessment Act and pertains to determining if an impact or risk is adverse or significant.

Table 1. Factors in Determining Adverse Environmental Effects

Changes in the Environment	Effects on People Resulting from Environmental Changes
Negative effects on the health of biota including plants, animals, and fish	Negative effects on human health, well-being, or quality of life
Threat to rare or endangered species	Increase in unemployment or shrinkage in the economy
Reductions in species diversity or disruption of food webs	Reduction of the quality or quantity of recreational opportunities or amenities
Loss of or damage to habitats, including habitat fragmentation	Detrimental change in the current use of lands and resources for traditional purposes by aboriginal persons
Discharges or release of persistent and/or toxic chemicals, microbiological agents, nutrients (e.g., nitrogen, phosphorus), radiation, or thermal energy (e.g., cooling wastewater)	Negative effects on historical, archaeological, paleontological, or architectural resources;
Population declines, particularly in top visual amenities (e.g., views)	Decreased aesthetic appeal or changes in predator, large, or long-lived species
Loss of or damage to commercial species	Loss of biodiversity
The removal of resource materials (e.g., or resources; peat, coal) from the environment	Foreclosure of future resource use or production
Transformation of natural landscapes	
Obstruction of migration or passage of wildlife	
Negative effects on the quality and/or quantity of the biophysical environment (e.g., surface water, groundwater, soil, land, and air)	

2.6 Development of Mitigation and / or Management Measures and Actions

NAD has already developed and implemented an Environmental and Social Management Plan (ESMP) to address airport operational impacts. This plan contains NAD's environmental and social policies and management system to ensure continual environmental and social improvement. The plan outlines the environmental and social programs and tracks action.

The general contractor will be required to develop and implement an environmental management plan (EMP) in accordance with contract documents to ensure the mitigation outlined in this EIA is performed. An independent environmental consultant will be retained to perform regular site monitoring to ensure compliance with the contractor's EMP and this EIA. Reports will be submitted to NAD's project management for review. Monthly reports will be provided to the BEST Commission throughout the construction period.

2.7 Public Disclosure

A public meeting was held in October 2007 that was extensively advertised in local newspapers. Questions raised and the responses provided at the meeting are provided in **Appendix A**. The Project also had significant press coverage while it was being evaluated by the government.

3.0 PROJECT DESCRIPTION

This Project Description was prepared using information provided by NAD, YVRAS, and the design consultant Stantec Consulting.

The emphasis of the Project Description is on those activities that have the greatest potential to cause environmental and/or socio-economic impacts.

The design will result in an airport terminal that in summary will comprise the following three key components:

- Stage 1: The US Departures Terminal will be a completely new structure,
- Stage 2: The existing US Terminal will be entirely renovated, modernized and reconfigured to serve as the new international arrivals area, and
- Stage 3: The Domestic/International Departures and Domestic Arrivals Terminal will be a completely new structure.

The current expansion plan will maximize the use of the existing buildings and aprons. Included in the Project will be related airside and landside works and associated ancillary and supporting facilities. The expansion of the airport will occur within the existing airport boundary. **Figure 2** illustrates the development project.

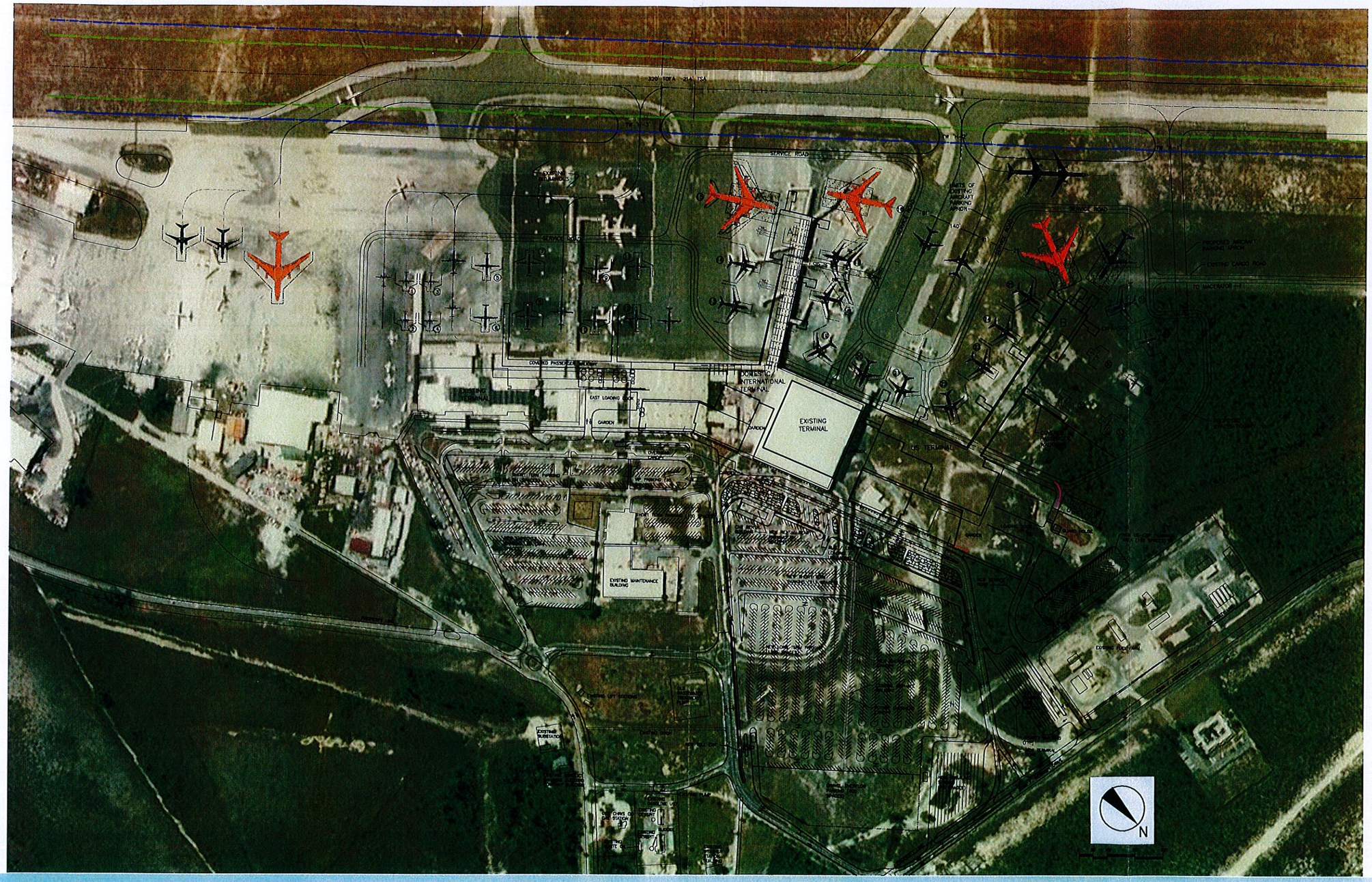
The existing fuel hydrant system will not be expanded to service the new gate positions but will be modified by the fuel consortium in the existing apron areas to service the revised gate positions for the new international pier and be removed at the existing international pier when it is demolished.

3.1 Design Alternatives

The following section details the development options.

No Development Option

The "No Development Alternative" implies not proceeding with the airport development project rather electing to leave the airport in its current state – somewhat degraded and unable to efficiently handle the current passenger load. This option would likely lead to adverse environmental and socio-economic impacts including but not necessarily limited to the following: Continued operation of the airport in sub-optimal conditions for safety and environmental standards and passenger comfort; and inability to cater for forecast future air traffic and passenger growth leading to:


SERVICE ROAD
DOMESTIC INTERNATIONAL TERMINAL
EXISTING TERMINAL
EAST LOADING BAR
GARDEN
EXISTING MAINTENANCE BUILDING
EXISTING CARGO ROAD
TO MACKEAN'S
N

- Failure to realize potential increased income for The Bahamas from tourism and general industry by providing the facilities required to facilitate growth in these sectors;
- No improvement in the management of environmental matters (poor environmental practices would continue unabated); and
- Failure to realize positive socio-economic benefits in the provision of jobs and the generation of revenue for the local community.

On this basis, it is considered that the positive benefits of airport development outweigh the potential negative environmental and social effects. Therefore, the no development option is not recommended.

Alternative Site Options

A Terminal Review Study was completed in November 2006. This study evaluated a green field option to the west of the existing terminals and an existing site option that reuses portions of the existing terminal. This study evaluated these options against the following criteria:

- Impact on US Operations
- Impact on domestic / international operations
- Impact on passengers
- Land acquisition and ancillary facility impact
- Project phasing
- Capital cost

The study recommended the following:

'After reviewing the two options against the key criteria, the recommendation is the existing site option. The existing site option provides sufficient areas for redevelopment, appropriate phasing, and reuse of existing buildings within a planning scheme that will allow the same standard of finish across the entire terminal facility. The phased construction will provide a more immediate resolution to issues of congestion within the existing terminal. The reuse of existing taxiways, apron, and landside infrastructure does not require significant developments to support the expanded terminal operation; the existing site option is therefore the preferred and recommended option."

The green field option would have significant impacts on the Windsor Well Fields.

3.2 Project Justification

The traffic forecasts (Section 4.13) indicate that the total number of passengers at LPIA is expected to increase from the current level of 3.3 million to 4.6 million by 2015 and 5.3 million by 2020 (the design year). Congestion problems, already apparent in certain areas of passenger processing, particularly U.S. check-in and landside traffic flow, will worsen unless steps are taken to alleviate capacity bottlenecks. The Expansion Project will increase both the number and efficiency of the aircraft gates, and increase and reallocate the new and renovated terminal space to achieve higher effective throughput capacity.

3.2.1 Expansion of Gating Capacity

The existing aircraft gating capacity at LPIA is 25 gates, comprising of six domestic gates, seven international gates, and 12 US gates. Neither the quality nor layout of these existing gates is optimal. The gating requirements forecasts indicate a growing requirement for gating to at least 30 gates by 2015 and 33 gates by 2020. These forecasts therefore confirm an increasing shortfall of available gating capacity at LPIA and justify the proposal to move to a 30-gate facility by 2010/11 (complete of Stage 1) and to a 33-gate facility by 2015 (complete of Stages 2 and 3). These future new and renovated gates will be of higher quality, allowing the majority of Code C (wing span between 78.7 and 118.1 feet and outer main gear wheel span of 19.7 feet to 29.5 feet) and larger aircraft to utilize apron drive bridges for enplaning and deplaning passengers. Also, one gate at the new international pier will be capable of accommodating a Code F (wing span between 213.3 and 262.5 feet and outer main gear wheel span of 45.9 feet to 52.5 feet) aircraft, given that the next generation aircraft such as the Airbus A380 may see selective usage in long-haul tourist markets in the period thorough 2020.

3.2.2 Expansion and Re-allocation of Terminal Space

To accommodate the increase expected in passenger numbers by 2020, it is proposed to increase the available terminal space. The higher level of passenger processing efficiency is achieved by effective space allocation. The space allocation has targeted key terminal sub-processes where additional space can serve to improve passenger processing, or where improved layout and technology can be used to maintain or even reduce the required space. As examples, significant increases in space has been made for in the lateral circulation, check-in queuing, security screening and holdroom and baggage makeup areas for US departures, and a decrease in space has been made in other areas through an improved and more efficient process and design.

3.2.3 Optimized Design of Proposed Facilities

The proposed facilities are the outcome of a comprehensive process designed to optimize the scope and scale of the project. A number of the factors that have been examined in the optimization effort are listed below:

1. Gate sharing between aircraft types to reduce total gates required.
2. Swing gates between traffic sectors to reduce total gates required.
3. Dual taxi lane configuration to allow multiple aircraft to access and egress sands concurrently and continuous movement to/from runways/taxiways to/from the aprons.
4. Taxi-in push-out design for many of the international and US stands to reduce apron congestion, reduce the required apron construction area and allow baggage/passenger loading up to scheduled departure time.
5. Taxi-in taxi-out design for turboprops for maximum efficiency.
6. Bridge design per expected aircraft mix at each gate.

7. Interstitial corridor to vertically separate inbound/outbound flows, thereby giving flexibility to operate international outbound and US arriving flights at adjacent gates.
8. Cost-effective building section, with high ceilings in key public areas and standard ceiling heights elsewhere.
9. Placement of vertical circulation cores, which include stairs, escalators and elevators for ease of flow, life safety and cost effectiveness and barrier free movement within terminals.
10. Check-in counter and bag tag counter requirements per industry standard passenger-per-agent-per-hour processing rates and forecast peak passenger hour departures.
11. Mix of traditional and self-service check-in counters.
12. Security screening lane requirements per Transportation Security Administration (TSA) guidelines on processing-rate-per-lane-per-hour and forecast peak passenger hour departures.
13. Compliance with the latest US pre-clearance design standards for outbound baggage systems.
14. US-pre-clearance counters per passenger processing rate per counter per hour and forecast US peak passenger hour departures.
15. Holdrooms designed for multiple gate seating, and sized appropriately for the aircraft and load factors expected as well as complementary seating available in concession areas and airline lounges.
16. Baggage makeup devices based on peak outbound bag flows and required staging lengths.
17. Bahamas Customs primary and secondary inspection counters per passenger processing rates per counter, expected referral rate (in the case of secondary inspection and forecast international and US peak passenger hour arrivals.
18. Bahamas Immigration counters per passenger processing rates per counter, and forecast international and US peak passenger hour arrivals.
19. Baggage claim devices based on peak inbound bag flows and required presentation lengths.
20. Baggage claim areas per expected occupancy as a percentage of peak hour arrivals, and per capita space allowance based on IATA Level of Service C (good level of service, stable flows, acceptable delays, good comfort).
21. Placement of static and dynamic signage at key decision points to expedite passenger flow.
22. Attractive washrooms sized to suit passenger numbers and aircraft sizes at gates, designed for ease of use and ease of cleaning.
23. Locations and mix of commercial services (retail food and beverage, lounges) in post-security and pre-security area optimized for passenger flows and dwell times.
24. Concessions concentrated in tow distinct zones – one US, one domestic/international – for passenger impact and convenience and ease of servicing.
25. Sustainable design in respect of site planning, energy efficiency, renewable energy use, conservation of materials and resources, and indoor air quality.
26. All systems and facilities designed for accessible, easy maintenance.
27. Low-maintenance design.
28. Flexibility for future expansion of specific zones, as required.
29. Phased development of parking in line with expected growth.

30. Retention of existing roadside traffic flow patterns and roadways.
31. Consistent portrayal of a Bahamian “sense of place”, including use of gardens.

3.3 Schedule and Phasing

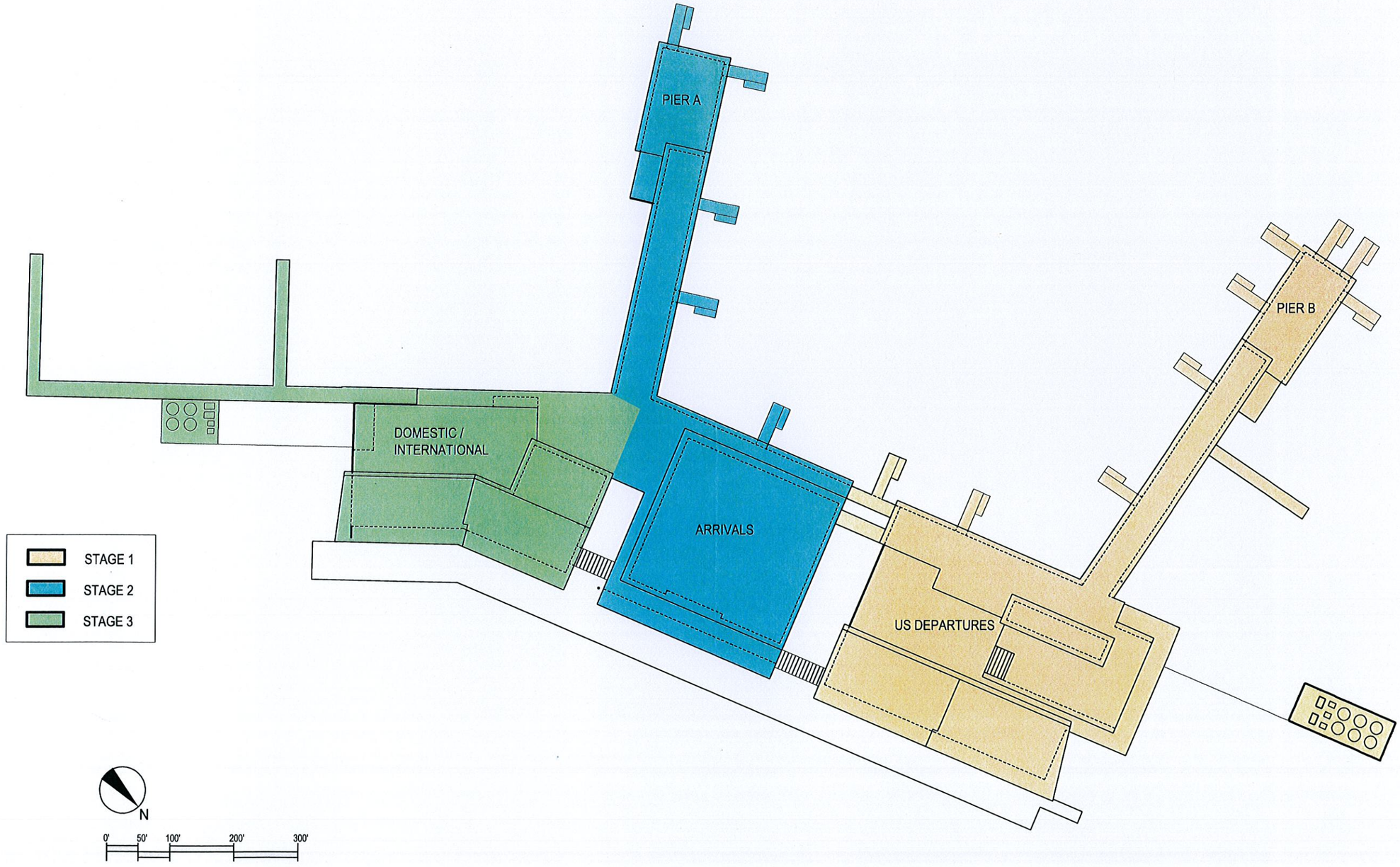
In accordance with the existing agreements, the terminal building is expected to be completed in three distinct stages:

- Stage 1: Construct U.S. Terminal expansion and new U.S. departure/arrival pier and associated apron to be complete in 2010.
- Stage 2: Renovate existing Terminal 2 to be complete in 2012.
- Stage 3: Demolish existing international/customs and immigration hall and build a new domestic/international departures area to be complete in 2013.

Figure 3 shows the staging of the project work over the approximately 66 month period as it relates to the terminal building complex. The Project schedule will likely be extended to accommodate a new roof on the US Terminal and financing delay.

In Stage 1 the new US Terminal area would be fenced to create a landside (non-secure) construction site for the terminal, apron, and associated road works. By locating the construction area on landside, access to the site is significantly easier than later stages will be. Once this construction is complete and occupied the existing U.S Terminal will be gutted back to the base structure in Stage 2. A number of small building relocations/demolition and temporary road works will precede Stage 1 of the project, and these will require their own schedule and staging plans.

Stage 2 will be initiated with the renovation of the existing U.S Terminal. In this construction a temporary passenger corridor will need to be constructed to allow for inbound U.S passengers to access the existing Bahamas Customs and Immigration facilities. Again, large portions of this work can be completed on the landside area by temporarily relocating the primary security line. Other portions of the construction will be completed on the airside.



LYNDEN PINDLING INTERNATIONAL AIRPORT
NASSAU, BAHAMAS

PROJECT DEFINITION REPORT
VOLUME III
Figure 3 PHASING PLAN

NAD
Nassau Airport Development Company

The existing U.S. pier will also be demolished in this stage. A security fence will be constructed around the existing U.S. Pier prior to demolition to make it a landside construction site. The temporary passenger corridor for inbound U.S. passengers will be constructed through this area adjacent to the building.

Stage 3 is also a large portion of work that will essentially complete the terminal expansion and upgrade. The relocation of the Bahamian Customs and Immigration functions will allow for the demolition of their current facilities. On the existing footprint of this area a new International and Domestic Terminal will be constructed. Again good portions of this work will be completed within the landside envelope by a temporary relocation of the primary security line.

A new covered passenger walkway, demolition of the last existing pier, completion of the roadway canopy, and the temporary relocation of the Airport Authority Security will complete this stage of work and its major subsets.

The final work consists of the demolition of portions of the current terminal building and the completion of any related or associated small projects.

3.4 Sustainable Design Initiative

In simple terms, sustainable design means doing more with less, and making intelligent design decisions that reduce energy consumption and minimize the impact that a building has on the environment. Most of the decisions regarding sustainability are of a detailed nature and will be formalized during the detailed design phase. A framework has been set that incorporates concepts that will contribute to a building that once fully designed, will conform to current sustainability principles. In North America a system named LEED (Leadership in Energy Efficient Design) has become the de facto standard for rating the sustainability of many building designs, including two airport terminals, one of which has been designed by the Stantec team. While the LEED standard is not particularly well-suited to airport terminal projects, it serves as a useful guideline for making environmentally responsible design decisions and it establishes the following six categories that need to be considered when making sustainable design decisions:

- Sites
- Water Efficiency
- Energy and Atmosphere
- Materials and Resources
- Indoor Environmental Quality
- Innovation and Design

Sites – The building orientation has been driven by functional concerns, such as the configuration of the existing runway and taxiways and the location of the existing terminal. Having said that, the design incorporates sustainable design strategies such as reusing the structure of the existing US terminal, and providing garden features between and within various portions of the terminal that contribute to better site drainage.

Water Efficiency – Water efficiency will be provided through strategies noted in Section 3.11 and will include low-flush automated fixtures and irrigation from groundwater.
Energy and Atmosphere – Energy efficiency is addressed in Sections 3.10 and 3.12 and includes natural day-lighting strategies, solar power, variable-speed drive escalators, geothermal and displacement ventilation providing that these are feasible and cost-effective.

Materials and Resources – Exterior and interior materials will be specified that are made from rapidly renewable or recycled sources wherever and that can be obtained from sources that require the least amount of transportation, recognizing that most materials will need to be imported.

Indoor Environmental Quality – Interior materials will be selected that have low Volatile Organic Compound (VOC) emissions. Smoking areas, if required or permitted, will be separately ventilated.

Innovation and Design – Innovative strategies such a solar powerand displacement ventilation have been considered for this project.

With respect to the process, the sustainable design initiatives will be considered and implemented by a working group including the client, the design team, local architects and engineers, local utility representatives and other appropriate stakeholders. Initiatives will be weighed against capital and operating cost in order to find appropriate solutions that not only meet sustainable design criteria, but are practical and cost-effective.

3.5 Architectural Design

For the new and upgraded airport terminals, the building program, form and materials are beingdeveloped to the requirements of a contemporary North American airport, at the sametime clearly recognizing and celebrating the unique people, culture, landscape andseascape of The Bahamas. The building design will reflect this ‘sense of place’ whileaddressing the challenges of building an enduring facility in the Caribbean climate.

As with most airport terminal designs, the terminal layout is a direct function of anefficient airside and landside plan. The structure of the existing U.S. Terminal is being retained and the building redeveloped as the new International / U.S. Arrivals facility. To the north a new U.S. Departures facility will be built and to the south the new International / Domestic terminal. These three building components will each beseparated by a garden with an additional garden at either end. The three buildings will beintegrated by a continuous barrel vaulted canopy on the landside curb and by the circulation corridors tothe new piers on airside. The landscape elements will also be extended into the parkingarea, including a covered walkway, for both shade and rain protection.

Public circulation within the terminal is designed for intuitive way finding, alwaysproviding a clear way forward. The number of vertical circulation cores has beenoptimized for convenience, life safety and cost effectiveness. At each core, escalators,stairs and an elevator have been provided.

A number of ‘feature areas’ will provide a dramatic new image and character for theairport.Over the two new departures halls, the structure will have a sloped barrel vaulted roof with clerestory windows thatbring in filtered light from above. The slopes of the roof structure vary to create amodulated form, providing a dramatic space both within and from the exterior.

For the departing US passengers a new retail restaurant centre has been created on theupper level just after the security screening and before the holdrooms. A major artfeature will be installed at the top of the stairs surrounded by a suite of shops, servicesand restaurants. As in

the departures hall below, there is a dramatic wood ceiling withclerestory windows above. The adjacent roof terrace will be landscaped with trellisedroof gardens for the lounge and the food court.

The new holdrooms feature a similar feature ceiling. Control of sun and daylight is asignificant issue in this climate. On these new piers horizontal windows are placedwithin a solid wall, strategically located for views. With the two upwardly sloping roofs on each pier, this becomes one of the signature elements of the new terminal.

For the arriving passengers there is a dramatic feature zone as they leave the building.
Directly in the garden there are trellises over an outdoor restaurant, bandstand and amajor installation of Bahamian art work.

Together these feature areas will provide an exciting new dimension and depth to theairport experience and clearly express the distinctive Bahamian sense of place.

3.6 Structural Design

As part of the investigation leading to this report, a review of local building practices andgoverning regulations was undertaken. The governing Building Code is The Bahamas Building Code third edition 2003 and South Florida Building Code 2003 Edition. Thelatter code is based on the 2003 International Building Code in wide use throughout theUnited States. The Bahamas Building Code recognizes not only US governing authoritiessuch as the American Institute of Steel Construction (AISC) and the American WeldingSociety (AWS) but also other authorities such as the Canadian Institute of SteelConstruction (CISC) and Canadian Welding Bureau (CWB). Governing materialdesignations are typically imperial and based on U.S. Standards and designations.

Most major building materials are shipped to The Bahamas with originating locationsvarying from South Florida, through the US Northeast to Nova Scotia on the Canadianeast coast. This would include fabricated items such as concrete reinforcement, structuralsteel and open web steel joists, engineered timber and aggregates for cast-in-placeconcrete and pavement.

Local concrete suppliers have the capacity to supply quality concrete and are familiarwith higher tech. concrete mixes incorporating pozzolans such as silica fume.
Coarse and fine aggregates used in concrete mixes are typically manufactured crushed stone fromFreeport. All concrete will be tested in accordance with and meet requirementsof American Concrete Institute (ACI) and American Society for Testing and Materials(ASTM) standards.

3.6.1 Development Site Existing Condition

The site is located adjacent to the existing US Departures building in an area which is partially unoccupied and partially occupied by a parking lot for official airport staff. The area has served a number of purposes in the past including short-term overflow parking, construction staging and aggregate stockpiling.

The existing ground surface in the area is nearly level except for a small pond in the south. The water surface in the pond at the time of the geotechnical site survey was two to three feet below the surrounding ground surface. There is a thin layer of topsoil in the area with a few small outcrops of limestone being observed. The topsoil is underlain by

between one and two feet of crushed limestone fill over part of the expansion area and one to three feet of weathered limestone “cap rock” over the remainder of the site. Beneath the fill and cap rock a moderately hard weathered limestone was encountered.

Based on the existing site grade (elevation 14.28 ft) and potential for wetness in low lying areas, the geotechnical report recommends raising the building site by approximately two to three feet with engineered fill. Engineered fill typically consists of locally acquired crushed limestone. This would allow the main floor to be built above the maximum anticipated water level in the area and would allow for positive drainage (16.68 ft top of slab) away from the building.

3.6.2 Existing Terminal Buildings

The existing US terminal building (main structural elements to remain), including the roof, and the international terminal building and all of the customs and immigration building will be demolished to accommodate the new terminal construction. This will require selective demolition with care taken not to damage structural elements to remain. A thorough investigation and analysis of the remaining existing structural elements was completed by Stantec.

3.6.3 Foundations

Based on the structural assessment, conventional shallow foundations are recommended. The shallow foundations would consist of a combination of cast-in-place concrete spread and strip footings near existing grade and bearing on engineered fill material.

Level 1 Foundation

The entire area of Level 1 will consist of a cast-in-place concrete slab on grade. The slab on grade will be cast over a typical compacted granular base and compacted granular sub-base placed to raise the elevation of the main floor. The slab on grade will typically be one thickness throughout. The exception to this will be at heavier load locations such as demising walls and at equipment installations where the slab on grade will be designed for the larger design loads imposed.

Level 2 & Lower Roof

Suspended floor structures will consist of cast-in-place concrete topping on compositemetal deck. The thickness of the concrete topping will be selected based on fire ratingand crack control requirements. The roof structures adjacent to the upper US Check-InHall and upper International/Domestic Check-In-Hall will also be designed as floors withmetal deck and concrete topping construction. This will allow the area adjacent the USCheck-In-Hall to be utilized as an outdoor plaza in the current terminal configuration andallow for future conversion to interior floor space in the future, if desired. This will alsoallow the area adjacent the International/Domestic Check-In-Hall to function as floorspace in an expanded Domestic Holdroom. The metal deck and concrete floor assemblieswill be supported on a combination of open web steel joist and structural steel beamassemblies supported by structural steel columns. The joist and beam support assemblieswill be designed on the basis of strength and deflection

limitation to minimize structuralvibrations due to rhythmic occupancy loads. The remainder of the first floor roof areaswill consist of metal deck on open web steel joists and structural steel beam assemblies.All metal deck will have a galvanized finish. Open web steel joists and structural steelsections will be shop primed. Open web steel joists and structural steel sections requiringfireproofing will also be shop primed and either encapsulated or receive fireproofcoating compatible with the applied primer.

Upper Roofs

Typical upper roofs will consist of metal deck on open web steel joists and structuralsteel beam assemblies. All metal deck will have a galvanized finish. All open web steeljoists and structural steel will be shop primed. Longer spans may be incorporated over theCheck-In-Halls to enhance space utilization and aesthetics, but other than this thestructural roof system in these areas will remain consistent with the remainder of the newterminal construction. Roof assemblies will be supported on structural steel columns.

Exterior Walls

The exterior walls would consist of a combination of curtain wall glazing and cladding assemblies. Glazing and cladding heights are not excessive in most cases and as such would not require additional support assemblies. The only exception to this is the entrance halls where additional horizontal supports may be required to support these assemblies. All exterior wall assemblies will be designed with the governing loading being from hurricane force winds.

3.7 Apron Design

3.7.1 Existing Apron

The existing apron, which will be rehabilitated to support the new aircraft movements, has various features incorporated into the function. The apron has an existing fuel hydrant system, drainage features and other common aircraft support features.

The existing apron is constructed with Hot Mixed Asphalt. The apron has a variety of underground utilities associated with the operations of the airfield. The apron contains drainage structures, electrical systems, water distribution systems, fuel distribution systems and other utilities.

The existing terminal apron is lighted with minimal lighting fixtures attached to the face of the terminal building (wall-packs) and is below levels for safe working conditions. The proposed design is to provide mast mounted lighting fixtures at each of the fixed links, which will in turn provide adequate ambient lighting to support night operations. As partof the apron design, a full lighting analysis will be performed to ensure that public areasare well lit while maintaining an ambient level that will not interfere with aircraftoperations or disturb any nearby residents.

The existing apron is drained of storm water runoff through a series of trench drains, pipes and catch basins. The existing system discharges to a ditch located in the grass area between the terminal apron and Taxiway Hotel. The grass islands also accept storm water runoff from the adjacent General Aviation Ramp. This area eventually drains to Lake Killarney.

The Airport Authority has indicated that flooding has previously occurred on the existing ramp rendering the ramp unusable at times of heavy precipitation.

3.7.2 Apron Construction

The existing Apron 2 was rehabilitated in 1991 during the same time as the rehabilitation ofRunway 09-27. The condition of the existing pavement in areas of the apron related to this project was considered good per a report dated June 2003 by Trow Associates. Aprons 4 and 5 are in very poor condition.

Considering the pavement condition at the existing terminal, repairs are recommended tothe existing apron on an as needed basis. The repairs to the existing Hot Mix Asphaltwill likely include profile milling of the existing Hot Mix Asphalt, repair of areasdetermined to be distressed or problematic and an overlay of Hot Mix Asphalt. Aprons 4 and 5 will be abandoned.
Proposed apron expansion construction details will include the following recommendations for Hot Mix Asphalt:

- inches of Hot Mix Asphalt (Fuel Resistant Surface Course)
- 6 inches of Hot Mix Asphalt (Binder Courses)
- 6 inches Granular Base (100% Crushed material)

- 12 inches Granular Sub Base.

The proposed section for Portland Cement Concrete Aircraft Stands recommendations are:

- 8 inches of Portland Cement Concrete
- 6 inches Cement Stabilized Base
- 6 inches Granular Sub Base.

The Water and Sewerage Corporation has confirmed that the area of active water collection on airport lands is in the center of the airport surrounding the Control Tower. The area north of the cargo facility is not in use with no short or medium-term plans to reactivate. All construction work for the Project must be a minimum of 150 feet away from the active water collection areas. The closest water collection area to the construction is over 800 feet in distance. The Water and Sewerage Corporation has guidelines, **Appendix B** for installing deep wells for discharge in proximity to well fields.

Stantec has prepared a Stormwater Analysis Report, provided in **Appendix C**, to evaluate the Expansion Project to determine potential stormwater impacts. The project consists of approximately 16 acres of new pavement surface on airside and 13 acres on landside. The drainage systems are separated between airside and landside.

Runoff calculations were performed for 5-year storm events as the "design storm" which considers runoff-using duration of six hours for the existing and developed conditions. This is in accordance with Ministry of Works & Utilities Design and Construction Guidelines, dated 2004. Additionally, calculations were performed for the two-year storm for peak flow analysis using the calculated critical duration for evaluation of the maximum effects of peak flows and runoff volume for more intense and more frequent events. The shorter, more intense storm condition typically results in substantially higher peak flow rates but in most instances results in less runoff volume due to the shorter duration. Stantec evaluated the effects of both storm conditions for this site.

Airside Drainage

The existing airside drainage system, a series of swales with excess water making its way to Lake Killarney, will be expanded to serve the new airside areas. The new expanded system will serve as infiltration basins for stormwater. Sediment will settle as water infiltrates and passes through the system. With the improvements to the swales allowing water to be retained for infiltration, Stantec calculates that there will not be an increase in flow rates or flooding.

Drainage from the new apron surfaces where fuelling activities will be occurring will be directed through two 15,000 gallon oil/water separators installed in parallel to intercept and contain spills up to 27,000 gallons at a flow rate up to 3,000 GPM, which would capture spills even during significant rainfall events. These oil/water separators will consist of state-of-the-art fiberglass tanks with enhanced coalescer separating systems which are low maintenance and easy to clean.

For added protection, a manually operated stop-gate will be installed that can be closed by spill responders to capture all drainage and prevent it from entering the drainage

swales and Lake Killarney. A second gate will be installed further downstream as extra protection.

3.8 Civil Landside Design

The proposed expansion of the LPIA will require significant landside development improvements to support the new passenger facilities. The necessary landside improvements will be designed to support primarily the vehicular traffic generated by the incoming and outgoing passengers, but will also consider pedestrian traffic, primarily to and from the parked vehicles. The specific design elements will include the following:

- Curbside passenger discharge and pick-up lanes
- Bus queuing lanes
- Through lanes for exiting vehicles
- Rental car facility and associated vehicle parking
- Short term parking lot
- Long term parking lot
- Bus/limo and taxi staging parking lots
- US-CBP parking lot
- New circulation roadway system and road improvements
- Walkway canopies
- Access and revenue control system
- Parking lot and access roadway lighting
- Landscaping

3.8.1 Existing Condition and Engineering Considerations

The airport has approximately 2,570 existing controlled parking spaces. These spacesinclude long-term parking, charter service parking, overflow parking and airportemployee parking. **Table 2**summarizes the existing parking conditions:

Table 2. Existing Parking Conditions

Parking Lot	Existing Number of Parking Stalls
Short Term	0
Long Term	1,390
Taxi Staging	75
Bus, Limousine and taxi Staging	110
Employee	295
CBP, Security and Airlines	100
VIP	0
Overflow	600
Rental Ready	0
Total	**2,570**

There are five car rental agencies (Avis, Budget, Dollar, Hertz and Thrifty) operating atthe airport. Each agency maintains a remote facility on the airport property. The totalcapacity of remote vehicle parking spaces for the car rental agencies is approximately220 spaces.

3.8.2 Traffic Patterns and Airport Access

The airport can be accessed via several roadways depending on the direction of approach. The main route to the airport from the east end of the island is John F. Kennedy Drive. From the south one would use Coral Harbour Road and from the west, West Bay Street and Windsor Field Road.

Two main entrances off John F. Kennedy Drive provide access to the airport terminals. Using the eastern entrance will bring motorists past the car rental remote facilities and directly to the Domestic Terminal. To access the main parking area and the US/International Terminal, motorists would likely use the western entrance.

Once within the airport internal roadway system, motorists are guided to their destinations with informational signage. Two internal roundabouts provide adequate traffic flow and direction. One-way and two-way traffic patterns allow for orderly access to pick-up and drop-off points at the terminal entrances.

3.8.3 Existing and Future Volumes

Future parking space requirements are estimated based on a 1.0% average annualincrease in resident population. The resident population growth rate was chosenconsidering that the increased passenger traffic from tourists will be using bus and/or taxiservices and will not require additional parking. The current landside site layout can accommodate the airports parking needs through the year 2020. **Table 3** shows the future number of parking stalls.

Table 3. Future Number of Parking Stalls.

Parking Lot	Future Number of Parking Stalls
Short Term	311
Long Term	1,282
Taxi Staging	100
Bus, Limousine and taxi Staging	75
Employee	435
CBP, Security and Airlines	100
VIP	35
Overflow	323
Rental Ready	81
Total	**2,742**

3.8.4 Proposed Parking Area Expansion

The number of parking stalls for the expanded airport facility was based on the projected design year demand volumes as depicted above. The objective for the conceptual landside site layout was to meet or exceed the design year volumes in addition to meeting other specific needs of the airport.

All new and rehabilitated parking areas utilize an interlocking stall arrangement with one-way interior circulation and two-way exterior aisle circulation. The bumpers of vehicles in abutting stalls are next to one another but offset from those in the stalls on either side. This arrangement maximizes the use of available space and provides easier traffic circulation when the parking angle is less than 90°. In general, the proposed parking lots are rectangular in shape. Rectangular sites are best for maximizing capacity, manoeuvrability and circulation. By arranging access aisles parallel to the longer site dimension with parking spaces along both sides of the access aisles, the efficiency of space use is maximized.

3.8.5 Existing and New Drainage Characteristics

Run off from existing landside surfaces enters deep wells and swales located around the perimeter of the car parks. These connected swales, long shallow swales connected by large diameter culvert pipes, form a linear retention pond with no outlet. Water infiltrates or evaporates from this system. The new surfaces will drain to a system of existing and new drainage deep wells, open swales and stormwater retention, large diameter culverts, existing and new stormwater collection catch pits, storm drains and slotted trench drains. Depending on the final design alternatives, underground retention storage may be employed, as well as permeable pavement. Drainage patters and locations where excess stormwater will accumulate are modified slightly compared to the existing conditions.

3.8.6 Traffic Patterns

A new one-way terminal entrance road is proposed off of Windsor Field Road located approximately half way between the existing fuel farm and the existing roundabout to improve roadway safety. A new two-way service road is required to gain access to the existing fuel farm, new US Terminal loading dock area and the new US-CBP parking area. The new three lane terminal road extends approximately 750 feet to the south where it turns to the southeast and passes in front of the new US departures/international arrival terminals where it is divided by a 50 foot wide curbed island. This curbed island will accommodate four separate bus staging areas and provide refuge for crossing pedestrians. The two lanes that pass in front of the terminals will be utilized for curbside passenger discharge and pick-up. Two lanes will also pass to the north of the curbed islands for through exiting traffic, access to the bus staging lanes and access to the new rental ready parking area. The terminal road finally turns back to the north where it ties into the existing exiting terminal road. Extending north along the exiting terminal road the first existing roundabout is being removed and replaced with a T-intersection. This roundabout was deemed unnecessary due to the expansion of the existing parking area to the west. A new roundabout is proposed at the intersection approximately 400 feet north of the first roundabout location. Extending west from the new roundabout will be a new 1000 foot leg of access road that will tie back into the new terminal road completing the circulation loop. Off of this new section of terminal road will be the new bus/limo and taxi staging areas.

3.8.7 Provisions for Pedestrians

A central walkway, approximately 10-15 feet in width, will extend through the expanded parking areas (long and short term) parallel to the parking lot aisles. This walkway will function as a central collection point for passengers using the lots and will funnel directly to the terminal building. The walkway will serve as the most direct route to the terminal facility which should discourage pedestrians from using drives meant for vehicles and minimize the number of pedestrian crossings at circulation aisles. The new walkway will be covered by a structural overhead canopy which will help protect pedestrians from the sun and inclement weather.

The total number of parking spaces reserved for persons with disabilities will be based on the total number of parking spaces in a particular lot. Accessible parking will be located as close as possible to the terminal facility with direct access to the covered walkways. All walkways including passenger discharge and pick-up areas will also be accessible to persons with disabilities.

During detailed design lighting will be provided within the new and rehabilitated parking areas including along the access roadways. Lighting should be of adequate level to enhance safety and security for airport customers. The lighting layout will be closely coordinated with the parking lot and landscape design. Illumination of the parking areas will be designed so that the user can distinguish features of the area, as well as pedestrians moving about and, should be sufficient to discourage illegal activities. The illumination design shall be such that the vision of the control tower is not impaired by luminary brightness or light spillage.

3.8.8 Landscaping

During detailed design numerous “green” spaces will be incorporated into the parking areas and overall site to allow for landscaping. A well-landscaped site will enhance the visual appeal of the airport facility. The landscaping will be consistent with the surrounding land uses and take into consideration such things as safety, operation, degree of maintenance, vandalism, loitering and where possible, the preservation of existing vegetation.

3.9 Passenger Loading Bridge Design

Passenger Loading Bridges will be provided to the new gates to suit the aircraft being staged at each gate. Each new bridge will be provided with Pre-Conditioned Air (PC Air), 400HZ Ground Power Units (GPU), and potable water cabinets. Hurricane hold-down straps will be provided in conjunction with hold down anchors in the apron.
The existing bridges include 6 Pedestal style and 2 Apron Drive Bridges (ADB) at the U.S. Departures terminal, and 2 Pedestal style bridges at the Domestic / International terminal. Because of the age and condition of the existing bridges, there is no plan to reuse them.

The finishes of the new bridges will include rubber flooring for ease of maintenance and plastic laminate wall panels in metal sided bridges. The ceiling will consist of horizontal slats, and horizontal fluorescent lighting.

The cab at the drive end of the bridge will have point-and-go controls, doors that can be closed to the weather, and an alarm connected to the bridge pressurization fan (provided by the building services and located on the fixed walkway).

PC Air units will be provided at each new bridge, sized to suit the largest aircraft expected at each gate. Dual air hoses will be provided for the Code E gates.

400 Hz Ground Power Units will be provided at each new bridge, sized to suit the largest aircraft at each gate.

3.10 Baggage Handling System Design

The new Terminal facilities will include various baggage handling systems and processes for the efficient routing and delivery of Outbound, Inbound, and Oversize baggage for the three Sectors – Domestic, International, and U.S. Pre-Clearance.

The new outbound baggage systems will include back-of-house, in-line Explosive Detection System for screening of all outbound baggage.

Special baggage such as live animals and large, oversize baggage will be screened manually in areas that are located in proximity to the check-in area / Explosive Detection System area, for ease of delivery of the screened bags to the make-up rooms.

3.10.1 Existing Baggage Handling Systems

Existing baggage handling system conveyors and screening equipment will be re-used in the Terminal Expansion as phasing permits.

3.10.2 New Baggage Systems

The baggage system conveyors can be provided with high efficiency gear motors in order to maximize the output and minimize the power requirements. All conveyors can be programmed to enter into "economy" mode, where the conveyors will stop after a preset time period (usually a few minutes), and will automatically start up as a bag is sensed on the upstream conveyors.

Additional environmental initiatives can include the re-use of the existing steel conveyor beds and support steel in this airport or in other smaller airports, or alternatively the selling or re-cycling of the existing steel to recycling facilities.

3.11 Mechanical HVAC Design

Ventilation and air conditioning will be designed to maximize energy efficient options as there is no natural gas available on the island and the cost of electricity is approximately $ 0.20 - $0.40 per kWh. However, the cost per kWh varies month to month pending the price of fuel. Variable flow, high temperature differential, chilled water pumping systems and feedback/demand control are some of the strategies that will be used to achieve energy efficient systems. A deep well cooling system will be used consisting of a total of 8 wells. Supply wells will be 400 ft deep and discharge wells will be 300 ft deep. The design will be carefully reviewed to ensure there will be no impacts on the existing contamination.

The existing mechanical equipment will be evaluated during the detailed design phase for potential reuse where there are long term economic and operational benefits.

DDC (direct digital control) controls will be provided for all mechanical systems and all control panels will be provided with an emergency power supply.

3.11.1 Energy

During the detailed design phase payback periods will be established for both closed loop geothermal and conventional cooling systems. Based on the payback period a final decision will be made on the mechanical system to be incorporated.

The design will incorporate the following systems giving consideration to energy/sustainability:

- High temperature differential cooling systems to reduce the chilled water flow rates and associated pipe sizes.
- Use of pressure independent control valves on cooling systems to accurately control system flow rates.
- Glazing performance.
- CO_2 control.
- Setback temperature control during unoccupied hours of operation.
- High efficiency chillers. The geothermal cooling allows chillers to consume 7-8% less electricity.
- DDC controls.
- Use the heat of rejection from mechanical equipment to provide heat to the building and ventilation systems.

- Displacement supply air distribution with stratification concepts.

3.11.2 Existing HVAC System

The existing mechanical system consists of a chilled water plant and several air handling units and rooftop units (RTU) throughout the terminal buildings. There are currently two Trane model RTAA300 air cooled chillers located at grade on the service side of the Terminal 2 building. These chillers serve chilled water coils located in air handling units that are distributed in various air handling mechanical rooms throughout the terminal building.

Due to high humidity on the island there is corrosion on the fins of the coils, even though the coils have a coating and the chillers are only 5 years old.

There is several air handling mechanical rooms in the Terminal 2 building at grade level and at the third floor level. The air handling units typically have outdoor and return air duct connections, filter sections, chilled water coils and fans. The chilled water coil piping and control valves is piped exterior to the units. There are no heating sections in the units. Sheet metal ductwork generally has external flexible fibreglass insulation.

Recently completed CTX areas (baggage x-ray areas) are served by dedicated split DX systems with vertical indoor air handling units, exposed ductwork and base mounted outdoor units.

The concourse areas (passenger walkways to and from the ramps) are served from a series of localized rooftop air conditioning units, which require regular maintenance and replacement due to corrosion.

The central mechanical chiller plant and air handling systems in Terminal 2 have a Honeywell DDC controls and control panel which could optimize the operation of the systems and scheduled maintenance. However, this panel has been disconnected and the building currently functions on manual control.

3.11.3 Proposed HVAC System

The proposed mechanical systems will comprise of a central plant chilled water systemthat will distribute chilled water to the air handling units located in various mechanicalrooms in each terminal building.

Typical air handling unit will have cooling coils; heating coils are not required.Numerous variable air volume boxes will be installed throughout the terminalbuildings to provide individual zone temperature control.

Specialized fire suppression systems such as pre-action systems, deluge systems, clean agent suppression systems, foam suppression systems or other specialized systems may be incorporated in specialized areas of the airport terminal buildings.

Consideration will be given to installing these systems in areas such as the CTX areas, baggage handling areas, and the emergency generator room.

3.12.2 Potable Water

New Providence Island has a shortage of potable water. The Windsor Well Fields, a surface water collection system, and a reverse osmosis plant, that draws salt water from deep wells, are located near the airport. In addition 2 million gallons per day of potable water are brought in by tanker boat from a neighbouring island.

The Bahamas Building Code requires the building to be supplied with potable water from the approved public water main. The existing airport Terminal T2 building is supplied with potable water from the Water and Sewerage Corporation by water mains from Windsor Field Road, near the northeast corner of the airport. The Director of Maintenance, Engineering and IT, advised there is a water meter near the property line. A dual potable water service is recommended to be provided to the overall airport site, interconnected and valved such that potable water service is maintained to the buildings even when one section of the water main is out of service for flushing, maintenance or repairs. The site water services will be addressed under the civil scope of work and routed to the water services mechanical rooms

The potable water system will enter the terminal water services mechanical rooms located at ground level, and from there distribute water to the potable water system, i.e., to all plumbing fixtures other than water closets and urinals. These water mains will also serve to supplement the flushing water supply system storage tank and the fire protection water supply system storage tank as described below.

Further, above ground, outdoor concrete potable water storage tanks will be located on the service ends of the terminal building. These storage tanks are filled from a branch line off the potable water supply mains, controlled by float valves in the tanks and are intended to be maintained filled with potable water. If the water supply from the utility company is out of service, duplex potable water pumps piped in parallel, located in the water services mechanical rooms will draw water from the storage tanks and distribute water to the plumbing fixtures. Potable water pressure tanks in the mechanical rooms will be provided to reduce cycling of the potable water pumps.

Currently the Terminal 1 building has its own water supply connection, as well as a flushing water well, storage tank and pump enclosure all located in front of the terminal building between the passenger drop off area and the parking lot. The tank and enclosure are unsightly and a visual obstruction to the building entrance and will be deleted.

3.12.3 Potable Hot Water

Hot water generation for potable water will be modular in nature rather than constructing a single domestic hot water system, due to the nature of the washroom and retail spaces

being spread out over the large facility. The type of system will vary depending on the location in the project as well as the hot water load requirements.

Solar powered photovoltaic panels will be located on the roof in the vicinity of the major washrooms groups. This will be further developed in conjunction with the electrical engineer during the next phase of the project. The use of solar powered photovoltaic panels in lieu of water based solar panels is being considered due to the simplicity of the installation and reduced extent of maintenance. The solar panels will be wired through disconnect switches (and possibly transformers) directly to electric immersion elements in the water heaters. The solar portion of the system will pre-heat the domestic water, with final heating provided by electric resistance immersion heaters. Utilizing solar energy will reduce the overall energy requirement from the utility electrical supply, thereby reducing operational costs as well as impact on the utility infrastructure.

Domestic water heaters in the vicinity of the central chiller plant may incorporate the heat of rejection from the condenser water side of the chillers via plate heat exchangers to further enhance energy conservation and reduction on overall utilities.

Small remote washrooms which contain one or two lavatories and remote individual sinks will incorporate small modular, localized, point-of-use electric water heaters, minimizing capital cost of equipment and eliminating distribution piping networks.

Domestic hot water equipment for restaurants, bars and food court use will be provided by the associated tenants. However, tenants may be required to incorporate solar panels as the source of pre-heating the water. Water based solar panels would be required for these areas due to the large domestic hot water demand. Electric supplemental heaters will be required to achieve 180F water for sanitizing purposes as required by The Bahamas Building Code.

3.12.4 Flushing Water

The Bahamas Building Code, Potable Water Conservation and Storage section has a requirement for a separate dedicated system to supply water to the water closets and urinals, in order to minimize the consumption of potable water. This system is termed as ‘Flushing Water”.

Rainwater collected from roof areas located within close proximity to the flushing water storage tank will be used to supplement the potable water.

The flushing water system will have an auxiliary potable water supply controlled by automatic float valves to ensure sufficient water is available for flushing purposes.

Mr. Neely, Director, Maintenance, Engineering and IT, advised that the existing flushing water supply system serving Terminal 2 originally drew water from a well approximately 20 feet deep, located outside the Water Services Mechanical Room. Mr. Neely advised that the well water is contaminated with hydrocarbons from previous oil or fuel spills in the vicinity. An above ground, steel oil separator tank was used but apparently not satisfactorily and oil could be smelled in the washrooms and was also staining the plumbing fixtures. Mr. Neely advised that a deeper well in the order of 150 feet deep was

3.12 Mechanical Plumbing & Fire Suppression Design

3.12.1 Fire Suppression Systems

The airport terminal is supplied with water from the Water and Sewerage Corporation by water mains fed from Windsor Field Road, near the northeast corner of the airport, and also serves the potable water supply systems. Water service connections will enter the two water services mechanical rooms located at grade level at each end of the terminal buildings. The two water services will be interconnected within the terminal buildings in order to ensure water is available when one of the service connections is out of service for flushing, maintenance or repairs. The site water services will be addressed under the civil scope of work and routed to the water services mechanical rooms.

Fire suppression water storage tanks will be located on the service sides of the terminal building. The storage tanks will be filled from a branch line off the water supply mains, controlled by a float valve in the tanks and are intended to be maintained filled with water.

The Bahamas Building Code requires fire pump installations comply with National Fire Protection Association Standard NFPA-20.

An electrically driven fire pump will be located in the water services mechanical room designed to draw water from the fire suppression storage tank and distribute water to the fire suppression standpipe and sprinkler systems. The fire pump will be controlled by a UL Listed fire pump controller and a dedicated UL listed transfer switch.

The Bahamas Building Code requires fire suppression sprinkler installations comply with NFPA-13. NFPA-13 states that, “A building, where protected by an automatic sprinkler system installation, shall be provided with sprinklers in all areas.” Thus, all areas of the terminal buildings will be provided with fire suppression sprinkler systems. The terminal buildings will be divided into several distinct sprinkler zones for ease of determining the location of a fire or trouble condition, and to minimize areas which may need to be shut down for maintenance or modification. Each zone will be separately monitored and identified through the fire alarm system.

The Bahamas Building Code requires fire suppression standpipe installations comply with NFPA-14.

A wet standpipe fire suppression system with fire hose cabinets will be provided throughout the airport buildings.

Fire department connections will be located near the main entrances to the buildings. These will be interconnected such that connection by the fire department at any response point will be able to supply the entire terminal building fire suppression systems with water.

On site fire hydrants will be provided per the civil scope of work including hydrants on the main entrance side of the building.

considered, however, that water would be brackish and would require some form of treatment prior to use and was therefore not pursued.

3.12.5 Sanitary Drainage

There are a number of sanitary lift stations at various locations around the exterior of the existing terminal buildings. These lift stations are on emergency power. Sanitary sewage from the terminal building plumbing fixtures including water closets, urinals and some other fixtures will be run by gravity and discharge into the lift stations. The civil engineering section of the report will discuss the options of reusing some of the existing lift stations, upgrading some of the existing lift stations or construction of one or more new lift stations. The sanitary sewage pumped by these lift stations ultimately is transported to a sewage treatment plant located near the northeast corner of the airport, operated by the sewer utility company.

Grease interceptors will be provided for connection of the sanitary discharge from the restaurant and food court areas as required by The Bahamas Building Code.

Aircraft lavatory waste currently is dumped into a macerator where it is pumped to the sewage treatment plant. The macerator must be moved to accommodate the new US terminal.

3.12.6 RoofDrainage

Storm drainage systems will be provided from all roof and canopy areas. Where practical, the storm water will be collected and directed to the flushing water storage tank. This recycled water will reduce the amount of water required to be generated by the flushing water system, and will be utilized for water closet and urinal flushing as described above.

Roofs and canopies that are located in areas not practical to be drained to the flushing water storage tank will be routed below ground and connect to the civil storm drainage system.

3.12.7 Plumbing Fixtures

Plumbing fixtures including water closets, urinals, lavatories, sinks, showers and janitor sinks will be provided throughout the facility as indicated in the architectural plans. The number of fixtures of each type for males and females will not be less than the requirements in The Bahamas Building Code.
Hands free fixtures will be provided in all public washrooms and staff washrooms. These fixtures will incorporate sensor activated flush valves for the water closets and urinals, and sensor activated faucets for the lavatories. These fixtures will increase the level of sanitation for the passengers and the staff in two ways. The fixtures will automatically flush after usage and will not rely on the user to flush the fixture. Also the user will not need to touch the flush valves or faucets.

Power supply for the sensor activation is envisioned to be provided by solar powered photovoltaic panels located on the roof in the vicinity of the major washrooms groups.

This will be further developed in conjunction with the electrical engineer during the next phase of the project.

Barrier free fixtures will be provided to facilitate use by the physically handicapped passengers and staff.

Drinking fountains and water coolers are not proposed for the project as we have been advised that the existing units are no longer in use and have been turned off, as bottled water appears to be generally used. It is recommended that portable bottled water units be provided in staff areas as owner supplied equipment. Retail units will sell bottled water to customers.

Water conserving plumbing fixtures will be provided to reduce water consumption and sanitary discharge, while maintaining sanitary conditions. This will reduce the impact on the utility infrastructure in terms of reduced water treatment and distribution as well as reduced discharge to the utility water treatment facilities.

Emergency eye wash and emergency shower stations will be provided as required in the secured customs area and baggage handling areas.

Food service areas and retail spaces will not be provided with plumbing fixtures under the base project scope. These areas will be shell spaces to be fit out by the respective tenants. Guidelines will be prepared to encourage water conserving fixtures in these areas consistent with the base building standards.

3.12.8 Fuel Systems

Propane gas tanks will be provided for the buildings with kitchen equipment.

Diesel fuel storage tanks will be provided in the vicinity of the electrical emergency generators to provide power for this equipment. The capacity will be sufficient to run the generators for a specified time period, plus additional capacity to permit regular testing of the generators while maintaining capacity for the required emergency run time. Two tanks will be provided such that fuel for emergency power is available if one tank is being serviced or replaced. Diesel tanks will be designed to meet the Florida standards for aboveground fuel systems.

3.13 Electrical Power and Lighting Design

The existing US Terminal is currently fed with two 7200-480/277V 1500kVA ONAN dielectric filled transformers. These transformers will be reused for distribution to the new US terminal expansion. They will be moved to the outside of the new US terminal on the north side of the building (close to the loading dock). Provision for a third transformer will also be allowed for future expansion.

The existing International, Bahamas Customs and Immigration and Pier C is currently fed with a combination of indoor and outdoor 7200-480/277V 500 to 800 kVA ONAN dielectric filled transformers. These transformers will be replaced with two transformers, and provisions for a third, similar to new the US terminal transformers. These transformers will be moved to the

outside of the new International Domestic Terminal. They will be placed outside close to the Domestic bag claim area which will be close to one of the new main electrical rooms.

3.13.1 Standby Generator Power

One to two new emergency generators are expected for this project. The existing US terminal has two diesel-fueled 480/277V, three-phase electric generators located in the main generator room adjacent the existing main electrical room. Generators will be refurbished and reused if possible. There are two other generators in the existing International and Pier C area that will be replaced. All four generators are to be outfitted with new sound attenuated, weather-proof, and ventilation controlled enclosures and moved. Two generators will be placed outside the new US terminal expansion on the right side of the building and the other two will be placed outside the new International/Domestic Terminal, on the left of the building. The US terminal generators will have a separate 14' x 20' conditioned enclosure built around them. New generators will be designed based on factory provided enclosures to economize on space while providing similar degrees of protection.

The service from the generators is to be routed to the new main electrical rooms. The generators will feed the new expansion portion as well as all renovated areas. New transfer switches are to be provided and will feature double-sided by-pass switches to permit maintenance without interrupting the facility operation.

3.13.2 Plumbing

The new terminals will have potable water pumps to draw water from the storage tanks and distribute water to the plumbing fixtures.

Due to the requirement for a separate dedicated system to supply water to the water closets and urinals, in order to reduce water consumption, flushing water pumps will be installed.

Solar powered photovoltaic panels will be used for potable hot water. Using the photovoltaic panels is a better alternative for this project rather than the water based solar panels because of the simplicity of the installation and reduced extent of maintenance. The solar panels will be wired through disconnect switches to the electric immersion elements in the water heaters. Utilizing abundant solar energy will reduce utility loads and costs.

3.13.3 Lighting Design

The electrical lighting design strategy will consider sustainability principles. From the last site visit it can be seen that this location has a good potential to save energy by using higher efficiency lighting and incorporating the use of automatic controls.

Specialty patterns and lighting fixture types will be considered in feature areas of the airport.

Generally most of the lighting will use high efficiency linear and compact fluorescent lamps. HID Metal Halides will be considered for the exterior of the buildings if the

increased longevity and compact source size is considered advantageous, otherwise fluorescent may be considered here also. The majority of lighting is anticipated to be based on T5HO lamps due to their superior efficiency, quality of light, and lamp life.

It is recommended to make much of the lighting addressable. This is to maximize the control flexibility by airport staff and simplify circuiting and wiring. It is anticipated that the reduction in circuiting and wiring costs especially if based on 277 Volt, combined with the energy savings afforded by this system, will eventually save rather than cost money. By having the lights on an addressable system, advantage can be taken of the natural light along windows and below skylights and clerestories. The system will determine what lights are not needed and can be turned off via computer to save energy cost. Light sensors and occupancy sensors will also be added to areas to detect light levels and turn off areas when not occupied and/or naturally illuminated. New control screens will be required.

Exit signs and direction of egress signs will be installed along all site lines. These will all utilize energy efficient LEDs and integral battery packs (as per the Bahamian Building Code). It is recommended that addressable battery packs be considered to simplify maintenance in this distributed configuration.

The remainder of the emergency lighting will consist of general lighting fixtures connected to the emergency power system.

4.0 BASELINE CONDITIONS (EXISTING)

This section describes existing baseline conditions for LPIA. Baseline conditions are described for the following:

- Land Use
- Meteorology and Climate
- Geologic Setting
- Air Quality
- Surface and Groundwater
- Contaminated Soils and Groundwater
- Resource Consumption
- Solid and Hazardous Wastes
- Sewage Effluent
- Habitat, Flora and Fauna
- Noise
- Traffic
- Cultural Heritage and Archeology
- Employment
- Local Economy

4.1 Land Use

The existing airport covers an area of approximately 1,237.5 acres (Roland John Survey – October 2000). It is located on the west side of New Providence Island in The Bahamas, at a location approximately 15 miles to the west of the City of Nassau.

The airport has two asphalt runways (one is 8,235 ft and the other is 11,000 ft). There are ten taxiways at LPIA. Former Runway 5-23 is now used as a taxiway. Taxiway Hotel runs parallel to and serves the full length of Runway 14-32. Runway 14-32 is currently the only runway equipped with a parallel taxiway. The remaining taxiways are either runway exits or connectors. The airport has five main apron areas: the US Pre-Clearance Terminal Apron, the International Terminal Apron, the Domestic Terminal Apron, the General Aviation Apron, and the MillionAir Apron.

LPIA currently has three primary terminal buildings that are used for the processing of commercial passengers. They are Terminal 1, Terminal 2 (US Terminal) and the Arrivals Hall:

- Terminal 1: At the south end of the terminal area, Terminal 1 handles departing and arriving domestic passengers as well as non-US international departures. This Terminal houses the domestic operations of Bahamasair, the National Airline, about ten other small domestic charter airlines as well as international flights departing to all areas of the world including Europe, Canada, Caribbean and Latin America. It is used by airlines such as Air Canada, British Airways and numerous charter airlines. It is also used to service non-pre-cleared flights into the U.S.

- Terminal 2 (US Terminal): At the north end of the terminal area, the U.S. Pre-Clearance Terminal processes departing passengers to the United States. This facilityhouses U.S.

Customs and Border Protection who areunder the control of Homeland Security Department. Once a flight is cleared here in The Bahamas, it operates like a domestic U.S. flight. The terminal houses U.S. Customs, Immigration, Agriculture and airline offices.

- Arrivals Hall: Between Terminal 1 and Terminal 2 lies the Arrivals Hall. The Arrivals Hall handles all international passenger processing regardless of origin and includes The Bahamas Immigration and Customs Processing.

Car rental facilities are located adjacent and northeast of the terminals. The airport maintenance building, hangars, and fixed base operators are located east and southeast of the terminals. The fuel tank farm is located to the north of the terminal area.

Surrounding land uses are as follows:

- North: a reverse osmosis water treatment plant, JFK Drive, wetlands and residential housing
- East: Lake Killarney, a large shallow lake, which receives some surface drainage from the airport.
- West: a commercial greenhouse and Caribbean pine forest.
- South: Coal Harbour Road and Caribbean pine forest. Also located south of the terminal area are two fixed base operations and a small General Aviation terminal.

The Water and Sewerage Corporation withdraws surface water at many locations on and surrounding the airport.

4.2 Meteorology / Climate

The Bahamas has a tropical maritime climate with two seasons. Summer is May through September and winter is October through April. Relative humidity averages 65% yearly. The rainy season lasts from May through October and hurricane season is from June through November. **Tables 4-6** present monthly mean values from temperature, precipitation and wind speed, respectively.

Table 4. Temperature Degrees Celsius

	J	F	M	A	M	J	J	A	S	O	N	D
Min	77.0	77.0	80.6	82.4	84.2	87.8	89.6	89.6	87.8	86.0	82.4	78.8
Max	62.6	62.6	64.4	66.2		73.4	75.2	75.2	75.2	71.6	68.0	64.4

Mean value for each month. Sampling period 1961-1990 (Weather Network)

Table 5. Precipitation Inches

J	F	M	A	M	J	J	A	S	O	N	D
1.85	1.57	1.57	2.13	4.57	9.17	6.22	8.50	6.73	6.93	2.24	2.05

Mean value for each month. Sampling period 1961-1990 (Weather Network)

Table 6. Wind Speed – Miles/Hour

J	F	M	A	M	J	J	A	S	O	N	D
18.0	19.3	19.9	18.6	17.4	16.2	16.2	15.5	13.7	16.8	18.0	17.4

Mean value for each month. Sampling period 1961-1990 (Weather Network)

The Department of Meteorology website, www.bahamasweather.org.bs, describes winds as predominantly easterly with a tendency to become north-easterly from October to April and south-easterly from May to September.

4.3 Geologic Setting

The topography at the airport and its immediate vicinity is generally flat with elevations of an average 16 feet above mean sea level. The Bahamas is an extensive archipelago of carbonate islands and shallow banks. According to soils information provided by the Department of Agriculture, Bahamian soils are classified into three basic physical classes, sand, silt, and clay, graded by the size of the soil particle size in decreasing order. All soils, except organic soils that are derived from peat, are one of these classes or some combination. The typical nature of soils occurring in The Bahamas is that of an alkaline reaction dominated by the bedrock or parent material, which is limestone. The pH is often 7.9 to 8.4, except for organic soils occurring in marshes. In the vicinity of the airport, soils and substrate generally consist of limestone bedrock and sandy loams of the pine forest and marls or limestone mineral clays of the wetlands areas.

4.4 Air Quality

There is no specific air quality data available for the airport. Air quality is expected to be good on New Providence as a result of the flat terrain and wind conditions. NAD is committed to modeling air quality when it prepares its Airport Master Plan. See Section 7.2.2 for more information.

The following is some information on the key priority air contaminants.

Ozone (O_3) is associated with smog and is formed in the atmosphere as a result of ozone precursors (volatile organic compounds (VOCs) and oxides of nitrogen (NO_x)) reacting with sunlight.

Volatile Organic Compounds (VOCs) are an ozone precursor. They are created from burning fuels or other organic materials. Emissions sources at airports include aircraft, ground support equipment and vehicles. VOCs emissions are at their highest during low power such as aircraft or vehicle idling. Other sources include fuel storage, aerosols, dry cleaning, paints and solvents.

Oxides of Nitrogen are an ozone precursor. Two types of nitrogen oxides are emitted into the atmosphere are significant quantizes: nitric oxide (NO) and nitrogen dioxide (NO_2). High temperature combustion processes produce NO and NO_2 is produced as a result of NO reacting with atmospheric oxygen. Airport sources include aircraft and ground surface equipment, boilers and generators.

Carbon Monoxide (CO)is formed by incomplete combustion of organic materials (e.g., gasoline, coal, wood). Airport sources include aircraft, ground service equipment, vehicles, boilers and generators. Carbon monoxide is produced the highest during aircraft and vehicle idling.

Particulate (PM-10) matter forms generally from incomplete combustion at somewhat higher rates at low power settings (idling). Most particulate matter is not inhaled because it is too large. Fine particles less than 10 micrometers in diameter (PM-10) are inhaled into the lungs.

Sulfur Dioxide (SO_2) is produced from the burning of sulfur containing fuels such as coal and oil. Emissions depend on the sulfur content of the fuel. Very little is emitted form aircraft operation. For airports, specifying low sulfur containing fuels can easily control this.

4.5 Surface and Groundwater

Surface water run-off from the airport drains to surrounding wetlands and Lake Killarney. Lake Killarney is a large shallow brackish water lake adjacent to the airport. The lake is frequented by waterfowl.

Existing apron drainage enters a series of open swales that allow infiltration with excess water draining to Lake Killarney. Landside (parking lots) drain to open swales that have no outlets and deep wells.

The Water and Sewerage Corporation operates the Windsor Well Fields (a potable water source) located near the airport. Only older 1960 vintage drawings exist for the well fields. Much of the original well fields are reported no longer in service. NAD is working with the Water and Sewerage Corporation to produce an up-to-date map of the active well field.

The Water and Sewerage Corporation has confirmed that the area of active water collection on airport lands is in the center of the airport surrounding the Control Tower. The area north of the cargo facility is not in use with no short or medium-term plans to reactivate. All construction work for the Project must be a minimum of 150 feet away from the active water collection areas. The closest water collection area to the construction is over 800 feet in distance.

A seawater reverse osmosis plant, operated by the Waterfields Company Limited (a consortium consisting of Bacardi Company Limited and a reverse Osmosis Engineering Group from Bermuda) began operation in February 1998. Approximately 2,400,000 US gallons is purchased everyday from the Waterfields Company and mixed with approximately 1,000,000 US gallons pumped from the Windsor Well Fields to reduce the salinity of the Windsor Well Field Water. The blended water is chlorinated. The distribution area for this water includes: Love Beach, Gambier, Deltaport, Cable Beach Strip, and Prospect Station. From Prospect Station, the water is further distributed to: Stapleson Gardens, Oaks Field Bain Town, Nassau Street, Centreville, Palmdale, Pyforms Addition, St. James Road, and other areas including Paradise Island.

In addition to Windsor Well Fields, the Water and Sewerage Corporation owns and operates other well fields on New Providence:

- Old Southwest
- Southwest One
- Southwest Two
- Perpalls
- Prospect
- Bluehills

Approximately 4.3 million gallons a day is shipped from Andros Island to Arawak Cay for distribution on New Providence.

Three-dimensional lens-shaped bodies of freshwater overlie deeper brackish and saline waters due to a difference in densities (**Figure 4**). Ninety percent of the fresh water is reported to be within five feet of the surface. All fresh groundwater comes from rainfall. The salinity is reported to be rising in freshwater due to over extraction.

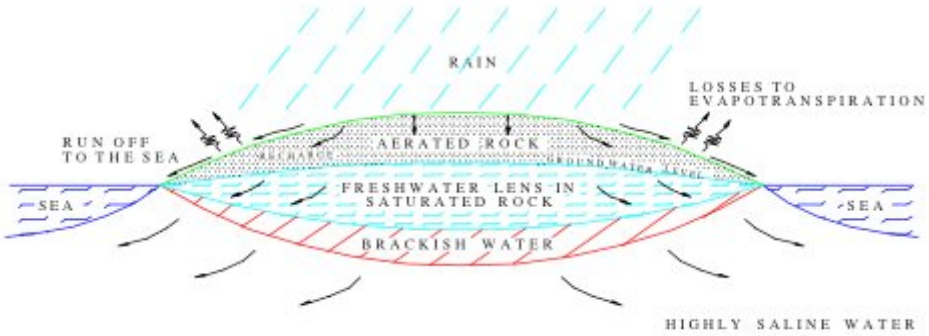


Figure 4. Diagram of Freshwater Lens in an Oceanic Island[1]

4.6 Contaminated Soils and Groundwater

Delta Environmental Consultants, Inc. and Islands by Design Ltd. Prepared a report dated June 15, 2007 titled *Environmental and Social Baseline Survey for the LPIA* (Baseline Report). Delta Environmental conducted a Phase II environmental assessment to address recognized environmental conditions identified in the Environmental and Social Baseline Survey that may impact the Expansion Project. Their report titled "Phase II Investigation Report" dated October 12, 2007.

4.6.1Baseline Report

NAD's objectives for this environmental baseline survey were to record the present environmental condition of the airport lands and facilities and assess the level of

[1] Drawing from the Water and Sewer Corporation Web Site.

compliance with applicable environmental, health and safety requirements. The assessment also includes an evaluation of the facilities' compliance with social matters relevant to The Bahamas.

The ASTM E 1527-05 standard defines the term *recognized environmental condition* as "the presence or likely presence of any *hazardous substances* or *petroleum products* on a *property* under conditions that indicate an existing release, a past release, or a *material threat* of a release of any *hazardous substances* or *petroleum products* into structures on the *property* or into the ground, ground water, or surface water of the *property."* This assessment has identified the following recognized environmental conditions in connection with the airport and tenant operations:

- Fuel hydrant system and pipeline
- Fuel Consortium and pipeline
- Former tank farm
- Used oil storage
- Above ground storage tanks
- Underground storage tanks
- Sanitary wastewater discharge
- Surface water discharge
- Historic site use
- Hazardous Building Materials

The following tenants and airport activities are located within the Expansion Project area:

- Terminals
- Airfield Lighting
- Former construction staging areas
- Airport Authority/NAD fuelling tanks
- Fuel hydrant system
- Former tank farm located in area of US Terminal
- Macerator
- Car rental companies (Avis, Dollar and National)

4.6.1.1 Terminals

No areas with significant staining or leaks of hazardous materials or petroleum products were identified during the walkthrough of the terminals.

According to hearsay, the US Terminal was constructed over a former fuel farm. Further review of drawings and historical aerial photos locate the former tank farms just outside the northeast corner of the terminal (see Section 4.6.2 for Phase II investigation results). Additionally, the use of groundwater for a non-potable water supply for the US Terminal was reportedly discontinued due to petroleum odors in the water.

There are generator/electrical rooms on the northeast side of the domestic terminal. One generator was observed with an attached day tank. Two other ASTs were located within concrete containment in the generator room and were approximately 500 and 2,500 gallons in size. The ASTs were reportedly installed during initial

construction in approximately 1957. No spills or leaks were observed within the concrete containment areas.

4.6.1.2 Field Lighting System

This system consists of small buildings and equipment located throughout the taxiways and runways. Some of the systems have associated generators and fueling tanks.

4.6.1.3 Former Construction Staging Areas

Five areas across the airport were used for construction staging during the airside improvement project. Lagan International was the contractor. Lagan's website indicates the contract period was May 2004 to April 2005. The project involved new construction and rehabilitation of runways, taxiways and aprons including runway/taxiway lighting, signing and pavement markings and drainage. Staging areas 1, 4 and 5 did not have any hazardous material concerns identified.

Staging Area 2

Stating Area 2 is now the overflow parking lot, northeast of Dollar Rent-a-Car and the paved pay parking area.

The area was an unpaved gravel surface. There was a concrete pad and cradle that previously held an AST of unknown size and contents. There were additional concrete pads in this area that airport personnel reported had been the location of an asphalt plant used during the construction operations. There was no surface staining observed in this area during the site reconnaissance.

Staging Area 3

Staging Area 3 is located northeast of Staging Area 2 and the Airport Authority / NAD Fueling area.

This area is reported to be the original location of the maintenance garage for the Airport Authority. The exact location of the garage was not known, there were several concrete pads in this area. This site was used by Lagan for equipment storage and trailer-type offices; there were also likely asphalt plant operations in this area.

At the far northwest corner of the lot was some type of below grade petroleum product storage or processing equipment, likely associated with the asphalt plant. There was product in the bottom of the structure and it appeared to be black and oily. The structure appeared to have inlet/outlet plumbing access points that were currently disconnected.

The remainder of the lot was an unpaved gravel surface with scattered concrete pads. Minimal staining was observed of the ground surface in this area.

4.6.1.4 Airport Authority/NAD Fueling Area

The airport operations maintain one fueling area for all Airport Authority and NAD vehicles and equipment. This area has been used as a fueling area for the Airport

Authority (emergency response vehicles/security vehicles) likely since at least the late 1960s. The system was used for refueling all Airport Authority/NAD vehicles including the crash, fire and rescue and security vehicles. It is located east of fuelling companies and north-northeast of Dollar

There was a small building on site with a generator and diesel AST that was not accessible (locked fence) at the time of the site walkover. There were two fuel pump dispensers and two USTs at the site, containing gasoline and diesel fuel. The area was fenced and locked. There was staining on the unpaved ground surface surrounding the fuel pump dispensers.

4.6.1.5 Dollar Rent-a-Car

Dollar is located landside, north-northeast of terminal, north of Avis and National. The facility had been present for about 30 years, since approximately 1975. It operated as National, then Hertz, then Dollar. It is now Dollar/Thrifty.

The facility had about 100 cars and did vehicle maintenance on site. There was a paint booth present on site, which was reported to be no longer in use. Welding was also formerly conducted on site and the facility maintained a compressor. Used oil was stored in five 55-gallon drums in the southeast corner of the property; there was minor staining on ground in the area. There were two underground hydraulic lifts in the maintenance area of the building. Car washing was conducted on site and runoff was overland. Also numerous (>30) cars were observed on site with varying degrees of damage due to driving accidents. The cars were kept on site for parts and will eventually be sold for scrap. There was a pond along the southeastern property boundary.

No ASTs were observed. One 6,000-gallon gasoline UST on site with associated fuel pump dispenser. The UST was approximately 20 years old (1985) and had been out of service for four years due to an ownership change. The UST was reportedly empty.

4.6.1.6 National Alamo

National Alamo is located adjacent to Dollar to the south. The facility is of unknown age, maintains about 75 cars, minor maintenance and car washing conducted on site, only one small building present.

Three 55-gallon used oil drums were present on the ground surface along the fence with Dollar, with visible staining on the ground. Car wash water discharged directly to the ground surface. There was a pond located along the southeast side of this facility, which extended past the Dollar and Avis properties as well.

No ASTs observed. One gasoline UST, approximately 8,000-gallon capacity, age unknown, no leak detection or monitoring

4.6.1.7 Avis Car Rentals

Avis is located northeast of the US Terminal. The building had been present as a car rental facility for at least 40 years (since 1965). Initial operations included heavy maintenance and auto body repair including a paint booth. Currently the facility only conducted minor maintenance, including oil changing. The paint booth no longer

operated although touch ups are conducted with small quantities of aerosol paints. Vehicles were washed on site and wastewater discharged to the ground surface.

Due to poor on site drainage three dry wells had been constructed on site to deal with storm water runoff. Two of the dry wells were in the car parking and maintenance areas; one was in the front of the building. There was a pond on the eastern property boundary. Three 55-gallon used oil drums were observed inside the building on the concrete floor, with minor staining on the pavement. The maintenance garage had storage of small quantity containers of paints and thinners (approximately 20 to 50 containers).

One 2,000-gallon gasoline AST with above grade piping to a fuel dispensing pump; the ground below the piping was recently covered with clean sand and could not be observed. Clean sand was typically used as an absorbent, indicating there were likely surface spills of gasoline in this area.

4.6.2 Phase II Environmental Assessment

Delta Environmental conducted a Phase II environmental assessment to address recognized environmental conditions identified in the Environmental and Social Baseline Survey that may impact the Expansion Project. Their report titled “Phase II Investigation Report” dated October 12, 2007 is provided in **Appendix D**The proposed construction at the airport generally includes the areas of the US and International Terminals and areas to the north and west. The following areas had a highpotential to impact the proposed construction and improvement projects:

- Fuel hydrant system
- Former tank farm located in area of US Terminal
- Macerator

Delta performed the following scope of work at the subject property:

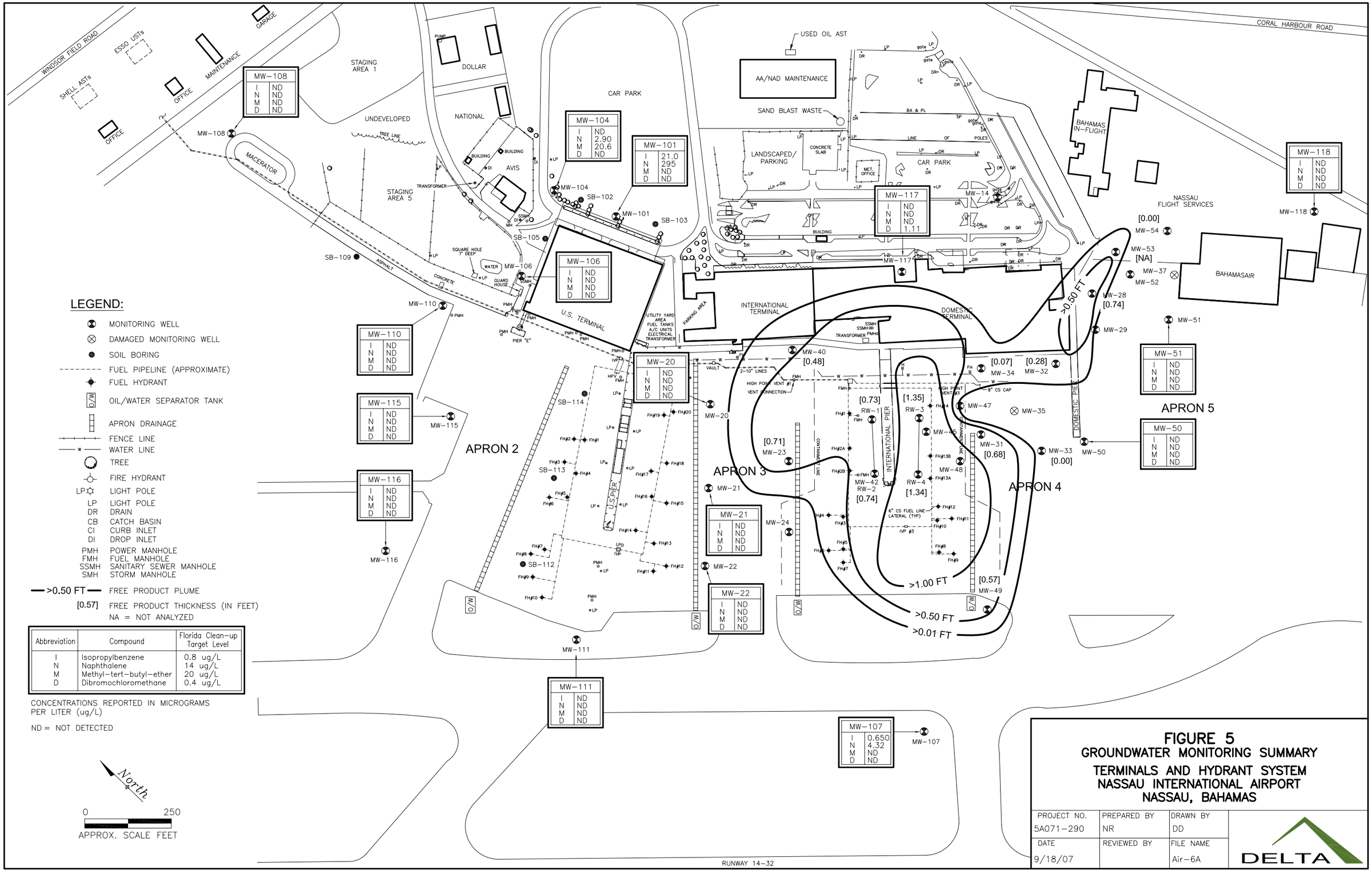
- Eighteen soil borings were advanced at the subject site between July 31, 2007, and August 7, 2007.
- Soil samples were collected from several borings and analyzed for volatile organic compounds(VOCs) and total petroleum hydrocarbons (TPH).
- Eleven of the soil borings were converted into monitoring wells, and were gauged and sampled for VOCs and TPH on August 8 and 9, 2007.
- Select Chevron monitoring wells were also gauged and sampled for VOCs and TPH on August 8 and 9, 2007.

For a map of the soil borings and monitoring wells, as well as the select fuel company wells included in this investigation, please refer to **Figure 5**. It should be noted that the soil samples submitted for analysis of TPH were not analyzed due to laboratory error; consequently these results are not available. Additionally, groundwater samples submitted for laboratory analysis of TPH on August 8, 2007, were not analyzed due to laboratory error and are also not available.

Based on the results of this investigation, the following conclusions can be drawn:

- Soil and groundwater impacts near the fuel hydrant system are defined and primarily limited to free phase hydrocarbons in the vicinity of the International Pier.
- Soil and groundwater impacts in the vicinity of the former tank farm appear to be limited to the area around MW-101. However, these impacts may extend to the south under the US Terminal.
- No soil or groundwater impacts were detected near the fuel pipeline that connects the fuel consortium to the fuel hydrant system.
- No soil or groundwater impacts were detected near the Macerator.
- Overall, groundwater impacts are defined and are primarily limited to free phase fuel hydrocarbons near the International pier with relatively minor dissolved phase impacts surrounding the free phase hydrocarbons and near the former tank farm.
- Based on the extent of groundwater impacts identified, the impacts are unlikely to affect either the deep-water wells at the reverse osmosis plant, the wells in the Windsor Well Field, or the conduit system in place around the runways.
- The existing monitoring well network is adequate to monitor the existing groundwater impacts and to ensure that contaminants do not migrate to the existing water supply wells or to discharge to the surface water collection system.

Delta is under contract with NAD to conduct four rounds of quarterly sampling, which are scheduled to be completed in October 2008. A report will be prepared following the final round of sampling that will review the effectiveness of the monitoring network to protect the Windsor Well Fields. This report will be provided to the BEST Commission upon completion.



LEGEND:

- MONITORING WELL
- DAMAGED MONITORING WELL
- SOIL BORING
- FUEL PIPELINE (APPROXIMATE)
- FUEL HYDRANT
- O/W — OIL/WATER SEPARATOR TANK
- APRON DRAINAGE
- FENCE LINE
- w — WATER LINE
- TREE
- FIRE HYDRANT
- LP — LIGHT POLE
- DR — DRAIN
- CB — CATCH BASIN
- CI — CURB INLET
- DI — DROP INLET
- PMH — POWER MANHOLE
- FMH — FUEL MANHOLE
- SSMH — SANITARY SEWER MANHOLE
- SMH — STORM MANHOLE
- >0.50 FT — FREE PRODUCT PLUME
- [0.57] — FREE PRODUCT THICKNESS (IN FEET)
- NA = NOT ANALYZED

Abbreviation	Compound	Florida Clean-up Target Level
I	Isopropylbenzene	0.8 ug/L
N	Naphthalene	14 ug/L
M	Methyl-tert-butyl-ether	20 ug/L
D	Dibromochloromethane	0.4 ug/L

CONCENTRATIONS REPORTED IN MICROGRAMS PER LITER (ug/L)

ND = NOT DETECTED

North

0 250

APPROX. SCALE FEET

FIGURE 5
GROUNDWATER MONITORING SUMMARY
TERMINALS AND HYDRANT SYSTEM
NASSAU INTERNATIONAL AIRPORT
NASSAU, BAHAMAS

PROJECT NO.	PREPARED BY	DRAWN BY
5A071-290	NR	DD
DATE	REVIEWED BY	FILE NAME
9/18/07		Air-6A

DELTA

4.7 Resource Consumption

Current water consumption within the terminals is estimated at 41,780 gallons per day. Table 7 provides billing information for the period of August 23, 2007 through March 28, 2008.

Table 7. Water Consumption LPIA Terminal Buildings

Service Period	Number of Days	Usage (Gallons)
8/24/07 – 9/28/07	35	1,248,100
9/28/07 – 10/24/07	26	1,278,700
10/24/07 – 11/29/07	36	988,600
11/29/07 – 12/28/07	29	1,360,100
12/28/07 – 1/22/08	25	1,479,200
1/22/08 – 2/27/08	36	1,323,400
2/27/08 – 3/28/08	30	1,388,000
Totals	**217**	**9,066,100**

4.7.1 Electrical Consumption

At present, NAD is responsible for the electrical consumption as reflected on three Bahamas Electric Corporation (BEC) utility meters. The meter numbers and locations are reflected below:

1. Meter #TB66 – International Airport Car Pak Sub-station
2. Meter #TK409 – Fire Station & Airfield Lighting Building
3. Meter #TD199 – Maintenance Compound

Table 8 shows the average daily electrical consumption for the period from September 2007 to August 2008.

Table 8. Yearly Average Billing from September 2007 to August 2008

Billing Period	Meter TB66 Daily Avg.KWH	Meter TK409 Daily Avg.KWH	Meter TD199 Daily Avg.KWH
September	36,919.52	1,142.86	737.14
October	33,126.41	1,425.00	710.00
November	33,564.08	1,400.00	650.67
December	27,563.17	1,422.22	628.15
January	26,471.51	1,440.00	562.29
February	26,277.75	1,306.67	581.46
March	35,308.59	1,525.93	560.00
April	29,555.52	1,400.00	583.53
May	31,533.30	1,440.00	640.00
June	35,010.71	1,448.28	695.17
July	34,666.64	1,548.39	717.42
August	36,373.28	1,354.84	720.00
Total	**386,370.48**	**16,854.19**	**7785.83**

4.8 Solid Waste

Bahamas Waste Limited provided a summary in **Table 9** of the solid waste disposed of from all of the facilities operated by NAD.

Table 9. Solid Waste Disposed of in the Landfill for 12 Months

Month / Year	Tons of Solid Waste
June 2006	74.4
July 2006	72.4
August 2006	95.57
September 2006	72.47
October 2006	92.22
November 2006	73.33
December 2006	62.93
January 2007	78.49
February 2007	67.85
March 2007	74.43
April 2007	79.50
May 2007	82.82
June 2007	82.99
12 Month Total	**1009.4**

The types of waste associated with airport terminal operations include:

- Domestic solid waste
- International waste (food waste off aircraft arriving from international origins)
- Glass, metal and plastic containers
- Compostable foods
- Cooking oil and grease
- Paper and cardboard
- Scrap metal
- Paint cans and empty chemical containers
- Wood pallets
- Liquid waste such as waste oil

4.9 Hazardous Materials and Waste

The types of hazardous materials used on the airport include:

- Aviation Fuel (Jet A and aviation gasoline)
- Motor Fuel (gasoline and diesel)
- Propane
- Oil (motor and hydraulic)
- Solvents
- Paints

Aviation fuel is stored in two areas on the airport: the fuel consortium (Chevron/Texaco, ESSO, and Shell), and at MillianAir. There are approximately 1,090,000 US gallons of Jet A in storage at the airport. A pressurized pipeline services aircraft gates around the US and international piers. A hydrant cart is used to transfer fuel from the hydrant to the aircraft. Most US air carriers "tanker" fuel, which means they already have sufficient quantities of fuel on the aircraft to make the return trip. This is reported to occur due to the cost of fuel in The Bahamas.

Table 10 lists information on above and belowground storage tanks at the airport. This table is a work in progress.

Table 10. UST/AST Inventory

Location / Owner	Contents	AST/UST	Size (Gallons)
Airfield Lighting Generator	Diesel	AST	500
Radar Generator	Diesel	AST	1000
Airport Authority Fuelling Station Generator	Diesel	AST	Run by BEC
Airport Authority Fuelling Station	Diesel	UST	2000
Airport Authority Fuelling Station	Gasoline	UST	2000
Airport Authority / NAD Maintenance Centre	Used Oil	AST	1000
Terminal-1 Building Generator/ T-2	Diesel	AST	1,500 1,500
Staging Area 3 (Proposed new parking lot)	Unknown	UST	Unknown
Abandoned Gas Station	Gasoline	UST	4000-8000
Abandoned Gas Station	Diesel	UST	4000-8000
Tenants			
Fuelling Consortium	Jet Fuel	AST	1,000,000
Fuelling Consortium	Gasoline	AST	5,000
Fuelling Consortium	Gasoline	UST	1,000.000
Fuelling Consortium	Diesel	AST	2,000
Control Tower	Diesel	AST	Unknown
Crash, Fire, Rescue Building	Used Oil	AST	55 gal /800
Hertz	Gasoline	AST	900
Avis	Gasoline	AST	2,000
Budget	Gasoline	UST	3,000
Dollar	Gasoline	UST	6,000
National	Gasoline	UST	8,000
Bahamasair	Used Oil	AST	
Executive Flight Support	Diesel	AST	
Executive Flight Support	Methanol	AST	
Executive Flight Support	Used Oil	AST	
Million Air	Diesel	AST	1,000
Million Air	Jet A1	AST	90,000
Million Air	Avgas	AST	25,000
Million Air	Gasoline	AST	
Million Air	Diesel	AST	
Million Air	Slop	AST	300
Nassau Flight Services	Used Oil	AST	2,000
Nassau Flight Services	Diesel	AST	2,000
Nassau Flight Services	Gasoline	AST	2,000
Bahamas In-Flight	Diesel	AST	500

NAD is collecting background information on hazardous material use and waste generation of its tenants. In general, hazardous material use and waste disposal are handled poorly. This is compounded by the lack of facilities to take waste.

A hazardous building material assessment was undertaken in the terminal buildings by Parks Environmental in August 2007. The report, "Hazardous Materials Survey Report, Lynden Pindling International Airport, Nassau, The Bahamas" is provided in **Appendix E**.

Parks conducted the asbestos and hazardous/special waste materials inspection, audit and sampling at the site July 30 to August 3, 2007. Accessible interior and exterior building materials and roofing materials were surveyed in the US Terminal, Arrival Haul and the western end of the International Terminal.

The following is a summary of the findings from the report:

> **Asbestos:** The Roof Caulk/Sealant found on the metal roof panel seams of the International Terminal is a non-friable ACM.
>
> **Lead Paint:** Given the age of the buildings (1985 or newer) interior paints are probably not lead containing. The sampling data indicates only the exterior canopy paint on the International Terminal may have elevated lead levels.
>
> **Special Waste Materials:**Parks identified special waste materials such as Rooftop Heating, Ventilation and Air Conditioning (HVAC) units,Fluorescent Light Bulbs, hydraulic door closers, and small electronic devicessuch as smoke and motion detectors and small communication devices.

4.10 Sewage Effluent

Sewage effluents generated in the existing terminals are directed via pump stations to the sewage treatment plant (built in 1989/90) owned by the Airport Authority and operated by the Water and Sewage Corporation located on the airport.Aircraft lavatory waste, at an estimated volume of 600 gallons per day, is disposed of in at a dump station where the waste is ground in a macerator and pumped to the sewage treatment plant. Treated water from the plant is discharged into deep disposal wells.

Stantec has estimated current sewage flows for the terminal buildings at 43,710 gallons per day. This data was estimated using the following 2008 data:

- 15,000 passengers (arriving and departing)
- 1,180 employees (two shifts of 590 employees)
- 300 meet and greet people
- 1 lavatory use = 2.5 gpm X 0.25 minutes per use
- 1 water closet use = 1.6 gallons per flush
- 1 urinal use = 1.0 gallons per flush

The Airport Wastewater Treatment Plant is located on airport property near the entrance to the airport. It serves the airport and residents in The Bahamas West subdivision.
The treatment plant was commissioned in 1993/94. It is a package plant with extended aeration and has three circular tank systems. The on site facilities include an aeration basin, clarifier,

disinfection tank, and a sludge holding tank. Sludge is periodically pumped out and disposed of at the Harold Road Sludge and Septic Facility. Effluent is disposed of in an approximately 250 foot deep well. The capacity is reported to be 75,000 imperial gallons per day and current flows range from 35,000 to 50,000 imperial gallons per day.

Three subdivisions under construction have been approved by the Water and Sewerage Corporation to use the treatment plant.

The car rental companies located within the Expansion Project area (Avis, National and Dollar) dispose of sewage to cesspits or septic tanks located within the lease areas.

4.11 Habitat, Flora and Fauna

Island By Design conducted an assessment of the immediate surroundings of LPIA to map the vegetation types, determine floristic diversity and identify the presence of protected and invasive species.Field visits were conducted on July 17, 18 and 20, 2007. The report titled "Supplemental Flora and Fauna Assessment" dated August 2007 is provided in **Appendix F**.

Aerial photographs and ground truthing was used to map the vegetation types.
Four (4) main vegetation categories were observed on site – Pine Woodland, Pine Shrubland, Wetlands and Disturbed Areas.

Three species listed under the Conservation and Protection of the Physical Landscape Act, Protected Tree Order, 1997 were observed:

- *Pinus caribaea var bahamensis*
- *Guapira discolor*
- *Swietenia mahagoni*

A more detailed survey was conducted within the construction site. The survey area was divided into three zones.

Zone 1, an area of approximately 2010 m^2, is a Pine Forest located north and north west of the existing car rental area north of Terminal 2. The area is relatively healthy with a dense pine needle ground cover. *Casuarina equisetifolia* is located on the fringes of the forest. Common understory species include: *Acacia choriophylla, Byrsonima lucida, Caesalpinia vesicaria, Coccothrinax argentata,* and *Metopium toxifera*.

Zone 2, an area of approximately 3000 m^2, a Pine Woodland interspersed with disturbed area (altered habitat either by humans or naturally [e.g., fire]) located north east of the existing car rental area. This area is dominated with *Casuarina equisetifolia* on the fringes.

Zone 3, an area of approximately 3060 m^2, is a disturbed area located north east of the existing car rental area. The common species in this heavily disturbed area include: *Casuarina equisetifolia, Delonix regia, Terminalia catappa, Aklbizia lebbeck, Sansevieria hyacinthoides* and *Jasminium fluminense*. Within this zone only one *Pinus caribea var bahamensis* was observed.

The areas of potential impact were surveyed using the quadrant survey method asopposed to the total inventory method. The results of that survey are provided in **Table 11**.

Table 11. Estimated Number of Protected Trees

Observed Listed Species	Zone 1	Zone 2	Zone 3	Extrapolated Number
Caesalpinia vesicaria	3	7	0	1083
Guapira discolor	0	0	2	245
Pinus caribea	17	21	0	4651

The quadrant sampling areas were 5m² in extent with 5 sampling areas per zonegiving a total of 25m² per zone, by extrapolation to each zone footprint an estimated total number of species was arrived at.

The majority of the pine woodland within and surrounding the airport is very healthy. The pine woodlands surveyed in the report were all secondary growth with pines reaching up to 25-30 ft. Some areas showed evidence of recent fire with pine seedlings, while other areas had a mixture of mature, juvenile and seedling pines. The presence of pine seedlings in recently burned areas is a good sign that the system regenerates normally.

The pine shrubland areas are relatively healthy in that there are very few pines present. The possibility exists that the pines will regenerate following a fire or in the absence of fire areas, will progress into a broadleaf habitat.

When comparing the health of the mangroves within the airport boundaries to those outside, it is likely that the mangroves inside airport boundaries are less healthy due to habitat fragmentation created with the construction of the Coral Harbour road. No culverts were observed connecting the two systems.

A survey of avifauna was conducted to assess the risk of avifauna/aircraft interaction. The information was used to develop the wildlife management plan for LPIA. A list of the avifauna observed is provided in Appendix F. No endangered or threatened species were observed. The annual Christmas Bird Count and other sources were researched by the biologist undertaking the survey. All avifauna within The Bahamas are protected by the Wild Birds Protection Act. However, some species are afforded a greater level of protection from other legislation or international treaties. Some of these higher protected species are known to use adjacent habitats, but they are outside the construction area.

4.12 Noise

Aircraft take-off and landings account for largest source of noise from operating the airport. Little to no jet aircraft maintenance occurs on the airport, therefore there are no jet aircraft engine run ups occurring. At present, there are no zoning restrictions on New Providence Island that prevent residential development in areas impacted by the arriving and departing flights at LPIA. Work is underway to develop a land planning strategy for New Providence Island.

NAD reports that no noise complaints have been received since it took over airport operations in April 2007.

NAD is committed to modelling noise from airport operations during the preparation of the Airport Master Plan. See Section 7.2.2 for more information.

4.13 Traffic

A low, medium and high passenger forecast was prepared by InterVISTAS in 2007. The terminal planning was based on the medium case, presented in **Table 12**.

Table 12. Medium Passenger Forecast

	2005	2010	2015	2020
Domestic	515,000	583,000	650,000	711,000
International and US - Commercial	2,668,061	3,152,000	3,838,000	4,484,000
International and US – Private/Other	76,200	78,600	82,000	80,000
Totals	**3,248,261**	**3,843,600**	**4,570,000**	**5,284,000**

Vehicle traffic will be evaluated during the preparation of the Airport Master Plan. See Section 7.2.2 for more information.

4.14 Cultural Heritage and Archaeology

The Bahamas's cultural heritage and archaeology is important. The Lucayan Indians have reportedly occupied several islands from as early as 700 A.D. The current airport came about when the United States entered the Second World War in 1941. Because of The Bahamas strategic position, New Providence Island was chosen for a joint training base and to support the Royal Air Force Transport Command. Construction of Windsor Field began in May 1942 by the American company Pleasantville Inc. under the supervision of the U.S. Corps of Engineers. Windsor Field was abandoned after the war in 1946. It was reopened in 1957 as Nassau International Airport.

Windsor Field played an important role in the development of The Bahamas. Buildings contain corner stones and plaques that commemorate the buildings. The face rock on the exterior of the domestic terminal is a culturally important architecture feature.

4.15 Employment

Approximately 5,000 workers are employed at the airport at the various businesses and government agencies that operate at the airport.

4.16 Local Economy

Through the policy goals originally set in the Airport Authority Act 2000, and through the subsequent airport management and development agreements that have been entered into, the Government of The Bahamas has recognized the importance of LPIA as a vital piece of the country's economic infrastructure and the imperative of upgrading the airport in order to meet national objectives. That imperative is based on the following considerations:

- About 50% of the Gross Domestic Product (GDP) of The Bahamas stems directly from tourism, and another 10% of the GDP is driven by tourism-related construction.
- Job creation for Bahamians and government revenues from tourism are crucially dependent on delivering new, quality resort destination projects.
- Accessibility is one of the four key factors being used by the Ministry of Tourism to promote The Bahamas as a premier destination. LPIA is the arrival and departure point for nearly 98% of all stopover visitors to New Providence Island, which is significantly higher than the 88% of stopover visitors to The Bahamas as a whole who arrive by air. Cruise ship passengers generally do not qualify as stopover visitors, unless they stay 24 hours or more and do not use the ship as accommodation. Therefore, ensuring a welcoming, quality airport experience is vital to delivering on the tourism promotion strategy as it affects New Providence Island.
- In a 2005 survey carried out by the Ministry of Tourism, a very high number (42%) of the passengers had one or more complaints about the airport. Dissatisfaction t these levels very likely indicates travel decisions are now being negatively affected, especially among potential return visitors whose last impression of The Bahamas is created at their departure through the airport.
- 2700 hotel rooms are anticipated to be added to the available room inventory by 2010. The $1 billion Atlantis Phase II development was recently competed, including a new 600-room hotel, and several other high-profile tourism projects are in progress such as the reconstruction of the South Ocean Golf & Beach Resort. In addition, the $1.6 billion Baha Mar Project is in the planning stage, which includes a 1,000-room Caesars Resort Hotel and a 95,000 –square foot casino that will be the largest in the Caribbean.
- The proposed Albany House resort development, backed by Tiger Woods and Ernie Els, and financed by the Tavistock Group, will include 500 homes, an 18hole championship golf course, a Club House, a marina and specialty shops, and a new beachfront hotel.

5.0 SCREENING AND SCOPING

Delta Environmental Consultants, Inc. and Islands by Design Ltd. prepared a report dated June 15, 2007 titled *Environmental and Social Baseline Survey for the LPIA* (Baseline Report). NAD's objectives for this environmental baseline survey were to record the present environmental condition of the airport lands and facilities and assess the level of compliance with applicable environmental, health and safety requirements. The assessment also includes an evaluation of the facilities' compliance with social matters relevant to The Bahamas.

The development is occurring within the boundaries of an existing operating airport. Many of the impacts identified can be addressed by improving existing management practices. The remaining impacts are expected to be mitigated through the development project.

NAD has developed an Airport Operations Environmental and Social Management Plan (ESMP) in conformance with ISO14001:04 - Environmental Management System. This ESMP meets the principles of the Plan, Do, Check and Act model. The ESMP is a "live" document that will be kept up to date.

The Contractor will be required to develop a Construction Program Environmental Management Plan that addresses the actual construction activities. When the construction program is completed, any ongoing management requirements will be addressed within NAD's ESMP and the Contractor's EMP will no longer be maintained.

The project was also reviewed against a list of environmental considerations to identify potential impacts. **Table 13** reviews the project against potential impacts in relation to airport operation, project design and construction and lists the site specific issues relevant to this project. **Table 13** serves as the issue / mitigation register.

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
Physical changes in the locality (topography, land use, changes in water bodies, etc) There are no specific issues for LPIA as the project is within the existing airport boundary.		The project will not change the topography or land use as it is within the existing airport boundary.	
The use of natural resources such as land, water, materials or energy, especially any resources which are non-renewable or in short supply Specific issues for LPIA include: • Use of potable water • Use of energy (fuel and electricity)	A **resource management program** will be developed and implemented to take advantage of any feasible opportunities to reduce consumption of electricity, fuels and potable water.	The project design will minimize natural resource consumption through the use of natural lighting, energy efficient equipment, low flow devices, and dual water systems. The design will utilize solar photovoltaics to provide electricity to power hot water heaters. The project design will consider highest and best use of existing facilities. The project design will minimize the creation of excess overburden. The impact of sourcing material will be considered (distance to travel etc). New generators will be certified to be capable of running on bio-diesel, if technically possible.	The contractor will take measures to minimize resource use.
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 Specific issues for LPIA include: • Use of hazardous materials, such as fuel, oils, paints, pesticides and solvents	Existing practices of handing harmful substances, such as waste oil, by tenants and airport maintenance are poor. A **hazardous materials management program** (to include pesticide use) will be developed and implemented consisting of proper use, collection and disposal programs, spill response plans, procedures, equipment and	Fuel storage systems (e.g., diesel tanks for emergency generators and hydrant systems) will be designed in accordance with best industry practices. All new fuel storage systems will have leak detection. A separate environment impact assessment will be completed by the Joint Operator for the expansion to the existing hydrant system.	Strict requirements will be placed on the contractor to handle and dispose of harmful substances. The contractor will have a spill response plan, spill kits and trained personnel. The contractor will be required to maintain records.

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
• No Asbestos containing building materials were found in existing buildings • Fuel storage tanks (diesel, gasoline, propane, jet A, and avgas) • Generation of hazardous wastes	training. Both of these programs will address health and safety issues, such as personal protective equipment (PPE).		
Production of solid wastes during construction, operation or decommissioning Specific issues for LPIA include: • Demolition of existing buildings during construction • Excess overburden from construction • Generation of domestic garbage • Generation of international waste from aircraft operation	A **solid waste management program** will be developed and implemented. Reduction of solid waste will be a key objective for the program. Finding a solution for the proper handling and disposal of international waste is the highest priority for the program.	The design will consider the handling of solid waste, separation of domestic and international aircraft waste and facilitate recycling.	The contractor will be required to minimize the production of solid waste, segregate wastes and maintain areas in a clean pest free state. Excess excavated overburden will be used on-airport lands. There will be considerable demolition waste that will need to be separated and reused to the extent possible to minimize the amount-requiring disposal.
Release pollutants or any hazardous, toxic or noxious substances to the air Specific issues for LPIA include: • Operation of vehicles • Taxi, idling and aircraft takeoff and landings • Use of ozone depleting substances • Operation of temporary concrete and asphalt batch plants • Generation of dust from construction activities • Installation and operation of emergency backup generators • Mould and mildew in cooling systems and in areas subject to	Fuel burning aircraft, generators and vehicles (on-airport and visiting) contribute to air emissions. An **air quality program** will be developed to understand airport emissions and to develop priorities to target improvement. This will include an inventory of equipment containing ozone depleting substances and implementing a plan to remove or replace. A **maintenance program** will be developed to regularly inspect and maintain cooling systems to prevent mould and mildew.	The design will require diesel back up power generator emissions meet at a minimum IFC standards or Florida State standards, whichever is stricter. The design will require that no ozone depleting substances be used within cooling systems.	The contractor will be required to take steps to minimize air emissions from equipment and the generation of dust. Any use of mobile concrete or asphalt plants will be subject to local permitting requirements.

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
water leaks	A **maintenance program** will be developed to regularly inspect and maintain areas susceptible to water leaks.		
Noise and vibration or release of light, heat energy or electromagnetic radiation Specific issues for LPIA include: • Taxi, idling and aircraft takeoff and landings • Construction activities, such as heavy equipment operation, pneumatic equipment use, truck traffic • Outdoor lighting	An **aeronautical noise management program** will be developed and implemented. Existing and future noise footprints will be developed and the airport will work closely with local planners to avoid conflicting land developments with aircraft operations. A compliant management system will be developed to monitor and understand complaints relating to aircraft operation.	Natural lighting will be utilized as much as possible in the design. New outdoor lighting will be reviewed to ensure it is shielded or directed to minimize excess light.	The contractor will be required to minimize construction noise, vibration and lighting. Nighttime noise will be kept to a minimum and truck routes will be planned in advance to minimize impacts on the community.
Risk of contamination of land or water from releases of pollutants onto the ground or into surface waters, groundwater, coastal waters or the sea. Specific issues for LPIA include: • Spills or leaks of hazardous materials, such as fuel, hydraulic oils, and motor oils from activities, such as storage, fueling, vehicle and aircraft maintenance, and painting • Surface water runoff high in suspended solids from construction and operation activities reaching Lake Killarney and/or surrounding wetlands • Surface water discharge to deep wells	A **spill prevention and response plan** will be prepared, maintained and practiced. Spill response equipment inventories will be improved. A **surface water quality program** will be developed to ensure surface waters draining from airport surfaces meet IFC or Florida State standards, whichever is stricter (including discharges to deep wells). A reverse osmosis (RO) drinking water plant is located adjacent to the airport. It is reported that this plant gets its water from deep wells. Existing on and adjacent to	The design will require that new fuel storage tanks, associated with diesel back up power generators, meet appropriate standards and have leak detection systems. Apron drainage will be pre-treated via oil/water separators before being discharged to swales. Flooding of the buildings and parking lots has been an issue. However, flooding has not occurred since the deep storm water disposal wells in the parking lot were maintained. The design will consider the impact of increasing the flow to the airport sewage treatment plant.	Strict requirements will be placed on the contractor for handling and disposing of harmful substances. The contractor will have a spill response plan, spill kits and trained personnel. The contractor will be required to maintain records. The contractor will be required to remediate any spills of hazardous substances caused by the construction project. The contractor will be required to have a plan in place to manage, treat and dispose of hydrocarbon-contaminated groundwater extracted during

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
• The airport is susceptible to flooding during periods of heavy rain • Proximity of the Windsor Well fields, a potable water source • Disposal of sewerage from the terminals to a sanitary treatment plant that is nearing capacity • Disposal of aircraft lavatory waste in a sewer dump that is connected to the treatment plant • Some existing airport buildings disposing of sewerage into cess pits	the airport are surface trenches that collect surface water for drinking water. The water collected from this system is mixed with the water generated at the RO plant. A **Phase II Site Assessment** concluded that the airport is not impacting Windsor Field water collection system. A **sewer effluents program** will be developed and implemented to assess sanitary disposal practices at all airport buildings to identify systems that do not meet acceptable practices.	The design will consider improvements to the aircraft lavatory dump.	dewatering activities. The contractor will be required to have an erosion control plan. Access to the aircraft lavatory dump must be maintained during construction.
Risk of accidents during construction or operation of the Project which could affect human health or the environment Specific issues for LPIA include: • Accident prevention • Emergency preparedness and response Coordination with emergency response services and agencies.	A **public and employeehealth and safety program** will be developed and implemented. The focus of the program will be on accident prevention. **Emergency response plans** will be developed so that the airport and surrounding response agencies are prepared to respond to larger emergencies.	The design will consider life safety and building evacuation.	The contractor will be required to have a health and safety program in place. Emphasis will be placed on preplanning all high-risk activities so that accidents can be avoided and response agencies are notified and prepared in the event of an emergency.
Social changes, for example, in demography, traditional lifestyles, employment Specific issues for LPIA include: • Employment opportunities • Shortage of construction workers in The Bahamas	No social changes are anticipated other than increased employment opportunities	No social changes are anticipated other than positive employment opportunities	No social changes are anticipated other than positive employment opportunities. Any foreign workers will be retained following strict adherence to Bahamian requirements.

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
Consequential development which could lead to environmental effects or the potential for cumulative impacts with other existing or planned activities in the locality Specific issues for LPIA include: • Increase in the number of passengers • Numerous large development projects occurring at the same time on New Providence Island	Tourism generates approximately 60% of the gross domestic product in The Bahamas. Because of this dependence on tourism, growth in this sector is essential. The airport has been lagging growth and is in need of expansion to accommodate existing and predicted growth.	There are numerous large construction projects planned: Residential development; Resort development; New east/west highway; and a New deep port. With the addition of the airport project, there will likely be a strain on resources, in particular, workers.	The contractor will need to consider the impacts on resource availability as a result of several large construction projects that are ongoing on New Providence Island.
Areas on or around the location which are protected under international, national or local legislation for their ecological importance, or are important or sensitive for reasons of their ecology e.g., wetlands, watercourses or other water bodies, the coastal zone, forests or woodlands, which could be affected by the Project landscape, cultural or other value, or protected, important or sensitive species of fauna or flora e.g., for breading, nesting, foraging, resting, over wintering, migration, which could be affected by the Project Specific issues for LPIA include: • Loss of habitat from construction • Interaction of wildlife and aircraft operation • Proximity of Lake Killarney, pine forests and wetlands	A **habitat and wildlife management plan** will be developed to minimize the risk of wildlife interaction with aircraft.	A **flora and fauna assessment** was undertaken within the project site to identify impacts and mitigation. The design of the gardens will reflect the natural beauty of The Bahamas. The Bahamas National Trust will be consulted regarding the design of the gardens. The design will consider opportunities to showcase within the terminal national parks and preservation activities of The Bahamas National Trust.	The contractor will undertake any required mitigation and obtain a permit for the removal of pine trees.

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
Areas or features of high landscape or scenic value on or around the location which could be affected by the Project Specific issues for LPIA include: • Proximity of Lake Killarney and wetlands		Bird watching on Lake Killarney is important. Neither the lake, nor views from the lake will be impacted by this project.	
Transport routes on or around the location which are susceptible to congestion or which cause environmental problems, which could be affected by the Project Specific issues for LPIA include: • Construction vehicle use of public roads	Current roadways leading to the airport are not congested.	Entrances and exits to parking lots will be improved.	The contractor will be required to plan and use approved transportation routes.
Areas or features of historic or cultural importance on or around the location which could be affected by the Project Specific issues for LPIA include: • Plaques, cornerstones and other historic items within buildings to be demolished • Face rock used on existing terminal buildings is of cultural importance	All future development projects will be reviewed through **impact assessment and construction monitoring program** to ensure there are no impacts on cultural heritage and archaeology.	The face rock used on the existing terminals will not be harmed by the Expansion Project. Cornerstones and plaques will be salvaged and displayed, if possible in the new building. Historical photographs and information about the airport to be displayed in the new building, if possible.	Items of historic and cultural value to be salvaged during demolition activities. The contractor will follow procedures from the Antiquities, Monuments and Museum Corp. in the unlikely event a historic or culturally significant item is found
Project located in a previously undeveloped area where there will be loss of Greenfield land There are no specific issues for LPIA as the project is within the existing airport boundary.		A green field option was evaluated and rejected. The project will expand and renovate the existing facilities	

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
Plans for future land uses on or around the location which could be affected by the Project Specific issues for LPIA include: • Protection for airport expansion to accommodate an increase in aircraft operation and passengers	See noise and vibration above	The project will not impact on surrounding land use as it is within the airport boundary.	
Areas on or around the location which are occupied by sensitive land uses e.g., hospitals, schools, places of worship, community facilities, which could be affected by the Project There are no specific issues for LPIA as the project is within the existing airport boundary.		There are no sensitive land uses near the project.	
Existing land uses on or around the location e.g., homes, gardens, other private property, industry, commerce, recreation, public open space, community facilities, agriculture, forestry, tourism, mining or quarrying which could be affected by the Project There are no specific issues for LPIA as the project is within the existing airport boundary.	See noise and vibration above		The contractor will be required to use approved operating quarries or import fill materials.
Existing areas on or around the location which are already subject to pollution or environmental damage e.g., where existing legal environmental standards are exceeded, which could be affected by	A **contaminated sites program** will be developed and implemented to monitor and manage existing contaminated sites to ensure no off-site migration is occurring.	The Baseline Report identified a high likelihood for soil and groundwater contamination within the project boundary. A **Phase II Site Assessment** was undertaken to identify the areas of potential	The contractor will be required to be prepared to contain and remediate any contaminated soils or groundwater discovered during excavation or dewatering.

Table 13. Issue / Mitigation Register

Potential Impacts / Issues	Operation Mitigation	Design Mitigation	Construction Mitigation
the Project Specific issues for LPIA include: • Existing contaminated sites • Existing monitoring wells		impact.	The contractor will need to decommission monitoring wells in a specified manner within areas where they exist and will likely be damaged (i.e., existing apron).
Project location susceptible to earthquakes, subsidence, landslides, erosion, flooding or extreme or adverse climate conditions e.g., temperature inversions, fogs, severe winds, which could cause the Project to present environmental problems Specific issues for LPIA include: • The Bahamas susceptible to hurricanes and other tropical storms leading to flooding and other damage. • Pine forests, located near the airport, are susceptible to wildfires	**Emergency plans** will be developed to prepare for emergency events.	The design will take into consideration the impact of severe weather and flooding.	The contractor will be required to develop and implement emergency plans in accordance with project requirements.

The benefits of this project are numerous. Visitors and residents of The Bahamas will be proud of the updated and expanded modern facilities as they arrive and depart the country. Environmental practices will be improved at the existing operation, for example, waste oils will be collected and disposed of properly.

5.1Environmental Impacts

The construction phase and airport operations have the following potential environmental and social impacts (positive and negative):

- Air Emissions
- Surface and Ground Water Emissions
- Contaminated Soil and Groundwater
- Resource consumption
- Solid and Hazardous Waste (including demolition waste)
- Sewerage Effluents
- Loss of Habitat
- Noise and Vibration
- Traffic
- Public and Employee Health and Safety
- Cultural Heritage and Archaeological
- Employment
- Local Economy

The following sections discuss the construction (Section 6.0) and operational impacts (Section 7.0) and the planned mitigation measures that will be undertaken to reduce impacts to acceptable levels. The management and monitoring activities that will be conducted to demonstrate that the mitigation measure remain effective are also discussed.

The hydrant system will be modified and expanded as a result of this project. While this EIA establishes the standards for the new hydrant system, a separate environmental impact assessment will be prepared by the Joint Operator, the owners of the system.

6.0 CONSTRUCTION

This section outlines the construction environmental impacts and mitigation to minimize the impacts. Management and monitoring activities are described to ensure the mitigation is effective.

The Project and all contractors will comply with:

- All applicable Bahamian environmental laws, regulations and permits in all material respects;
- IFC General Environmental and Social Guidelines (2007) and the specific industrial sector Environmental and Social Guideline for Airports (2007);
- All contract requirements and specifications; and
- The Environmental Management Plan developed by the Prime Contractor.

The primary objective of the Project Team and all contractors is to cause no harm to the environment, workers, public or the surrounding communities. The primary environmental and social targets for the Project are:

- Zero Accidents
- Zero Spills
- Zero Complaints (Passengers, Public, Community)
- 100% Compliance

6.1 Construction Impacts, Mitigation, Management and Monitoring

6.1.1 Air Emissions

Construction equipment, plant and vehicles emit pollutants including greenhouse gases (i.e. carbon monoxide, carbon dioxide and methane). Moving vehicles in dry and windy conditions also generate dust.

Plant, equipment and vehicle exhaust emissions will be minimised through:

- The use of catalytic converters, where appropriate;
- The use of low sulphur fuel;
- The regular maintenance of engines to ensure operation to vendor specifications; and
- Turning off engines when possible to reduce idling and exhaust emissions.
- Good atmospheric dispersion is expected to prevent build-up of exhaust emissions.

Dust generation will be minimized by:

- Minimizing the total area of bare earth at the construction site during dry periods;
- Minimizing the movement of vehicles on unsealed surfaces;
- Minimizing the speed at which vehicles move on unsealed surfaces;
- Covering vehicle loads of soil / aggregates;

- Covering or surface treating soil / aggregate stockpiles; and
- Wetting down bare earth areas in dry and windy conditions.

Management and Monitoring

The contractor will implement and incorporate the mitigation and control measures, which are cited above, in the Construction Program EMP in addition to the following:

- Monthly checks to ensure that construction plant, equipment and vehicles are being regularly serviced and maintained to vendor specifications;
- Twice daily general site observations to visually assess dust levels;
- Weekly site inspections to ensure that areas of bare earth are being minimised and that soil / aggregate stockpiles are covered; and
- As required site inspections to ensure that wetting down of dust generating areas is occurring in windy and dry conditions.

Inspections will be performed and all observations will be recorded in accordance with the Construction Program EMP.
The mitigation and monitoring activities, summarized in **Table 15**will reduce the impact to air emissions from construction activities to acceptable levels.

6.1.2 Surface and Groundwater Resources

Construction program activities have the potential to:

- Increase suspended sediment loads in surface water systems;
- Result in surface and / or groundwater impacts from spills of hazardous materials;
- Result in surface and / or groundwater impacts where run-off from concrete/cement product wash areas is not contained; and
- Mobilise hydrocarbon contaminants, if existing contaminated land is disturbed (see Section 6.1.3)

Sediment

Potential sources of sediments reaching surface water from construction sites include excavating, exposed ground surfaces and stockpiles. Sediments can reach surface waters via runoff from construction sites during rainfall events.

A number of mitigation and control measures will be implemented to reduce the potential for construction program activities to result in increased turbidity levels in drainage systems. These include:

- Staging of site clearance activities to minimise the area of exposed ground and the duration of disturbance;
- Installation of cut-off ditches or geotextile silt-fences around excavations sites, exposed ground and stockpiles to collect turbid surface water run-off;
- Suitable siting and covering or surface treating of stockpiles that are required to stand in place for extended periods of time;

- Areas that need to be cleared of vegetation to accommodate construction and roadway development will be minimised and any slopes will be stabilised to prevent erosion - cleared areas will be promptly re-vegetated with native grass and shrubs as soon as possible;
- Overland drainage will be controlled to prevent channelling and sediment transport by diverting flows away from areas that are exposed;
- Regular cleaning of site access points to prevent build up of dirt and mud on roads; and
- Fully contained vehicle wheel wash facilities, where required, to reduce the amount of dirt / mud that may be transported off-site onto the surrounding road network.

With the above control measures in place, the residual impact associated with potential releases of sediment into the site storm water drainage system and local surface waters is considered to be low.

Oils, Hydrocarbons and Other Hazardous Materials

Sources of oils, hydrocarbons and other hazardous materials on the construction site include existing contaminated soils and groundwater, plant and machinery, spillage and leakage at refueling areas and poor handling and storage of hazardous materials.

A number of mitigation and control measures will be implemented to reduce the potential for construction program activities to result in releases of hydrocarbon products that may lead to surface water and / or groundwater contamination. Existing contaminated sites are addressed in Section 4.6.

These include:

- Oils, hydrocarbons and other hazardous materials will be stored in designated locations with specific measures to prevent leakage and release of their contents, including the siting of the storage area away from surface water drains and on an impermeable base with impermeable containment that has no outflow and is of adequate capacity to contain 110% of the contents;
- Plant and machinery will be kept away from surface waters and will have drip trays installed beneath oil tanks / engines / gearboxes / hydraulics which will be checked and emptied regularly;
- Collection, retention and testing of any groundwater resulting from dewatering activities within potential contaminated sites;
- Re-fueling and delivery areas will be located away from surface water drains and natural water bodies and courses;
- Provision of spill response equipment to contain and clean-up spills;
- A designated area will be developed to allow for the bio-remediation of contaminated soils; and
- Provision of spill response training to all relevant construction workforce personnel.

With these control measures in place, the potential for an uncontrolled release of hydrocarbons or other hazardous materials into the environment is expected to be

minimal and hence the residual impact on surface and / or groundwater is considered to be low.

Concrete/Cement Products

Concrete and cement products are highly alkaline and their release into the environment can have an adverse effect on flora and fauna and on water quality in general. Existing commercially available concrete batch plants will used. Therefore, there will not be an on site batch plant. Impacts form concrete and cement products would result from the rinsing of equipment used to handle concrete and cement products.

A number of precautions will be taken on site during the construction program to reduce the potential for impacts associated with use of cement/concrete products including:

- A designated and contained area will be used for washing down equipment associated with concrete or cementing processes.

With these control measures in place, the potential for an uncontrolled release of alkaline wastewater into the environment is expected to be minimal and the residual impact on surface and / or groundwater is considered to be low.

Management and Monitoring

The contractor will incorporate the above cited control measures into the Construction Program EMP to minimise the deposition of sediments into nearby surface water bodies. The Plan will also include provisions for monitoring as follows:

- Daily inspections of excavation activities to ensure the area is free from contamination;
- Inspections, as required, to ensure that excavation sites and stockpiles are equipped with appropriate and effective erosion and sedimentation control measures;
- Weekly inspections of all erosion and sedimentation control measures to ensure proper and effective operation;
- Weekly inspections of site access points to ensure regular cleaning is being conducted;
- Weekly inspections of wheel wash facilities to ensure proper operation and maintenance;
- Monthly inspections increasing to weekly during the rainy season of surface water drainage lines to ensure that they remain effective in diverting flows from exposed areas and free of debris to ensure proper operation;
- Inspections of fuel and hazardous material storage areas to ensure that they are appropriately constructed (i.e. impermeable base, no outflow and adequate containment);
- Weekly inspections of fuel and hazardous material storage areas to ensure that goods are properly stored and that the facility is being maintained in good working order;
- Weekly inspections to ensure that plant and machinery is kept away from surface waters and that all items are equipped with drip trays;

- Weekly inspections of re-fueling and delivery areas to identify evidence of spills;
- Monthly inspections of spill response equipment to ensure adequate supply and in good working order;
- Inspection to ensure that the asphalt and concrete batching plants are appropriately sited; and
- Inspections, as required to ensure that all alkaline wastewater associated with cement production and / or equipment washing is contained and treated prior to disposal.

All observations will be recorded in accordance with the requirements of the Construction Program EMP.

The mitigation and monitoring activities, summarized in **Table 15** will reduce the impact to surface water to acceptable levels.

6.1.3 Contaminated Soil and Groundwater

Contaminated soil and groundwater has occurred from past spills from the operation of fuel systems at the airport. This existing fuel hydrant system is the responsibility of the Joint Operator (Chevron, ESSO and Shell). A plume of jet fuel contamination is known to exist around the international pier and potentially extending under the international arrivals building. The international pier will be demolished in the third stage of this Project. The international arrivals building will be demolished and re-built in the third stage. Contamination is also anticipated to exist under the US Terminal in the location of the former tank farm.

The fuel pipeline from Clifton Pier to the tank farm on the airport is not being impacted by the development project and any impact of its operation is not being considered within the scope of this environmental impact assessment.

Construction activities, such as excavating and dewatering, have the potential to interact with existing soil and groundwater hydrocarbon contamination. The Phase II Site Assessment identified potential areas of interaction of construction activities and contaminated soil and groundwater.

A number of mitigation and control measures will be implemented to reduce the impact of spreading the existing contaminated soils and groundwater from construction program activities and to ensure the protection of the public, airport and construction workers. These include:

- Existing contaminated sites will be identified in advance of construction activities;
- A remediation plan will be developed and implemented by the responsible party for managing contaminated soils and groundwater;,
- Air monitoring will be initiated prior to any construction in areas close to known contamination or remediation activities and continue throughout the time contaminated soils are exposed to ensure the public, airport and construction workers are not harmed. Details for this sampling program will be developed

as part of the remediation plan and in consultation with the Department of Environmental Health Services.
- The Department of Environmental Health Services will review and approve remediation plans.

In the event soils or water are encountered unexpectedly, the contractor will:

- Immediately stop work and notify the Project Office;
- With the advice of the qualified contaminated sites consultant, evaluate the site;
- Store any potentially contaminated soils on plastic and covered with plastic; and
- Implement the contaminated soils and water guidelines provided in **Appendix G**.

NAD will attempt to identify the responsible party for any unexpected contamination discovered. In the event a responsible party is not found or is not performing at a satisfactorily level, NAD will be prepared to take over the investigation and any required remediation and seek cost recovery.

Remediation Plans and Standards

It is intended that soils and water beneath new buildings and new hard surfaces (e.g., aprons, parking lots) meet acceptable Florida State commercial standards. See the site assessment guidelines provided in **Appendix H**. If these standards are not achieved, the responsible party must:

- Undertake further remediation until standards are achieved;
- Conduct a risk assessment that demonstrates that remaining contamination is safe for the public, building occupants, workers, and does not pose a risk to the environment or the Windsor Well Fields; or
- Design and pay for engineering controls (e.g., vapour barriers).

Long-term site monitoring may be required and remains the responsibility of the responsible party.

Separate remediation plans will be prepared by the responsible party for addressing site contamination (or NAD in the event the responsible party is not determined or performing satisfactorily). These plans will be submitted to NAD, the Department of Environmental Health Services (DEHS) for review and approval.

Management and Monitoring

The contractor will incorporate the above cited control measures into the Construction Program EMP to minimise the spread of contaminated soils and groundwater. The Plan will also include provisions for monitoring as follows:

- Inspection to ensure the remediation plan and the required permit are in place and being followed;

- Immediate inspection of all areas where construction activities disturb new ground to determine whether or not contaminated land is encountered and if there is a potential for contaminants to be mobilised;
- In the event that additional contamination is discovered, immediately stop work and implement measures to prevent further disturbance and potential mobilization of contaminants, until the contamination can be treated or removed;
- Remediate contaminated soils and groundwater in accordance with the remediation plan.

All observations will be recorded in accordance with the requirements of the Construction Program EMP.

The mitigation and monitoring activities listed in Table 15 will reduce the impact of existing contaminated soils and groundwater being released to the environment. This Project provides a positive opportunity to accelerate remediation of contamination that has existed at the airport for nearly 20 years.

6.1.4 Resource Consumption

The construction project will consume resources such as water and building materials (steel, wood, soils, aggregate etc.). Approximately 145,500 cubic yards of fill will be imported to the site. The fill is expected to come from local commercial facilities or imported to the island.

A number of mitigation and control measures will be implemented to reduce the consumption of resources. These include:

- Minimize water consumption (e.g., utilize ditch water and/or groundwater that seeps into excavations for compaction and concrete curing)
- Minimize the amount of construction fill required (e.g., stockpile for reuse any structural fill materials, use non-structural fill materials in landscaping areas, and recycle asphalt); and
- Implement resource efficiency.

It is important that materials come from renewable sources and that consideration be placed on the distance materials travel.The criteria for resource efficiency include the following:

- Recycled content;
- Natural, plentiful or renewable;
- Resource efficient manufacturing process;
- Locally available;
- Salvaged, refurbished, or remanufactured;
- Reusable or recyclable;
- Recycled or recyclable product packaging; and
- Durable.

Management and Monitoring

The contractor will incorporate the above cited control measures into the Construction Program EMP to minimise the consumption of resources. The Plan will also include provisions for monitoring as follows:

- A weekly inspection to ensure water loss is not occurring through leaking hoses etc.
- Provide regular documentation on natural resource procurement practices.

The mitigation and monitoring activities listed in Table 15 will minimize the consumption of resources.

6.1.5 Solid and Hazardous Waste (Including Demolition Waste)

Construction waste will include, for example, the following types of waste:

- Paper
- Wood
- Cardboard associated with packaging,
- Scrap metal
- Building rubble,
- Gypsum wall board,
- Empty chemical containers (including paint)
- Oils, waterproofing and paint
- Asphalt,
- Concrete,
- PCB light ballasts
- Fluorescent light tubes
- Oil filled transformers
- Cooling system refrigerant
- Lavatory waste
- Concrete wash water
- Excess overburden

Poor storage on site, transportation, and possible impacts associated with the selected third party disposal companies are the main causes of negative impacts associated with waste.

Approximately 63,000 cubic yards of material will be excavated for the foundations. This material will be reused within the construction project or on the airport in pre-approved locations.

Demolition waste from the remodel of US Terminal and the demolition of the Customs and Immigration Hall and International Terminal will need to be carefully sorted by waste type to facilitate reuse and recycling of the material to reduce the overall amount that must be disposed of off site.

A Hazardous Building Material Assessment undertaken by Parks Environmental in August 2007 (Section 4.9) identified some risks and made the following recommendations:

Asbestos: *The Roof Caulk/Sealant found on the metal roof panel seams of the International Terminal is a non-friable ACM. If the metal roof panels/sheets are to be recycled, the metal recycler should be notified of the asbestos-containing caulk, or the caulk should be removed prior to recycling.*

Lead Paint: *Given the age of the buildings (1985 or newer) interior paints are probably not lead containing. The sampling data indicates only the exterior canopy paint on the International Terminal may have elevated lead levels. Further testing may be warranted to more accurately determine the lead content of all the paint on the canopy.*

Special Waste Materials: *It is advisable to remove and segregate the items and materials identified as special waste (i.e., plastics, fabrics, light bulbs, electronic devices and motors). These materials should not be included with the general demolition debris that is typically limited to concrete, wood (except waterproof treated wood), metal, plaster and drywall. In the US, it is not uncommon for construction debris landfills to not accept plastics, fabrics, light bulbs, electronic devices and motors.*

Improved estimates of waste and a Construction Waste Control Plan will be developed by the construction contractor prior to the commencement of enabling works on site. A description of the alternatives for waste management is provided below. It is expected that one or a combination of these options will be used to appropriately manage construction waste.

The contractor's municipal type waste will be brought to the New Providence Municipal Landfill via a licensed waste contractor. This landfill facility was built in 1998 that is expected to have capacity until 2018. The sanitary landfill facility was built on 135 acres. The landfill is lined with a high-density polyethylene geo-membrane to prevent contaminants from leaching into the ground.

Only a small facility hazardous waste disposal facility exists in the Grand Bahamas. Therefore hazardous waste is generally sent to other countries under the terms of the 1989 Basel Convention. The Construction Program EMP will describe how hazardous wastes will be disposed of.

Recycling efforts are limited on the island. At present, only beer bottles are recycled. Used tires are collected and shipped off island for recycling. The Construction Program EMP will introduce a Reduce, Re-use, Recycle (3R) waste management philosophy. The Construction Program EMP will include:

- A minimisation / collection / storage / treatment / re-use / disposal strategy for each waste stream in accordance with local requirements;
- Develop, under the guidance of a qualified professional, a soil management and disposal program;
- Include a strategy for returning packaging waste (containers, plastic wrapping, pallets etc. to their point of origin);
- Identify potential third party re-users; and duty-of-care requirements;
- Methods for properly managing (e.g. training, storing, containerizing, labeling, transporting and disposing) wastes;
- Maintain records of waste disposal.

- Minimize the creation of hazardous wastes as there are no in-country solutions;
- Develop a safe on site storage facility that is locked and contained, away from site drainage;
- Maintain detailed records of material in storage;
- Secure legal disposal options and keep chain of custody records;
- Provide on-site temporary sanitary facilities, and
- Arrange for contractors to empty holding tanks on a regular basis and dispose of in local treatment facilities.

Management and Monitoring

The contractor will incorporate the above cited control measures into the Construction Program EMP to ensure solid and hazardous wastes are handled and disposed of properly. The Plan will also include provisions for monitoring as follows:

- Inspection to ensure acceptable plans are in place to manage each waste stream; and
- Weekly inspections to ensure waste storage, handling and disposal are occurring as planned.

The mitigation and monitoring activities, summarized in Table 15 will reduce the impact of managing waste.

6.1.6 Sewage Effluents

Sewage effluents created from the construction project (portable toilets) are addressed in Section 6.1.5.

Demolition of existing sewerage handling facilities, such as the macerator (aircraft lavatory dump), cess pits and leach fields, will be decommissioned in accordance with DEHS guidelines, as follows:

- All effluent and sludge will be removed
- Areas treated with slaked lime(calcium hydroxide)
- Holes are made in the bottom of the tanks to allow drainage
- Concrete tanks are crushed below ground level
- The area is backfilled

6.1.7 Loss of Habitat, Flora and Fauna

The proposed development works have the potential to result in direct and indirect impacts on habitat, flora and fauna as follows:

- Direct loss of habitat due to construction of the new terminal building and apron;
- Direct fatality of faunal species due to collisions with moving vehicles; and
- Indirect disturbance due to increased noise and dust levels and anthropogenic activity in the construction site area.

- In addition to direct habitat loss, habitat degradation may occur as a result of the following:
    - Creation of wind blown dust; and
    - Increased soil erosion resulting in increased sediment loading in wetlands.

Given the erosion and sediment control measures discussed in Section 6.1.2, residual impacts on habitat resulting from dust or soil erosion are considered to be negligible.

The loss of the habitat is not considered to be significant. Two areas being cleared are on the periphery of a large system and one is a fragment habitat, thus removal of these areas will not result in habitat fragmentation. Additionally, all areas are subjected to some degree of disturbance and invasive species and proper removal will be an asset as it would decrease the chances of invasive species spreading to healthier sections of the system. Similarly the loss of the flora is not considered to be an impact to the avifauna as a significant amount of the same habitat will be undisturbed.

The objectives of the project are to maintain no net loss of species diversity and no non irreversible damage to ecosystem characteristics and function. Further, the protection of native flora species in The Bahamas will be highlighted within gardens designed for public viewing.

The Construction Program EMP will include, but not necessarily be limited to the following:

- All vegetation clearance will be undertaken with due care and attention to minimize impact on the adjacent habitat.
- Should any nesting birds be located, a designated local biologist will be contacted immediately to ensure that appropriate action is taken to ensure legislative compliance and to avoid any adverse impact on breeding birds.
- All removed vegetation will either be burned or composted in accordance with and approval from the DEHS.

The BEST Commission has suggested a mitigation ratio of two to one be adopted inassessing a mitigation value. The Project proposes that gardens featuring native vegetation be considered mitigation for the loss of protected trees. These gardens will be placed in highly visible locations and can be used to promote conservation and protection of valued plants in The Bahamas.

Management and Monitoring

The contractor will incorporate the above cited control measures into the Construction Program EMP to minimize the impact on flora and fauna. The Plan will also include provisions for monitoring as follows:

- Inspection to ensure approved mitigation plan is in place; and
- Weekly inspections to ensure site clearing activities create minimum disturbance; and
- Inspections per the mitigation plan to ensure mitigation is effective.

6.1.8 Noise and Vibration

Construction activities such as the movement of heavy plant, construction materials and machinery to and from site may cause noise disturbance to surrounding communities.

Best practice procedures will be implemented in order to reduce construction noise. Such measure will include:

- Hydraulic construction to be used in preference to percussive techniques where practical;
- All plant and equipment will be properly maintained, silenced where appropriate and operated to prevent excessive noise and switched off when not in use;
- Loading and unloading of vehicles, dismantling of equipment such as scaffolding or moving equipment or materials around the site will be conducted as far as practicable during day time hours; and
- Noise complaints will be immediately investigated.

With these mitigation and control measure in place, the residual impacts associated with construction noise are considered to be low

Management and Monitoring

The Construction Program EMP will include the mitigation and control measures cited above. The Plan will also include provisions for monitoring including but not necessarily be limited to the following:

- Weekly inspections to ensure that appropriate sound abatement measures are being implemented around noisy construction plant and equipment;
- Monthly checks to ensure that construction plant, equipment and vehicles are being regularly serviced and maintained to vendor specifications; and
- Monthly day and night spot measurements of noise levels taken by a qualified person at the boundary of the construction site and at the nearest sensitive receptors to demonstrate compliance with IFC noise limits provided in **Table 14** if complaints of construction noise are received.

Table 14. IFC Noise Level Guidelines (One Hour L_{Aeq} [dBA])

Receptor	Daytime 07:00 – 22:00	Nighttime 22:00 – 07:00
Residential, institutional, educational	55	45
Industrial, commercial	70	70

All observations will be recorded in accordance with the Construction Program EMP.

The mitigation and monitoring activities, summarized in **Table 15**will reduce the impact of construction noise.

6.1.9 Traffic

The construction program will generate short-term increases in heavy goods vehicle movements on the local road network in the vicinity of the airport and as such, has the potential to cause impacts on local traffic and transport infrastructure in terms of disrupting other road uses. Potential traffic and transport related impacts include:

- Disruption to road users from vehicles entering and leaving the construction site;
- Disruption to pedestrians from vehicles entering and leaving the site;
- Disruption of other road users along the transport routes;
- Damage to road infrastructure by heavy construction vehicles; and
- Accidents on or off airport resulting in spilled loads and/or release of hazardous materials (e.g., oils, concrete, asphalt).

A number of mitigation and control measures will be implemented in order to minimise disruption to other road uses including:

- Transport routes to and from the airport construction site will be agreed with government officials prior to commencement of the construction program;
- Traffic control measures (e.g. flagmen) will be deployed at all intersections of site access routes and main roads;
- Strict speed controls will be implemented for all transport vehicles;
- All large or over-size transport vehicles will be accompanied by escort cars equipped with flashing yellow warning lights while in transit on public roads;
- Delivery of construction plant, equipment and goods will be planned so as to minimise the total number of required trips;
- Delivery of construction plant, equipment and goods will be scheduled outside of peak hour traffic times; and
- The spill response plan will include actions for responding to accidents involving hazardous materials on or off the airport.

With these mitigation and control measure in place, the residual impacts associated with construction traffic are considered to be low.

Management and Monitoring

The Construction Program EMP will include the mitigation and control measure cited above. The Plan will also include provisions for monitoring, including but not necessarily be limited to the following:

- Advance approval of transport routes;
- Advance scheduling of site deliveries;
- Monthly post checks of site deliveries to ensure that the appropriate traffic control measures are being implemented;
- Monthly surveys of selected transport routes to identify any degradation of public road surfaces; and
- Spot checks to ensure that large or over-size transport vehicles are accompanied by escort cars.

The mitigation and monitoring activities, summarized in Table 15 will reduce the impact of construction traffic on the local road network.

6.1.10 Public and Employee Health and Safety

The construction program has the potential to negatively impact on public health and safety as there is a potential for accidents to occur between construction and private vehicles as both will be using the public road system. Similarly, there is a potential for pedestrian accidents from either vehicle accidents or being struck by falling debris from adjacent construction activities.

Prior to commencing construction works, a Construction Public Health and Safety Plan will be developed and implemented. The Plan will include provisions for the management and monitoring of public health and safety to be implemented by the contractor, including but not necessarily be limited to the following:

- Mechanisms for making public announcements (e.g. newspaper / radio) about the construction program and in particular when public roads will be used by heavy transport vehicles;
- Reporting mechanisms for the public to register concerns or complaints regarding perceived risks to their health and safety due to the construction operation;
- Incident recording and reporting protocols;
- Emergency contact details in the event of an accident.

Management and Monitoring

The contractor will incorporate the above cited control measures into the Construction Program EMP to minimise the risk of accidents. The Plan will also include provisions for monitoring as follows:

- Inspection to ensure plans are developed per specifications;
- Weekly inspections to ensure employees are working in accordance with plans; and
- Follow up of all complaints and accident / incident reports.

Construction work by its nature is high risk for its workers. While any accident to workers or the public would be catastrophic in terms of the consequence, the likelihood of an accident occurring will be lower as a result of the mitigation and monitoring activities summarized in Table 15.

6.1.11 Cultural Heritage and Archaeology

The Bahamas Antiquities, Monuments and Museums Corp. have identified the face rock walls used within the existing terminals as important features to be preserved, if at all possible along with plaques and cornerstones. The domestic terminal, which has the face rock, will not be demolished as a result of this Project.

Unknown archaeological resources may be present below the ground surface in areas that will be subject to disturbance during the construction program. Bahamas Antiquities, Monuments and Museums Corp. have procedures for addressing potential archaeological finds. These procedures will be incorporated within contract documents.

A number of mitigation and control measures will be implemented to ensure items of cultural or archaeological importance are protected and preserved during the construction project.

- Salvage face rock walls for reuse within the terminal buildings,
- Salvage plaques, cornerstones and any other items that pertain to the history of the existing terminal buildings,
- Retain a qualified professional to be on call to respond to finds
- Follow The Bahamas Antiquities, Monuments and Museums Corp. procedures on what to do if a find is made and train construction personnel on the procedure.

With implementation of the above control and recovery measures residual impacts associated with archaeology and cultural heritage are expected to be low.

Management and Monitoring

The Construction Program EMP will include the mitigation and control measures cited above.

- Inspections to ensure a procedure is in place in the unlikely event there is a find;
- Inspection prior to demolition activities to identify and mark items to be salvaged,
- Inspection to confirm salvaged items are separated and preserved for reuse in the new buildings.

Maintenance of records will be in accordance with the Construction Program EMP.

6.1.12 Employment

The proposed airport construction program and the expanded and renovated airport will result in a positive impact on local population and economy by creating short term and long term employment opportunities.

If the local job force cannot support the construction project in terms of number of workers and skills, the contractor will import workers following the requirements in The Bahamas.

The Labour Act and the Employment Act in the Bahamas are progressive and generally meeting North American standards. All contract documents make clear requirements for contractors to meet all applicable legal requirements. NAD will endeavour to take the commercial means necessary to ensure contractor supply chains address child and forced labour.

Management and Monitoring

As per Bahamian immigration regulation, the foreign workers would not be permitted to engage in gainful employment on the LPIA site without being in the possession of a valid work permit.

- This policy will be further monitored through the General Contractor sponsored and administered Safety and Security Orientation and ID badge system.
- All persons working on the LPIA site must go through the General Contractor sponsored and administered Safety and Security Orientation and produce the required document in order to receive their ID badge for site access.
- The required documents include the following:
    1) Valid photo ID; Bahamian Passport, Bahamian Driver's Licence, Bahamian Voter's card, Foreign Passport.
    2) (Foreign Workers) valid work permits indicating employment access to the LPIA site.
    3) National Insurance Board Card

6.1.13 Local Economy

The construction phase of the project is expected to have a positive economic impact on the services sector in the vicinity of the airport, for example, revenues generated by demand for local services to support the construction program.

Management and Monitoring

No specific management and monitoring requirements are considered necessary for this positive project impact.

6.2 Environmental Construction Management

The NAD Project Team consists of a team of professionals to manage and monitor all phases of the construction. The Project Team will ensure NAD's design requirements are met through active field management of the design engineers, all vendors, consultants and contractors.

Contracts address environmental performance through detailed contract specifications in addition to general environmental construction standards. The environmental construction standards, provided in **Appendix I**, contain environmental standards for the following:

- Air Quality and Dust Control
- Archaeological Protection
- Water Quality Protection
- Hazardous Materials Handling and Storage
- Underground and Aboveground Storage Tanks
- Noise
- Revegetation / Site Restoration
- Habitat, Flora and Fauna
- Resource Consumption
- Public Roadways
- On Site Movement of Soil
- Waste, Rubbish and Garbage
- Spill Prevention and Emergency Response Planning

NAD and the Project Team will undertake regular public announcements via local newspapers and radio about the construction program and in particular when public roads will be used by heavy transport vehicles or when airport access routes are impacted due to temporary rerouting on the airport due to construction activities. NAD will also update its web site regularly with construction information.

The public can make their concerns or inquires via the NAD web site at feedback@nas.bsor via the telephone. This information will be included within the announcements.

NAD staff responsible for receiving messages from the web site or phone will forward complaint/concern/inquiry to the appropriate department or Project Office.

The Project Office will evaluate and investigate every complaint/concern/inquiry that relates to construction and take corrective action as required.

Records will be maintained and NAD will endeavor to answer each complaint/concern/inquiry via phone or in writing within a reasonable time period.

6.2.1 Contractor Environmental Management Plan

The general contractor must develop its own EMP to ensure actions and mitigation necessary to protect the environment is incorporated into all site procedures. At a minimum, the contractor's EMP must address the following:

- Policy
- Planning
- Implementation and Operation

Policy

The contractor will develop an environmental policy that includes, at a minimum, the following:

- A commitment to comply with applicable regulations and other requirements that the company subscribes to.
- A commitment to provide a safe work environment.
- A commitment to provide the training and equipment necessary to for employees to conduct their work safely.
- A commitment to continuously improve performance and to pollution prevention.
- A commitment to communicate the policy to all persons working for and on behalf of the company.

Planning

Environmental issues and the legal and other requirements for the Project have been identified in the EIA. The contractor must demonstrate within its plan that it has read and understood the EIA. **Table 15** summarizes the requirements for mitigation and monitoring.

Implementation and Operation

Roles, responsibilities and authorities should be defined, documented and communicated to ensure effective environmental and social management.

A specific management representative should be assigned that is responsible for ensuring that the EMP is established, implemented and maintained and is responsible for reporting performance, reviewing the Plan and making recommendations for improvement.

Documented confirmation is required that the training needs of all persons working for or on the company's behalf whose work pose significant hazards to their health and safety and / or may create a significant impact on the environment has been identified. Records of all training must be maintained.

Management, Supervisory, and Employee responsibilities must be communicated to all employees through training, formal job descriptions, work experience, hiring practices, etc.

Awareness training should be provided that includes the importance of conforming to the policy and procedures, the significant environmental, and the roles and responsibilities of management and staff.

The EMP must address how the contractor will receive, document and respond to external interested parties.

Records shall be legible, identifiable and traceable to the activity. Records shall be stored and maintained in such a way that they are retrievable and protected against damage, deterioration or loss.

The contractor will establish, implement and maintain procedures to identify potential emergency situations and potential accidents that can have an impact on the environment, surrounding communities, the employees, and / or the public using the airport.

The contractor should be prepared to respond to actual emergency situations and accidents and prevent or mitigate associated adverse environmental or social impacts.

6.2.2 Environmental Monitor

A local independent Environmental Monitor will be retained to perform the following:

- Verify all project approvals and permits are in place prior to the start of construction;
- Evaluate contractor plans (e.g., EMP, Spill Response and Waste Management) and monitor implementation;
- Develop inspection checklists to ensure site inspections are focused and useful
- Conduct environmental monitoring of construction works; The environmental monitor will ensure the protection of the environment, that mitigation measures are appropriately implemented and to facilitate communication between the Contractor, the Project Team and environmental authorities (e.g., BEST and DEHS); and
- Prepare regular written reports to the Project Team, contractor and the environmental authorities (e.g., BEST and DEHS) on an agreed to schedule.

Table 15. Construction Mitigation and Monitoring Activities

Environmental Effect	Construction Mitigation Actions	Construction Monitoring
Air Quality **Exhaust Emissions**	• Use (where appropriate) catalytic Converters • Use low sulphur fuel • Regular maintenance of engines Turn off engines to reduce idling	• Monthly checks to ensure that construction plant, equipment and vehicles are being regularly serviced and maintained to vendor specifications;
Air Quality **Dust Emissions**	• Minimize bare earth • Minimize movement and speed of vehicles on unsealed surfaces • Cover vehicle loads of soil / aggregate • Cover or treat bare earth and stock piles in dry and windy conditions	• Twice daily general site observations to visually assess dust levels; • Weekly site inspections to ensure that areas of bare earth are being minimised and that soil / aggregate stockpiles are covered; and As required site inspections to ensure that wetting down of dust generating areas is occurring in windy and dry conditions.
Water Quality **Erosion**	• The staging of site clearance activities to minimise the area of exposed ground and the duration of disturbance; • The collection, retention and testing of any groundwater resulting from dewatering activities within potential contaminated sites; • Installation of cut-off ditches or geotextile silt-fences around excavations sites, exposed ground and stockpiles to collect turbid surface water run-off; • Suitable siting and covering or surface treating of stockpiles that are required to stand in place for extended periods of time; • Areas that need to be cleared of vegetation to accommodate construction and roadway development will be minimised and any slopes will be stabilised to prevent erosion - cleared areas will be promptly re-vegetated with native grass and shrubs as soon as possible; • Overland drainage will be controlled to prevent channelling and sediment transport by diverting flows away from areas that are exposed; • Regular cleaning of site access points to prevent build up of dirt and mud on roads; and Fully contained vehicle wheel wash	• Inspections, as required, to ensure that excavation sites and stockpiles are equipped with appropriate and effective erosion and sedimentation control measures; • Weekly inspections of all erosion and sedimentation control measures to ensure proper and effective operation; • Weekly inspections of site access points to ensure regular cleaning is being conducted; • Weekly inspections of wheel wash facilities to ensure proper operation and maintenance; and • Monthly inspections increasing to weekly during the rainy season of surface water drainage lines to ensure that they remain effective in diverting flows from exposed areas and free of debris to ensure proper operation.

Table 15. Construction Mitigation and Monitoring Activities

Environmental Effect	Construction Mitigation Actions	Construction Monitoring
	facilities, where required, to reduce the amount of dirt / mud that may be transported off-site onto the surrounding road network.	
Water Quality Spills	• Oils and hydrocarbons will be stored in designated locations with specific measures to prevent leakage and release of their contents, including the siting of the storage area away from surface water drains and on an impermeable base with an impermeable containment that has no outflow and is of adequate capacity to contain 110% of the contents; • Plant and machinery will be kept away from surface waters and will have drip trays installed beneath oil tanks / engines / gearboxes / hydraulics which will be checked and emptied regularly via a licensed waste disposal operator; • Re-fueling and delivery areas will be located away from surface water drains and natural water bodies and courses; • Provision of booms, containment and absorbent material response equipment to respond to contain and clean-up spills; and • Provision of spill response training to all relevant construction workforce personnel.	• Inspections of fuel and hazardous material storage areas to ensure that they are appropriately constructed (i.e. impermeable base, no outflow and adequate containment); • Weekly inspections of fuel and hazardous material storage areas to ensure that goods are properly stored and that the facility is being maintained in good working order; • Weekly inspections to ensure that plant and machinery is kept away from surface waters and that all items are equipped with drip trays; • Weekly inspections of re-fueling and delivery areas to identify evidence of spills; and • Monthly inspections of spill response equipment provisions to ensure adequate supply and good working order.
Water Quality Concrete / Cement Products	• Mixing and handling of wet concrete will be undertaken in designated areas; A designated and contained area will be used for washing down plant and / or equipment associated with concrete or cementing processes;	• Inspection to ensure that a designated and contained area is being used for washing down plant and / or equipment associated with concrete or cementing processes;
Contaminated Sites	• Develop a Contaminated Sites Control Plan for work in any areas that are known to have existing contamination; • The collection, retention and testing of any groundwater resulting from dewatering activities within potential contaminated sites; • Immediate inspection by the environmental monitor of all areas where construction activities disturb new ground to determine whether or	• Inspection to ensure Contaminated Site Control Plan is developed and implemented; • Weekly inspections to ensure groundwater is being retained and tested resulting from dewatering activities; and • Daily inspections during excavation in suspected contaminated areas to ensure soils are not being mobilized.

Table 15. Construction Mitigation and Monitoring Activities

Environmental Effect	Construction Mitigation Actions	Construction Monitoring
	not contaminated land is encountered and if there is a potential for contaminants to be mobilised; • In the event that additional contamination is discovered, immediately stop work and implement measures to prevent further disturbance and potential mobilization of contaminants, until the contamination can be treated or removed; and • Remediate contaminated soils and groundwater in accordance with the Contaminated Sites Control Plan.	
Habitat, Flora and Fauna	• All vegetation clearance will be undertaken with due care and attention to minimize impact on the adjacent habitat. • Should any nesting birds be located, a designated local biologist will be contacted immediately to ensure that appropriate action is taken to ensure legislative compliance and to avoid any adverse impact on breeding birds. • Obtain a permit to remove pine trees. Destroy removed vegetation in accordance with DEHS requirements.	• Inspection to ensure approved mitigation plan is in place; and • Weekly inspections to ensure site clearing activities create minimum disturbance; and • Inspections per the mitigation plan to ensure mitigation is effective.
Resource Consumption	• Minimize water consumption (e.g., use ditch and groundwater to compact soils and cure concrete); • Reuse materials (e.g., stockpile structural for reuse, use non structural fill for landscaping, recycle asphalt) • The impact of sourcing material will be considered (distance to travel etc).	• Weekly inspections to ensure water loss is not occurring through leaking hoses etc.
Construction Waste	• A minimisation / collection / storage / treatment / re-use / disposal strategy for each waste stream in accordance with local requirements; • Develop, under the guidance of a qualified professional, a soil management and disposal program; • Include a strategy for returning packaging waste (containers, plastic wrapping, pallets etc. to their point of origin, if practical); • Identify potential third party re-users; and duty-of-care requirements; • Methods for properly managing (e.g.	• Inspection to ensure acceptable plans are in place to manage each waste stream; and • Weekly inspections to ensure waste storage, handling and disposal are occurring as planned.

Table 15. Construction Mitigation and Monitoring Activities

Environmental Effect	Construction Mitigation Actions	Construction Monitoring
	training, storing, containerizing, labeling, transporting and disposing) wastes; • Maintain records of waste disposal. • Minimize the creation of hazardous wastes as there are no in country solutions; • Develop safe on site storage facility that is locked, contained, away from site drainage; • Maintain detailed records of material in storage; • Secure legal disposal options and keep chain of custody records; • Provide on-site temporary sanitary facilities, and • Arrange for contractors to empty holding tanks on a regular basis and dispose of in local treatment facilities.	
Noise	• Avoid noisy activities between 10 PM and 7 AM. • Hydraulic construction to be used in preference to percussive techniques where practical; • All plant and equipment will be properly maintained, silenced where appropriate and operated to prevent excessive noise and switched off when not in use; • Loading and unloading of vehicles, dismantling of equipment such as scaffolding or moving equipment or materials around the site will be conducted as far as practicable during day time hours; and • Noise complaints will be immediately investigated.	• Weekly inspections to ensure that appropriate sound abatement measures are being implemented around noisy construction plant and equipment; • Monthly checks to ensure that construction plant, equipment and vehicles are being regularly serviced and maintained to vendor specifications; and • Monthly day and night spot measurements of noise levels at the boundary of the construction site and at the nearest sensitive receptors to demonstrate compliance with IFC noise limits, if complaints of noise are received.
Local Traffic	• Obtain agreement with the local government for transport routes to and from construction sites • Ensure traffic control measures are deployed at locations that require the added safety • Enforce strict speed controls • Accompany all large oversized transport loads with escorts equipped with flashing warning lights on public roads • Ensure delivery of plant and	• Advance selection of transport routes; • Advance scheduling of site deliveries; • Monthly checks of site deliveries to ensure that the appropriate traffic control measures are being implemented; • Monthly surveys of selected transport routes to identify any degradation of public road surfaces; and

Table 15. Construction Mitigation and Monitoring Activities

Environmental Effect	Construction Mitigation Actions	Construction Monitoring
	equipment is planned to minimize trips • Try to schedule deliveries outside peak traffic times	• Spot checks to ensure that large or over-size transport vehicles are accompanied by escort cars.
Cultural Heritage and Archaeology	• Salvage face rock walls for reuse within the terminal buildings, • Salvage plaques, cornerstones and any other items that pertain to the history of the existing terminal buildings, • Retain a qualified professional to be on call to respond to finds • Develop procedures on what to do if a find is made and train construction personnel on the procedure	• Inspection to ensure plan is in place in the unlikely event there is a find; • Inspection prior to demolition activities to identify and mark items to be salvaged, • Inspection to confirm salvaged items are separated and preserved for reuse in the new buildings.
Public and Employee Safety	• Mechanisms for making public announcements (e.g. newspaper / radio) about the construction programme and in particular when public roads will be used by heavy transport vehicles; • Reporting mechanisms for the public to register concerns or complaints regarding perceived risks to their health and safety due to the construction operation; • Incident recording and reporting protocols; • Emergency contact details in the event of an accident. • Develop and implement an emergency plan including spill response • Train all contractor staff in emergency planning and spill response • Develop a detailed health and safety plan • Train all contractor staff on the plan	• Inspection to ensure plans are developed per specifications; • Weekly inspections to ensure employees are working in accordance with plans

7.0 AIRPORT OPERATIONS

The Project is occurring at an existing operating airport. Operations at LPIA will continue throughout the construction period and new facilities will be transitioned into operations upon completion. This section outlines the impacts, mitigation, management and monitoring activities that relate to airport operations.

NAD's operations will comply with:

- All applicable Bahamian environmental laws, regulations and permits in all material respects;
- IFC General Environmental and Social Guidelines (2007) and the specific industrial sector Environmental and Social Guideline for Airports (2007); and
- Its Environmental and Social Management Plan (ESMP – see Section 7.2.1).

Objectives and targets have been established and are provided in the ESMP.

7.1 Airport Operations Impacts, Mitigation, Management and Monitoring

7.1.1 Air Emissions

Impacts on air quality can be generated from the following airport operational activities:

- Aircraft auxiliary power unit (APU) use;
- Mobile diesel ground power units (GPUs) use;
- Aircraft engine start-up, taxiing and take-off;
- Ground support equipment (GSE) and other airside vehicle use;
- Landside vehicle traffic; and
- Emergency back up generator use.

Ground level emissions will occur during APU operation and aircraft engine start-up, taxiing and take-off. Reductions in ground level aircraft emissions will result from the introduction of new aircraft with improved engines and the gradual phasing out of older, less efficient aircraft. While it will be some time before the benefits of new aircraft are realised, they are expected to contribute to reduction in emissions and noise levels.

In preparation of is Airport Master Plan, NAD will model aircraft movements (including ground support equipment) to determine baseline and future conditions using an atmospheric dispersion model, such as, the Emissions and Dispersion Modelling System (EDMS) recommended by the United States Environmental Protection Agency (see Section 7.2.2 Airport Master Plan). EDMS uses information such as the number of flights per day, types of aircraft, taxi length, idling duration, numbers and type of support vehicles and refueling duration and frequency.

The EDMS was developed in the mid-1980s to assess the air quality impacts of proposed airport development projects. In 1998, the FAA identified EDMS as the required model to perform air quality analyses for aviation sources. EDMS is one of the few air quality assessment tools specifically engineered for the aviation community. The

EDMS is designed to assess the air quality impacts of airport emission sources, and contains the latest aircraft engine emission factors from the International Civil Aviation Organization (ICAO) Engine Exhaust Emissions Data Bank. The FAA continues to enhance the model under the guidance of its government/industry advisory board to more effectively determine emission levels and concentrations generated by typical airport emission sources.

NAD will also support international efforts to lobby aircraft engine manufacturers to meet more stringent air quality requirements.

GPUs and APUs are currently used to supply electrical power to aircraft parked at gate positions. Upon completion of the development project, electrical power and air conditioning will be supplied from the aircraft bridges. Air emissions will be improved as aircraft will no longer rely on GPUs or APUs for power. Remote parking and commuter aircraft will still require the use of mobile diesel GPUs.

GSE and airside vehicles are used to service aircraft and to perform other airport activates (e.g., maintenance and inspections). GSE include baggage tugs, catering vehicles, fuel trucks, hydrant carts, and towing tugs. Equipment is operated with diesel or gasoline. NAD will inventory vehicles that operate on the airport to understand baseline conditions. NAD will work with the tenants that operate GSE to encourage them to upgrade their fleets, over time. NAD will target its older vehicles for replacement with newer more efficient vehicles.

Groundvehicle traffic will grow in line with the forecast growth in air travel. The introduction of cleaner fuels and more efficient vehicles will help to counterbalance the increase in vehicle emissions.

Residual impacts on local air quality from airport related emissions are considered to be of low.

Specific improvement to air quality resulting from the development project includes:

- Supplied air and power on the gates eliminating APU use for aircraft that utilize gate positions,
- New emergency diesel powered generators that are more efficient and cleaner burning meeting the 2007 IFC or Florida State requirements for emissions, whichever is more stringent, and
- Air cooling systems that do not use ozone depleting substances.

Management and Monitoring

NAD will develop an **Air Quality Program** as outlined in its ESMP. The ESMP describes the measuring and monitoring activities and tracks actions taken to better understand and reduce impacts on local air quality.

NAD's Air Quality Program consists of the following:

- Inventorying sources of air pollution (mobile and stationary);

- Running the EDMS model on current and forecasted growth in support of the Airport Master Plan;
- Upgrading equipment to newer and less polluting by identifying older equipment for replacement.

Regional air quality issues are complex. Air emission inventories, like ambient air quality monitoring are each only one part of the overall characterization of an air shed. Accounting for the existing concentrations of pollutants in the ambient air requires accurate calculation of the following thee components: an emission inventory of all local sources including both anthropogenic and biogenic point, area, and mobile sources; proven measurement of baseline conditions from continuous ambient air monitoring; and dispersion modeling that incorporates the complexity of local meteorology. While short-term spot sampling can be useful to assist with correlating the results of continuous monitoring to understand local distributions, it should be a supplement to continuous sampling rather than vice versa. It is important to recognize that seasonal and diurnal fluctuations which may be associated with local meteorology and/or differing emission sources may not be captured by short-term monitoring. Speciation of hydrocarbon samples into particular chemical species can aid in determining the source, however, often the products of hydrocarbon combustion are the same from fuel to fuel, with only the relative concentrations of each species varying.

The level of air traffic and good dispersion conditions at the airport to not warrant continuous air monitoring at this time.

7.1.2 Surface and Groundwater

Stormwater runoff from paved surfaces may contain pollutants from leaks and spills of fuels and oils. A number of sources of surface water pollution exist that need to be controlled at the airport. Such sources include surface runoff / drainage from:

- Apron areas, taxiway, runway and parking lots;
- Fuels and hazardous materials storage areas;
- Waste storage and handling areas; and
- Maintenance and vehicle fueling areas.

The shallow groundwater on the airport is known to be contaminated from past spills associated with the operation of the fuel hydrant system.

Specific improvement to surface water quality will result from the development project as the runoff from the new paved parking lots will be discharged into deep wells. Existing aprons, and new apron drainage will be pre-treated through oil/water separators and discharged through swales that eventually drain into Lake Killarney. To prevent possible contamination from fuel spills, the entire apron surface water collection system will utilize gate valves that will allow the system to be closed off from the swales in the event of fuel or other hazardous spills. Spill can then be cleaned within the components of the drainage collection system without a negative impact to the environment.

The impact of flooding will be less following the completion of the development project due to an improved understanding of the airport drainage systems. New fuel storage

tanks and fuel hydrant systems will be less prone to leaks or spills as they will meet United States best industry standards and have leak detection systems.

Management and Monitoring

NAD developed a **Surface Water Quality Program and a Spill Prevention and Response Plan**as outlined in its ESMP. The ESMP describes the measuring and monitoring activities and tracks actions taken to manage surface and ground water discharges.

A Surface Water Quality program has been developed to improve surface water quality at discharge points. The program will include the following:

- Pollution Prevention
- Surface Water Quality Sampling

Pollution Prevention

Emphasis will be placed on improving the management practices of use, storage, and disposal of hazardous materials. See the hazardous material management program for details (Section 7.1.5).

Surface Water Quality Sampling

Surface water quality sampling will be initiated following the construction of the new apron associated with Stage 1 to ensure waters reaching Lake Killarney are within acceptable limits. Sampling stations will be determined and sampling will occur monthly in the wet season. Storm event sampling will be undertaken once per wet season.

The IFC publishes guidelines for effluent discharge.These guidelines are for the design, construction and operation of airports and associated facilities. Storm water and runoff must not exceed the limits shown in **Table 16** before being discharged to surface waters. Site specific standards need to be developed through consultation with local authorities.

Table 16. IFC Effluent Standards for Airport Facilities

(Milligrams per litre, except for pH, bacteria, and temperature)

Parameter	Maximum Value
pH	6-9
BOD	30
COD	125
TSS	50
Oil and grease	10
Heavy Metals Total	10
Arsenic	0.1
Cadmium	0.1
Chromium: Hexavalent Total	 0.1 0.5
Copper	0.5
Iron	3.5
Lead	0.1
Mercury	0.01
Nickel	0.5
Selenium	0.1
Silver	0.5
Zinc	2.0
Cyanide: Free Total	 0.1 1.0
Ammonia	10
Fluoride	20
Chlorine (total residual)	0.2
Phenol	0.5
Phosphorous	2.0
Sulphide	1.0
Coliform bacteria	< 400 MPN/100ml
Temperature increases	< 3°C[a]

7.1.3 Contaminated Soil and Groundwater

Specific improvement to reduce the risk of existing contaminated sites will result from the completion of the development project. The demolition of the international pier and rehabilitation of the existing apron will provide an opportunity for the Joint Operator to accelerate the remediation effort.

Management and Monitoring

NAD has developed a **Contaminated Site Management Program** as outlined in its ESMP. The ESMP describes the measuring and monitoring activities and tracks actions taken to operate the groundwater monitoring system and to prioritize, investigate and

remediate potential contaminated sites identified in the Baseline Report. The Contaminated Site Management Program consists of the following:

- Groundwater monitoring program
- Contaminated Site Registry
- Identification of Additional Contaminated Sites

The State of Florida regulations for the remediation of contaminated sites is adopted as the guideline for LPIA.

- Chapter 62-770 Petroleum Contaminated Site Cleanup Criteria
- Chapter 62-780 Contaminated Site Cleanup Criteria

Groundwater Monitoring Program

A groundwater monitoring system was installed during the Phase II Site Assessment. The objective of this monitoring system is to provide early warning of groundwater migration, in particular, towards the Windsor Well Fields, a surface potable water collection system.

NAD contracted Delta Environmental (under contract number 5A071-290 (Ground Water Sampling dated October 4, 2007) to undertake the following:

Conduct one year of quarterly sampling for the wells sampled for the Phase II investigation in August 2007. Monitoring wells included in this investigation are MW-101, MW-104, MW-106, MW-108, MW-110, MW-111, MW-115, MW-116, MW-117, and MW-118, as well as Chevron wells MW-20, MW-21, MW-22, MW-24, MW-47, MW-50, and MW-51.

Detailed methodology is described as documented within Delta Environmental's proposal appended to the contract.Each well is gauged for water and product levels, and then sampled.Samples will be shipped via chain of custody to a lab for VOCs using method SW-846 8260B and TPH using Texas Method 1005. The lab will provide a report.

Following the completion of a full year of monitoring, the sampling schedule will be re-evaluated, and a reduced sampling scheduled considered if groundwater concentrations appear stable or declining. Delta Environmental prepares quarterly reports and will prepare a detailed report after the October 2008 sampling event that includes recommendations for the ongoing program. Each quarterly report and the first year report will be provided to the BEST Commission in a timely manner.

Contaminated Site Registry

The Manager of Public Safety maintains a contaminated site registry that records important information about each potential contaminated site. This registry is shared and accessible to the following NAD departments:

- Environment
- Health and Safety

- Commercial Leasing
- Engineering
- Maintenance
- Legal

Data recorded in the contaminated site registry includes the following:

- Location
- Owner
- Date of creation (existed prior to takeover or a specific date if it occurred after takeover)
- Likely cause
- Level of risk (High, Medium, Low)
- Actions taken
- Reference reports, memos, letters

The purpose of maintaining a contaminated site registry and sharing it with key departments is to prevent accidental contact with contaminated soils or groundwater. Potential lessees of existing contaminated sites should have all information disclosed to them. The responsible party must be determined. All new construction projects and maintenance projects that require excavation should be reviewed by the person with most knowledge about the existing contaminated sites.

Delta environmental has recommended a level of action for each potential contaminated site, which includes, for example:

- no action,
- monitor,
- further assessment,
- remediate, and/or or
- manage in place.

No action indicates that the likelihood of the site posing harm to human health or the environment is very low or that the site is in an area that cannot be disturbed (e.g., under the runway), or that the level of contamination is below regulatory limits appropriate to the land use. Sites deemed no action required should be recorded in the contaminated site registry.

A site is identified as requiring **monitoring** when the likelihood of the site posing harm to human health or the environment is very low. However, there is uncertainty if existing contamination is migrating. Generally, a consultant will recommend that monitoring wells be installed in a down gradient direction (hydraulically) and sampled on a regular basis (quarterly, semi annually or annually). Monitoring wells will be sampled initially following an appropriate period of rest and development. After a period of time and multiple rounds of sampling, the consultant might recommend that the monitoring stop, be expanded or other action taken (install additional wells or take action to prevent migration). Monitoring does require that a qualified consultant remain involved to review sampling results and make recommendations. Sampling of wells should only be done by qualified persons. Airport staff can be trained and equipped to undertake sampling.

Further assessment will be recommended for the following reasons:

- To confirm the presence or absence of contamination,
- To assess the risk of the contamination (e.g., is it migrating towards a receptor, is it at levels that pose a risk to human health or the environment, etc),
- To determine the extent and nature of the contamination.

Further assessment activities include installing monitoring wells, soil borings and / or test pits, for example. Further assessment should be conducted by a qualified consultant.

Remediation is recommended when the likelihood of the site posing harm to human health or the environment is medium or high. Other attributes that trigger remediation should be identified specific to an individual airport, for example protection of buildings (e.g., terminals) and groundwater extraction systems (heating, cooling, irrigation or potable).

A qualified consultant will recommend the type of remediation and cost. Several options should be explored with the risks and costs evaluated. Remediation could be the removal by excavation (soil), pumping and treating for groundwater or more complex depending on the nature and extent of the contamination.

Contamination can be **left in place** where conditions are favorable. For example, the site is not needed or cannot be used for development, the contaminants are of the nature that they do not migrate, or the geologic and biologic conditions present are breaking down the contamination. Generally monitoring is required for this option.
It is common one or more of these options are required to manage a contaminated site.

Unidentified or New Contaminated Sites

While baseline assessments try to identify all existing contaminated sites, they can miss sites as the scope of the assessment includes the entire airport. This section also provides information on how to conduct further review on a smaller scale.

A site assessment should be conducted for the following activities:

- Land Leasing,
- New Construction,
- Maintenance where significant excavation is required, and
- Following spills of hazardous materials.

Land Leasing

New land leases should include detailed statements that require tenants to prevent contaminating the land and being financially responsible to remediate if damaged. Baseline conditions should be established prior to the tenant entering into a lease. Video footage or photographs of the visual appearance should be kept on record to document the visual condition prior to the tenant taking possession.

The environmental site assessments that the airport operator conducts do not in anyway relieve the tenant of any need to conduct its own due diligence.

The objective is to conduct a Phase I environmental site assessment to identify any areas of potential environmental concern or liability and to record the condition of the land at the present time. The purpose is to identify any actual or potential contamination.

Pending the type amenities and the purpose of the lease, the detailed assessment may need to include an assessment of the following (including abatement recommendations and cost estimates):

- Asbestos-Containing Materials,
- Lead-based Paint,
- Other hazardous building materials, and
- Archaeological / Cultural / Historical

Site assessments conducted for land leasing purposes are kept on file within the Commercial Leasing Department.

New Construction

A Phase I environmental site assessment to identify any areas of potential environmental concern or liability should be completed at the **design phase** of the project. Further assessment might be required to confirm the presence of contamination. The cost and method for addressing the contamination will need to be included in the project cost.

Maintenance Projects

Generally, if excavation is within previously disturbed ground the risk is lower to contact contaminated soil. However, utility corridors make excellent conduits for contamination. Contaminated groundwater can travel great distances from its source. Sometimes the original installation was within a contaminated area that was not recorded nor properly addressed at the time. Therefore, maintenance projects that require excavation should be reviewed by a qualified person. Project managers also need to be prepared to act responsibly if contaminated land or water is discovered. In the event of a discovery after the project is initiated, a qualified consultant will need to be brought in as quickly as possible to determine the nature and extent of the contamination. **Any soils that must be or have been removed should be placed on plastic and covered with plastic.** These soils should not be mixed with clean material until a qualified person has tested them.

Hazardous Material Spills

The owner of the hazardous material that is accidentally spilled is responsible for undertaking appropriate assessment and clean up activities. This requirement should be clearly stated within all leases. If a tenant / owner do not act in a timely nor responsible manner, NAD must be prepared to step in and takeover the investigation and clean up activities and recover the costs. All spill locations that were not fully contained on a hard surface should be recorded in the contaminated site registry.

7.1.4 Resource Consumption

The new structures and renovated existing structures will be designed to be energy efficient and to incorporate sustainable design concepts. From an architectural perspective, heat-gain will be minimized by providing roof overhangs and limiting glazing to the amount necessary to provide passengers with airside views. Mechanical and electrical energy efficiency will be achieved through use of current technologies such as solar power, day lighting strategies and computer controls. Plumbing systems will incorporate water efficient fixtures with hands free operation, and solar energy will be used for hot water generation.

Management and Monitoring

The consumption of resources, such as water and energy (including fuels and electricity) is, to an extent, a controllable operating cost. NAD has developed a **Resource Management Program** as outlined in its ESMP. The first step to reducing consumption of resources, is understanding baseline conditions. NAD ensures all water and energy use is monitored. The ESMP describes the measuring and monitoring activities and tracks actions taken to improve the efficiency of consuming resources, in particular water and energy (electricity and fuels). As the facilities expand and passengers increase, the consumption of resources will also increase. Simply being more efficient will slow the rate of increase.

NAD will support Bahamian efforts to develop national standards for natural resource management by participating in pilot studies and providing information on natural resource consumption and purchasing practices.

The Resource Management Program consists of:

- Monitoring Resource Consumption;
- Purchasing Program

NAD will track and report its resource consumption (e.g., fuels, electricity and water). Opportunities to reduce resource consumption will identified and implemented where justified.

Purchasing Program

NAD will consider resource efficiency and specify materials are made from rapidly renewable or recycled sources wherever when making purchasing decisions. Commonly, fuel use is closely related to air emissions, therefore, purchasing more fuel efficient fuel burning equipment (e.g., vehicles), will also reduce air emissions.

The criteria for resource efficiency include the following:

- Recycled content;
- Natural, plentiful or renewable;
- Resource efficient manufacturing process;
- Locally available;

- Salvaged, refurbished, or remanufactured;
- Reusable or recyclable;
- Recycled or recyclable product packaging; and
- Durable.

7.1.5 Solid Waste and Hazardous Materials

Solid waste generation per passenger is estimated at 0.6729 pounds per passenger. Based on this estimation, waste volumes will grow from 2,018,800 pounds for one year (2006/07) to an estimated 3,075,153 pounds in 2015 to an estimated 3,555,603 pounds in 2020. These numbers assume no recycling. This per passenger estimate is high for international airports. These estimates will be refined as better data is collected.

As a result of the development project, waste collection and storage systems will be improved for handing, storing, and separating terminal domestic and international waste.

Management and Monitoring

NAD has developed a **Solid Waste Management Program and a Hazardous Materials Management Program**to ensure hazardous materials required for airport maintenance activities and the solid waste and hazardous waste generated from operational maintenance activities will be appropriately segregated, containerised and managed as outlined in the ESMP. The ESMP describes the measuring and monitoring activities and tracks actions taken to manage solid waste and hazardous materials (including waste).

Solid Waste Management

The Solid Waste Management Program consists of the following:

- Tracking and Monitoring Waste Disposal
- International Waste

Tracking and Monitoring Waste Disposal

Better data is required on the types and sources of solid waste. Dumpster audits will occur from time to time to estimate the type and source of waste being disposed of in the various bins NAD has on the airport. This data will be used to target reduction in generated waste.

International Waste

At present, all domestic and international waste is mixed at the source and disposed of in the New Providence Landfill. However, this is in contravention of the Pan American Health Organization guidelines to prevent the spread of animal diseases. International waste is supposed to be segregated at the source, transported separately to the landfill, and disposed of within a designated area per instructions from the DEHS. An alternative to land filling will be evaluated further. Bahamas Waste Limited operates an autoclave for the treatment of medical waste. This technology is acceptable for the

treatment of international waste. The waste is heated to 1,600 degrees Fahrenheit and the unit has a 1,000-pound capacity per cycle. Any alternative to land filling will be evaluated and approved by the DEHS.

Hazardous Materials

The Bahamas hazardous materials requirements are found in the Environmental Health and Services Act which has been in force in The Bahamas since 1987. The basic requirements of the Environmental Health and Services Act prohibit anyone from depositing, adding to, emitting or discharging into the environment any contaminant or pollutant from any source.

The IFC general EHS and airport specific guidelines contain additional guidance in the storage and handling of fuel and hazardous materials. Aviation fuelling is addressed in industry specific standards.

Florida State regulations should be used as guidelines for above and belowground fuel storage tanks:

- Aboveground Storage Tank Systems (Chapter 62-762)
- Belowground Storage Tank Systems (Chapter 62-761)

NAD's Hazardous Materials Management Program consists of the following:

- Safe Storage and Disposal of Hazardous Waste
- Hazardous Building Materials
- Tracking and Monitoring Hazardous Waste Disposal
- Spill Response Plan

Safe Storage and Disposal of Hazardous Waste

All non-hazardous wastes shall be stored, collected and disposed of in accordance with the ESMP for operations. Specific guidelines that apply include the following:

- The storage area shall be readily accessible to collection vehicles;
- Storage areas shall be of adequate size and capacity to accommodate the required number of containers consistent with the waste generated and collection schedules;
- Containers shall be clearly labelled for their intended use and equipped with lids;
- Containers and waste storage areas shall be cleaned on a regular basis; and
- Waste material shall be removed to the disposal site at the earliest opportunity.

The Emergency Planning and Environment Coordinator prepared and distributed guidelines to tenants on storage and handling of hazardous materials in July 2008.

All hazardous wastes will be temporarily stored on site. Management procedures for the handling, storage and disposal of hazardous wastes will include, but not necessarily be limited to the following:

- Hazardous waste storage areas shall be designed to have spill containment systems;
- Hazardous waste storage areas shall be protected to avoid runoff to and from the storage area and have facilities to monitor and pre-treat any runoff;
- Containment curbs shall be maintained around the loading/unloading area ;
- Containers and storage tanks shall be comprised of suitable material to permanently contain the hazardous waste and be clearly identifiable;
- Storage areas shall be inspected regularly for leakage;
- Incompatible materials shall not be stored in common containers;
- The surface impoundment used to store hazardous wastes shall be adequately lined and leakage monitoring and detection equipment installed; and
- The storage areas shall be paved and appropriately lit with clear signage.

Hazardous Building Materials

Hazardous building materials within the terminal buildings impacted by the Expansion Project are documented in a report prepared by Parks Environmental Consulting, Inc in September 14, 2007. Areas of mould and mildew identified within this report were brought to the attention of building maintenance. NAD's Maintenance Department will inspect and clean air conditioning filters and ducts on a regular basis and clean up areas of mould and mildew. The new terminal buildings following the completion of the Expansion Project should have fewer leaks, which lead to mould and mildew.

Areas containing asbestos (currently only the roofing materials) will be well marked on drawings and noted in maintenance procedures.

Hazardous building material surveys will be undertaken in any buildings proposed for renovations of demolition. The surveys will be conducted by NAD for buildings within its control and by tenants for buildings within tenant control.

NAD will keep inventories of all hazardous waste within its control. Information maintained will include amount and type of waste, waste source, dates, quantity, and disposal. Opportunities to reduce the generation of waste will be considered.

Spill Response Plan

NAD will develop a site specific spill prevention and response plan. A generic spill response action list is provided in **Table 17**.

The spill response plan will address the following, at a minimum:

- Plan Activation / Notification
- Identification of high risk areas
- Specific protection / containment / clean-up measures
- Resources available
- Disposal.

A sample risk assessment matrix is provided in **Table 18**. NAD will use these resources and many more to develop its own spill response plan.

Table 17. Generic Initial Response Actions for Spills on Airport Property

STEP	ACTION
ENSURE SAFETY	☐ Never rush in. Warn others in the immediate area. ☐ Eliminate all sources of ignition, if required. ☐ Notify the Fire Department whenever there is <u>any</u> safety risk. (e.g., all Gasoline and Jet B spills). Ambulance services and Police should be notified as required. ☐ Immediately isolate the spill area. ☐ Follow standard safe work procedures. ☐ Use appropriate personal protective equipment. ☐ Stay upwind of spill vapours. Stay out of low areas. ☐ Do not touch or walk through spilled substances.
STOP PRODUCT FLOW	☐ Act quickly. Only attempt to stop the product flow if it is safe to do so. ☐ Close valves. ☐ Set containers up right (e.g., drums, pails)
SECURE THE AREA	☐ Clear the area of all non-essential or untrained personnel. ☐ Initially isolate larger spills for 25 to 50 m in all directions, if required. ☐ Limit or prevent access to the site. ☐ Enforce safety procedures.
ASSESS SITUATION	☐ Quickly and accurately gather spill details that need to be communicated to response personnel and authorities. ☐ Use the Report of Hazardous Substances Release form for guidance. ☐ Additional data should include: ✔ Material spilled (if known) ✔ affected areas ✔ situation under control or escalating? ✔ initial proposed tactics to contain / control spill ✔ assistance required
NOTIFICATION	☐ Notify the Responsible Party Person-In-Charge. ☐ Notify Fire Department or Airport Operations. ☐ Notify appropriate Government Agencies when safe and practicable to do so.
CONTAINMENT, RECOVERY, DISPOSAL	☐ Larger spill should be handled by qualified contractors. ☐ Initiate physical response actions to limit the spread of the spill. ☐ Recover product using appropriate equipment such as sorbent material, explosion proof pumps, and spark proof shovels, etc. ☐ Store recovered material in contained, well-ventilated area and arrange for disposal.
DOCUMENTATION	☐ Complete required reports and forward to appropriate persons/Agencies.

Table 18. Sample Risk Assessment

Area of Activity	Potential Spill Source	Potential Control Measures	Potential Spill Impact Considerations

Table 18. Sample Risk Assessment

Area of Activity	Potential Spill Source	Potential Control Measures	Potential Spill Impact Considerations
Underground Storage Tanks	Failure of tank	• Daily inventory reconciliations? • Double-walled tanks? • Electronic monitoring?	• Estimated size of spill? • Largest tank? • Estimated length of time to discover spill? • Likely migration of product underground? Will product seep into waterways, drinking water, etc.
Aboveground Storage Tanks	Tank overflow during filling or major tank failure	• Visual inspection? • Spill containment dikes? • Impermeable tank farm liner? • Low level, high level, and high-high level alarms? • Double walled tanks?	• Estimated size of spill? • Largest tank? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Mobile Aviation Refueller Loading Facility	Tank overflow during refueller loading	• Concrete pads leading to catch basin and petroleum oil/water separator? • Attended loading? • Sensors shut-down pump(s)?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Fuel Transfer Pumps	Pump seal failure	• Heat sensor shuts down pump(s)? • Audible and visual alarms? • Spill containment?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Underground Pipelines	Pipeline / valve failure	• Pipelines are designed with flanges only at valves? • Emergency pump stop switches? • Leak detection system? • Testing program? • Corrosion protection of underground tanks and pipes? • Monitoring wells? • Isolation valves?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product?
Aboveground Pipelines	Pipeline / valve failure	• Pipelines designed with flanges only at valves? • Visual inspection of aboveground lines? • Emergency pump stop switches? • Testing program? • Isolation valves?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?

Table 18. Sample Risk Assessment

Area of Activity	Potential Spill Source	Potential Control Measures	Potential Spill Impact Considerations
Hoses / Fuel Nozzles	Fuel hose / fuel nozzle failure	• Attended? • Emergency pump stop switches? • Fuel handling hose inspection program?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Mobile Aviation Refuellers	Accident / tank failure	• Driver training program? • Visual maintenance inspection?	• Estimated size of spill? • Largest tank / compartment? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Aircraft Vents	Over filling of aircraft tanks / aircraft mechanical problem (e.g., fuel valve) / heat expansion	• Attended? • Emergency pump stop?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Propane Gas, Welding Gas, Other Gases	Leaking valves / valve damage	• Stored outside or in well ventilated area? • Storage in a secure area (i.e., fenced enclosure)?	• Flammability, corrosiveness, asphyxiation potential, oxidizer, other hazards? • Largest cylinder? • Estimated length of time to discover spill? • Likely migration of product vapours?
Flammable Product Container Storage Cabinets	Leaking Container	• Cabinet designed and manufactured to conform to NFPA standards, OSHA regulations, or similar standards for storage of flammable and combustible liquids?	• Flammability, corrosiveness, asphyxiation potential, oxidizer, other hazards? • Largest container? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Lube Oil Room	Pump seal failure / Leaking drum/package	• Spill containment?	• Flammability, corrosiveness, asphyxiation potential, oxidizer, other hazards? • Largest container? • Estimated length of time to discover spill? • Likely migration of product?
Electrical Transformers	Over Heating	• Pressure relief vent? • Area fenced? • Mineral Oil?	• Estimated size of spill? • Largest amount of oil in transformer?

Table 18. Sample Risk Assessment

Area of Activity	Potential Spill Source	Potential Control Measures	Potential Spill Impact Considerations
		• Spill Containment?	• Estimated length of time to discover spill? • Likely migration of product?
PCB Filled Light Ballast	Leaking Ballast	• Schedule in replace or remove PCB filled light ballast from service?	• Estimated size of leak? • Estimated length of time to discover leak? • Likely migration of product?
Asbestos	Accidental Damage	• Encapsulate? • Remove?	• Airborne fibres?
Mercury Filled Thermostats	Accidental Damage	• Secondary Containment?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product?
Air Cargo Hazardous Material Handling (Dangerous Goods)	Damage Container	• Segregated storage area? • Concrete floor, weather protected area? • Material Safety Data Sheets? • Transportation of dangerous goods Placards?	• Estimated size of spill? • Estimated length of time to discover spill? • Likely migration of product? • Vapour migration?
Aircraft Painting	Failure or tipping of paint containers Solvent vapours	• Spill containment? • Ventilation?	• Flammability, asphyxiation potential, other hazards? • Largest container? • Estimated length of time to discover spill? • Likely migration of liquid product? • Likely migration of vapours?

7.1.6 Sewage Effluents

The aircraft lavatory dump station is within the development area. The current design has the pit opening at the top of a mound to prevent rain water from entering the system, which lends to spills of waste material. As a result of the development project, a new aircraft lavatory dump station will be constructed. This facility will be designed to minimize rain water from entering the system and to facilitate the cleaning of accidental spills.

The capacity of the existing sanitary treatment facility is expected to be sufficient for the next ten years. The aircraft lavatory dump (macerator), control tower, cargo building and terminals are connected to the sanitary treatment facility. All other buildings have septic tanks, septic fields or cess pits.

Management and Monitoring

NAD has developed a **Sewerage Effluent Management Program** as outlined in its ESMP to improve the handling of sewerage effluents at the airport. The focus will be on the numerous tenants using septic fields and cess pits for sewage disposal. The ESMP describes the measuring and monitoring activities and tracks actions taken to manage sewerage effluent and aircraft lavatory waste. The Sewerage Effluent Management Program consists of:

- Locating and tracking all sewage cess pits and septic tanks and fields located on airport lands.
- Ensuring new systems meet DEHS requirements.

7.1.7 Flora and Fauna

There are two main causes to potential impacts on fauna during airport operations as follows:

- Lighting; and
- Wildlife strike.

With the exception of the terminal and apron lighting, runway and taxiway lighting is a low level and intensity, as such its associated impact is classed as being of negligible significance. Although the apron lighting will be of a much higher intensity, the lighting will be directed as much as possible. The impact of additional lighting on fauna is considered to be low.

An important operational safety risk for airports is wildlife strikes. The point of impact is usually any forward-facing edge of the aircraft, although with jet engine aircraft the animal is frequently sucked into the engine, causing damage to the fans or the housing or airflow ducts. Bird strikes can also cause major damage to an aircraft's wings and fuselage.

A bird strike can be defined as occurring when:

- A pilot reports a strike;
- Maintenance personnel report that aircraft damage is due to a wildlife strike;
- Airport personnel report seeing a wildlife strike; and / or
- Airport personnel find wildlife remains on airside areas within 150 ft to 250 ft of a runway centre line and no other cause of death can be identified.

Most bird strikes happen close to the ground, where the majority of the birds are found, hence bird strikes happen most often during take off or landing or during low altitude flight. Bird strikes have however, also been reported at high altitudes.

Management and Monitoring

A comprehensive **Wildlife Management Plan**has been developed and implemented (**Appendix J**). The Plan will promote aviation safety for passengers and flight crews by

reducing wildlife hazards and associated risks to aircraft and airport operations caused by wildlife activities on and in the vicinity of the airport.

There are tools and techniques available to manage wildlife hazards associated with airports at an acceptable risk level. Approaches to minimising the potential for serious bird strikes at airports have focused on five primary areas:

1. Manipulating habitat and access to habitat at or near the airport ("passive");
2. Dispersing, removing or excluding wildlife from the airport ("active");
3. Influencing land use decisions around the airport where they may increase the hazard to aircraft;
4. Development of systems to warn of bird strike potential; and
5. Development of aircraft and engines able to withstand bird strikes.

NAD's approach to bird strike management is based on the above five control measures focussing on measures 1 through 4. NAD has employed the expertise of Gary Searing, LGL Ltd. in Victoria British Columbia, Canada, supported by biologists from the local firm Island by Design to develop and implement the management strategy. NAD will record all wildlife strikes in accordance with the Wildlife Management Plan.

7.1.8 Noise and Vibration

Aircraft take-off and landings account for largest source of noise from operating the airport. At present, there are no zoning restrictions on New Providence Island that prevent residential development in areas impacted by the arriving and departing flights at LPIA. Work is underway to develop a land planning strategy for New Providence Island and NAD intends to participate to protect for future growth of airport operations.

Operating noise will be decreased as a result of the development project as aircraft will not be operating APUs or using mobile diesel powered GPUs while parked at the gate.

As The Bahamas is a member of the International Civil Aviation Organisation (ICAO) the following policies and guidelines are applicable to environmental management of Lynden Pindling International Airport:

- ICAO Policies and Practices related to Environmental Protection (Resolution A33-7);
- ACI Policy Handbook, 4th Edition, 2003, Chapter 6 - Airports and the Environment;
- ICAO Annex 14 to the Convention on International Civil Aviation (Aerodromes);
- ICAO Annex 16 to the Convention on International Civil Aviation (Environmental Protection):

The ICAO policy on the environment is to achieve maximum compatibility between the safe and orderly development of civil aviation and the quality of the environment through limiting or reducing the number of people affected by aircraft noise

ICAO's current environmental activities are largely undertaken through the Committee on Aviation Environmental Protection (CAEP) that was established in 1983. CAEP produces annual meeting reports, which provide recommendations for adoption by the

ICAO Council. ICAO has produced the following documentation related to environmental management (for both airports and aircraft):

- Environmental Technical Manual on the Use of Procedures in the Noise Certification of Aircraft (Doc 9501);
- Recommended Method for Computing Noise Contours Around Airports (Circular 205);
- Airport Planning Manual, Part 2 – Land Use and Environmental Control (Doc 9184);
- Guidance on the Balanced Approach to Aircraft Noise Management (Doc 9829); and
- Policies on Charges for Airports and Air Navigation Services (Doc 9082/6).

Management and Monitoring

NAD will develop an **Aeronautical Noise Management Program** as outlined in its ESMP. The ESMP describes the measuring and monitoring activities and tracks actions to minimize the impact on surrounding communities from the operation of aircraft.

The Aeronautical Noise Management Program consists of:

- Gathering Data to Support Noise Modelling
- Recording and Responding to Noise Complaints

Noise Modelling

NAD will define an airport area of influence based on future growth predictions that takes into account noise exposure in preparing an Airport Master Plan (Section 7.2.2). NAD will also consider using supplemental metrics in order to identify potential noise issues where average cumulative metrics like Day-Evening-Night Average Sound Level Contours (L_{den}) may not provide full insight to issues. This approach will help NAD define effective noise abatement alternatives outside of the L_{den} contours.

To prepare a comprehensive airport noise contour based on actual operations, NAD is collecting information for each arrival and departure operation. For each flight, the following information is being collected:

- Date of operation
- Time of operation
- Flight number
- Operation type – arrival, departure, training, overshoot, etc.
- Runway used
- Aircraft Type
- Origin or destination

This information forms the baseline of existing aircraft operations, and can be modified accordingly to create future noise based on forecasted growth.

Noise Complaints

Noise complaints will be recorded and analyzed in accordance with the ESMP for operations. However, no noise complaints have been received since NAD began operating the airport.

When receiving and responding to a noise complaint, the following information is recorded as requested from the complainant:

- Phone number
- Date and time of call
- Date and time of event
- Address
- Details of complaint:
    a. Operation
    b. Complaint (excessive noise, sleep disturbance, flight frequency, low flying, etc.)
    c. Runway in use
    d. Aircraft type
- Details of the investigation and follow up action

This information will be used to assess trends and identify key community issues. Reports can be prepared on a quarterly and annual basis.

7.1.9 Traffic

The development project will result in the improvement of access to the airport for vehicles off of JFK Road and into parking facilities. The airside vehicle access and security point will be moved and improved.

NAD will be undertaking an Airport Master Plan (see Section 7.2.2) that will evaluate the capacity of roadways leading to and on the airport for airport related traffic. Future roadway improvements, if required, will be identified in the Airport Master Plan.

7.1.10 Public and Employee Health and Safety

NAD takes its responsibilities for public and employee safety very seriously. NAD has developed**Safety Management System,Emergency Plans and an Employee Health and Safety Program** as outlined in its ESMP. Key elements that will be addressed by the employee health and safety program include exposure to noise and physical (including heat exposure) and chemical hazards. Maintenance programs will also be established to prevent mould and mildew within air conditioning systems and as a result of water leaks. The ESMP describes the measuring and monitoring activities and tracks actions taken to improve public and employee health and safety.

NAD will work with The Bahamas National Trust who manages the pine forests in the vicinity of the airport to prevent wildfires that can impact on airport operations. NAD understands that The Bahamas National Trust is pursuing an amendment to the Fire Act to allow controlled burns. NAD understands that a good forest management program

that includes control burning is necessary to minimize the risk of wildfires. Controlled burns will need to be coordinated with airport operations to avoid impacts on operation.

As a result of the development project, emergency exits and evacuation plans will be improved.

7.1.11 Cultural Heritage and Archaeology

NAD values the history LPIA (formally Windsor Field) played in the development of The Bahamas.As a result of the development project, important items of historic or cultural importance salvaged from the existing facilities will be incorporated within the new terminal buildings. If possible, a display of historic information and photographs will be included.

To ensure the preservation and protection of the cultural heritage and archaeology, all future development projects will be reviewed and evaluated within the **Environmental Impact and Construction Monitoring Program** as outlined in NAD's ESMP.

Environmental Impact and Construction Monitoring

NAD's Environmental Impact and Construction Monitoring Program has been developed to ensure development and construction projects, outside of the Expansion Project, are properly assessed and monitored to minimize environmental impacts, such as the loss or damage to cultural heritage or damage, loss or theft of items of historical significance.

NAD will screen each proposed development project and every large construction project for impacts to the environment. Further technical assessment may be conducted or further impact assessment may be required. This will be determined through consultation with the appropriate authorities.

7.1.12 Employment

The proposed airport construction program and the expanded and renovated airport will result in a positive impact on local population and economy by creating short-term and long-term employment opportunities.

If the local job force cannot support the construction project in terms of number of workers and skills, the contractor will import workers following the requirements in The Bahamas.

The Labour Act and the Employment Act in the Bahamas are progressive and generally meeting North American standards. NAD states within its Environmental and Social Policy that it "provides full support to the environmental and social aspects of sustainability through actions of continual improvement, including: …exceeding or complying with all applicable laws and regulations; and, …investing in our employees' health and safety." In addition to complying with the laws, NAD has developed a human resource policy addressing hiring and promotion. NAD also has a training manual that includes a training policy.

7.1.13 Local Economy

There is likely to be a direct positive economic impact to enterprises operating in the vicinity of the airport from business opportunities at the airport and in surrounding areas. In addition, the airport development is expected to generate indirect positive impact on the tourism industry (hotels, retail, hospitality, and restaurants, transport (car rental/coach buses) by increasing tourism revenues through increased numbers of tourists over time and the enhanced image of Nassau as an international tourist destination.

No specific management and monitoring requirements are considered necessary for this positive project impact. Other than NAD management will stay in close communication with government agencies to communicate business opportunities.

7.2 Environmental Management – Operations

7.2.1 Environment and Social Management Plan

NAD has developed an ESMP for airport operations. This plan has seven sections:
Section 1. Introduction
Section 2. Environment and Social Management Plan Organization and Format
Section 3. Environment and Social Policies
Section 4. Legislation and Other Requirements
Section 5. Accountability
Section 6. Environment and Social Management
Section 7. Environment and Social Management Plans

The ESMP for operations is the responsibility of the Emergency Planning and Environment Coordinator for NAD.

The following is NAD's environmental policy:

Environmental and Social Policy

We envision a sustainable future for Lynden Pindling International Airport and will advance this vision by increasing our contribution to the economic, social and environmental well-being of The Bahamas. Our primary social responsibility is for providing world class airport facilities that will meet the predicted passenger growth in a financially sound manner. Because our business depends on building and maintaining healthy relationships with stakeholders, customers, communities and employees, we will act ethically and in a manner worthy of their respect.

Our Policy provides full support to the environmental and social aspects of sustainability through actions of continual improvement, including:

- minimizing risk and contributing to improved economic performance through the implementation of environmental and social plans and programs for Lynden Pindling International Airport,
- exceeding or complying with all applicable laws and regulations,
- preventing pollution through using best available technology, where cost effective,
- investing in our employees' health and safety,
- building relationships and encouraging specific stakeholder engagement on environmental and social aspects of operations and developments,
- training, supporting and motivating our employees and business partners to be aware of and meet their environmental and social responsibilities,
- setting specific measurable environmental and social objectives and targets and publicly reporting the results,
- being accountable for our actions and impacts, responding promptly to incidents or risks arising from our business,
- preparing for emergencies and coordinating contingency plans with responsible authorities and adjacent communities, and
- promoting the principles of energy efficiency and resource conservation.

Accountability for environmental and social responsibilities exists across all departments and levels of management within NAD.

The Board of Directors oversees the business conduct of NAD and the activities of management. The Board's fundamental role is to ensure that NAD fulfills its objectives on an ongoing basis and operates in a safe, efficient and reliable manner.

The President and Chief Executive Officer is responsible for implementation of the environmental and social policies, compliance with regulatory requirements, and for ensuring management has appropriate systems in place to manage environmental and social risks.

The Executive Team provides leadership, direction and management for environmental and social issues within each of their divisions.

The Emergency Planning and Environment Coordinator, who reports to the Manager of Public Safety, provides environmental management knowledge, leadership and support to all departments through three key functions:

- Program development and implementation (as detailed in the ESMP for operations);
- Stakeholder communications including raising awareness, training and reporting, and;
- Implementation of the environmental and social management system (as detailed in the ESMP for operations).

All NAD employees are responsible for:

- knowing and abiding by safe work and environmental procedures and practicing safety and environmental stewardship in their personal work habits;
- demanding and expecting safe work and environmental stewardship practices among their fellow employees;
- reporting hazardous conditions to supervisors;
- co-operating in the resolution of safety and environmental problems in the workplace and initiating suggestions for improvements; and
- assisting in the induction and on-going training of others where their experience and knowledge is lacking.

All of NAD tenants are responsible for:

- knowing and abiding by Bahamian laws, regulations and their leases;
- demanding and expecting safe work and environmental stewardship practices among their employees and providing any required training;
- reporting hazardous conditions, accidents and spills of hazardous or polluting substances to NAD;
- Implementing Environmental Management Plans, if the tenant has high risk activities;
- cleaning up and / or making repairs at their cost if they have spills or accidents;
- Co-operating in the resolution of safety and environmental problems in common areas and initiating suggestions for improvements.

All of NAD contractors are responsible for:

- knowing and abiding by Bahamian laws, regulations and their contracts;
- Implementing environmental and social management plans and reporting on a predetermined basis their progress on meeting the plans;
- demanding and expecting safe work and environmental stewardship practices among their employees and providing any required training;
- reporting hazardous conditions, accidents and spills of hazardous or polluting substances to NAD;
- cleaning up and / or making repairs at their cost if they have spills or accidents;
- Co-operating in the resolution of safety and environmental problems in common areas and initiating suggestions for improvements.

NAD's ESMP for operations is developed generally consistent with ISO 14001 Environmental Management System Specification and describes the management activities necessary to achieve the policy. The ESMP for operations outlines the following management activities:

- Environment and Social Awareness
- Records and Document Control
- Auditing
- Identification of Environment and Social issues
- Reporting

The ESMP for operations provides details on environment and social programs. Key details the programs are provided in Section 7.1. Specific objectives and targets have been developed and are provided in the ESMP (Table 5).

7.2.2 Airport Master Plan

NAD is committed to completing an Airport Master Plan for LPIA in 2009. An Airport Master Plan culminates in an Airport Landuse Plan. The Airport Landuse Plan guides airport management decisions on developing airport lands to protect for future growth.

To create the Airport Master Plan, NAD will undertake extensive stakeholder consultation and technical studies. The purpose of the Airport Master Plan is to ensure that LPIA will continue to serve the needs of the Bahamian people well into the future. To accomplish this, all aspects of airport operation need to be understood. Being an airport, the impact of the Airport Master Plan extends outside airport lands. The aircraft approach routes to and from the airport must be protected by local authorities so that tall structures that obstruct aircraft or non-compatible development do not occur. This includes vehicle traffic to and from the airport. Public roads need to keep pace with traffic growth to prevent bottlenecks that cause passengers to miss flights or impacting local traffic.
A number of Airport Master Plan studies are committed to within this EIA, these include:

- Developing an airport influence area for aeronautical noise (Section 7.1.8);
- Modeling airport air emissions (Section 7.1.1); and
- Vehicle traffic (on and off airport).

NAD will consult with appropriate local authorities prior to undertaking technical studies.

8.0 CUMULATIVE IMPACTS

Cumulative impacts are caused by the accumulation and interaction of multiple impacts on the functions of an ecosystem over time. Cumulative impacts are defined as the changes to the environment caused by an activity in combination with other past, present and future human activities.

For the purposes of this EIA, the two most important ecosystems, which are closely related, are the pine forest and Lake Killarney. Of particular interest, is the Windsor Well Fields, a significant source of fresh water for the Island of New Providence.

The airport was constructed in 1942 resulting in a loss of pine forest and likely a loss of mangroves that drained into Lake Killarney. Subsequent development at the airport over the years caused further loss of pine forest and mangrove habitat. Engineered drainage systems for the airport obviously altered natural drainage systems evolving to what we have today.

The pine forests are susceptible to forest fires, which are a natural part of the forest cycle. However, human interference has resulted in fewer fires allowing dangerous levels of debris to accumulate. The Bahamas National Trust wants to include control burns into pine forest management. While control burns will result in loss of trees, the resulting fires will be smaller and improve the health of the forest. The Project will result in the loss of some pine forest habitat as discussed in Section 4.11. Other developments are also impacting pine forest habitat on New Providence.

The Project is not impacting on any existing mangroves. Some airport drainage already makes its way to Lake Killarney. Additional hard surfaces constructed as a result of this project will add to the drainage. Weirs will be constructed within swales and ditches to slow the flow and allow for infiltration under lower flow conditions (less than 5 year events). It is likely that other development in the area, outside of airport lands, is resulting in surface water drainage directed to Lake Killarney.

The airport is located on land that lies over the largest fresh water lens on the Island of New Providence. The fresh water lens is up to 50 feet thick in areas. The Water and Sewerage Corporation operates a water collection system and mixes the water with fresh water produced from an osmosis plant and distributes the potable water. The Project will result in an increase to impermeable surfaces within this fresh water lens. All fresh water is derived from rain water. Drainage from the new surfaces will be held in swales and ditches to allow for infiltration, however, some will make its way into Lake Killarney.

Other development projects are impacting on the fresh water lens. The Albany project is constructing a sheet pile wall to separate the fresh water lens from an inland marina it is constructing west of the airport on the coast.

Potential future development at the airport will be assessed in the Airport Master Plan (Section 7.2.2).

A number of large construction projects are planned or underway on new Providence Island, in addition to this project, including:

- Residential Development;
- Resort Development;
- A New East / West Highway; and
- A New Deep Port.

Some of these projects have the potential to conflict with the Airport Expansion Project, for example, competition for resources and increased construction related traffic. **Table 19** lists a number of potential impacts and mitigation measures. NAD and its contractors do not anticipate any negative impacts on the Expansion Project.

Table 19. Potential Cumulative Impacts

Potential Cumulative Impacts	LPIA Mitigation Measures
Traffic congestion	The phased construction of the Airport Expansion Project means that much of the transport of materials and equipment by trucks will be completed before many of the other projects in the area begin, such as the JFK road expansion and Baha Mar. Landing of some of the materials at Clifton Pier rather than downtown may assist with truck routing efficiency. NAD will have a grievance mechanism in place to receive and respond to any complaints. The Airport Expansion Project will result in the improvement of access to the airport for vehicles off of JFK Drive and into parking facilities. The airside vehicle access and security point will be moved and improved. NAD will be undertaking an Airport Master Plan (see Section 7.2.2) that will evaluate the capacity of roadways leading to and on the airport for airport related traffic. Future roadway improvements, if required, will be identified in the Airport Master Plan. Due to the phased construction at LPIA and timing of the other projects noted above, it is not expected that there will be any significant cumulative impacts to the traffic in the surrounding area. Therefore the overall contribution of this Project to traffic congestion is anticipated to be low
Increased solid waste from construction	The contractor will be required to minimize the production of solid waste, segregate wastes and maintain areas in a clean pest free state. Excess excavated overburden will be used on-airport lands. There will be considerable demolition waste that will need to be separated and reused to the extent possible to minimize the amount-requiring disposal. No significant cumulative impacts on the local landfill are anticipated as a result of the minimization of wastes for the LPIA Project and the phased timing of the other projects noted above. Therefore the impacts on the local landfill from the solid waste generated by the LPIA Project are anticipated to be low.
Increased solid waste from airport operation	A solid waste management program will be developed and implemented. Reduction of solid waste will be a key objective for the program.
Increased noise levels in the area	Noise will be generated by the construction activities at LPIA, and possibly at the other projects noted above, potentially increasing noise levels in the surrounding area. NAD will have a grievance mechanism in place to receive and respond to any complaints. The contractor will be required to minimize construction noise and vibration. Nighttime noise will be kept to a minimum and

Table 19. Potential Cumulative Impacts

Potential Cumulative Impacts	LPIA Mitigation Measures
	truck routes will be planned in advance to minimize impacts on the community. An aeronautical noise management program will be developed and implemented. Existing and future noise footprints will be developed and the airport will work closely with local planners to avoid conflicting land developments with aircraft operations. A compliant management system will be developed to monitor and understand complaints relating to aircraft operation. Therefore it is anticipated that due to the mitigation measures identified above the LPIA Project will not contribute significantly to cumulative noise impacts
Increase in Dust Levels	Dust will be generated by the construction activities associated with the LPIA Project, and potentially from the other projects noted above, creating the potential for cumulative impacts to the air quality of the surrounding area. Fill material that is transported on trucks is to be covered to prevent material loss during transport. It is anticipated that the LPIA Project's contribution to cumulative impacts associated with an increase in dust levels will be negligible due to the distance of the LPIA Project from the other projects identified above.
Impacts from hazardous materials	Strict requirements will be placed on the contractor to handle and dispose of harmful substances. The contractor will have a spill response plan, spill kits and trained personnel. The contractor will be required to maintain records. A hazardous materials management program (to include pesticide use) will be developed and implemented consisting of proper use, collection and disposal programs, spill response plans, procedures, equipment and training.
Surface water drainage to Lake Killarney	Weirs will be constructed within swales and ditches to slow the flow and allow for infiltration under lower flow conditions (less than 5 year events).

Growth in tourism is driving much of this development. The Bahamas government is making strides toward sustainable tourism and understands that guidelines need to be put in place to protect and preserve the ecological, social, cultural and economic development for Bahamians.

9.0 CONCLUSIONS

The development is occurring within the boundaries of an existing operating airport. Many of the impacts identified can be addressed by improving existing management practices. The remaining impacts are all expected to be mitigated through the development project.

The project design is incorporating many features to reduce the impact on the environment. **Table 15** is a summary of the construction mitigation and monitoring activities, which will ensure that construction impacts are low.

YVRAS will, in cooperation with, and on behalf of NAD, provide the project management and construction oversight during the construction phase of the project. The environmental and social requirements identified in the EIA for the contractor will be carefully specified within the contract documents. The contractor will prepare a construction environmental and social management plan and an independent environmental construction monitor will be retained. Monthly reports summarizing the inspections and corrective and preventive actions will be submitted to the Project Team, NAD and the BEST Commission. NAD staff will perform further inspections of high-risk activities to ensure the contractor and sub-contractors are managing the environmental impacts to NAD's satisfaction.

Additional detailed plans will be necessary as the design and construction plans are finalized. **Table 20** provides a summary of the various permits and approvals that will be required.

Table 20. Status of Permits and Approvals

Permits/Approvals	Status
Permit to Harvest a Protected Tree(s)	Permit issued by the Department of Physical Planning on September 13, 2008
Approval to remove underground fuel storage tanks	Department of Environmental Health Services must approve contractors and procedures
Contaminated site remediation	Department of Environmental Health Services approves contractors and remediation plans
Building Permit	Ministry of Public Works and Transport, Building Control Division issued a building permit for the Early Works
Approval to install deep disposal wells	Water and Sewerage Corporation must approve deep disposal well plans and installations

NAD has already developed and implemented an ESMP to address airport operational impacts. This plan contains NAD's environmental and social policies and management system to ensure continual environmental and social improvement. The plan outlines the environmental and social programs and tracks action.

The BEST Commission will be provided copies of all environmental monitoring reports.