EXECUTIVE SUMMARY

This document presents the findings of an Environmental Impact Assessment (EIA) for the installation of an Incinerator at the Sangster International Airport, Montego Bay, Jamaica. The EIA was submitted to the National Environment and Planning Agency (NEPA) in support of the application for a permit to operate the Incinerator.

Context

The SIA is the larger of the two international airports, handles the bulk of tourist arrivals to the country, and directly serves the premiere resort area of Montego Bay and the north coast of Jamaica. The airport complex consists of a single 8700 foot runway, taxiways, aprons, terminal buildings, charter terminal and other aircraft and passenger support services.

The SIA is rated by the ICAO as a category 8 airport. Standard international navigational and landing aids are used, together with a control tower and weather service with 24 hour operation. The present runway capacity is rated as 45/hr with an annual capacity of about 150,000 movements.

There are a total of 14 operational stands, and the terminal building services 12 scheduled airlines with 12 customs and 16 immigration/health counters through 11 gates.

In early 2003 the SIA was leased by the Airports Authority of Jamaica (AAJ) to the private consortium, the Montego Bay Airport Limited, (MBJ) to operate and expand the facilities of the airport. The AAJ is mandated as part of the agreement, to commission a new incinerator to replace the existing method of waste disposal which is inadequate and which cannot meet the growing needs of the expanding facility.

The Terms of Reference for the study were submitted and approved by NEPA, and a Public Presentation of the Project and Findings of the EIA were also required by NEPA. The Tasks stipulated in the TORs included Description of the Project, Description of the Existing Environment, Legislative and Regulatory Considerations, Determination of Potential Impacts, Mitigation and Management of Negative Impacts, Analysis of alternatives, and Development of a Monitoring Plan. The environmental assessment report is organized according to the outline below.

- Executive Summary
- Policy, Legal and Administrative Framework
- Description of Proposed Project
- Description of the Environment
- Significant Environmental Impacts
- Analysis of Project Alternatives
- Impact Mitigation Management Plan

The proper disposal of solid waste has been a problem at the SIA for some time. In general the installation of a purpose built incinerator facility will allow the SIA to dispose of “international waste” in a more controlled and environmentally appropriate manner.

The burning of “international waste” generated on incoming aircraft has been a general recommendation from the Ministry of Health as a precautionary measure to avoid introduction of deleterious substances and mixing with local waste.

A solid waste survey was carried out in 2001 to determine the type and quantities of international solid waste generated at the SIA. The findings indicate that an average of 1680 Kg. of international waste is generated daily with an average of 0.181Kg/passenger per day.

The combustible fraction of the international waste represents 83% by weight.

The Existing Environment

Physical characteristics

Mean annual rainfall recorded at the SIA for the period 1963-1999 is 1050 mm with mean monthly rainfall varying from a low of 49 mm in March to a high of 153 mm in October. Intense rainfall of relatively short duration is also characteristic of this region occurring as sudden downpours.

Wind direction at the SIA is predominantly from the east, and the data indicates that winds from the east occur about 45% of time and 29% of the time from the northeast typically between 7 to 21 knots. Mean wind speeds are generally higher in the daytime with a peak of about 15 knots at 2pm. and a low of 3 knots at midnight. During the night-time there is s strong tendency for wind speeds to come from the south-eastern sector at between 3 and 7 knots.

The site of the proposed incinerator is located on flat land approximately 2.5 meters above sea level and adjacent to an area of much degraded mangrove wetland. Significant quantities of surface flow is generated quite rapidly after heavy rainfall because of the close proximity and steepness of the catchment hillslopes to the coastal plain, and a large portion of this surface runoff will accumulate in the low-lying wetland area to the south of the site. A natural channel passing the south east of the site carries water from the wetland area to the sea. Ground water is typically located 3 feet below ground level.

Montego Bay like the rest of Jamaica is prone to hurricane force winds, storm surge, earthquakes and flooding from storm events of varying intensity.

Air Quality

The air shed surrounding an airport is impacted by sources both on and off the airport compound. Point sources include, Jet blast, Exhaust from ground transportation (air and landside), Incinerators (burn box), Boiler stacks, Domestic burning of solid waste, Open burning.

Volatile organic compounds (VOC's), oxides of sulphur (Sox), nitrogen oxides (NOx) and carbon monoxide (CO) were measured continuously over two different 8 hour periods at the Sangster International Airport. Measurements of aircraft exhaust vapours were taken at the eastern and western perimeter fences, upwind and downwind respectively of the runway. Nitrogen oxides were undetected at the sites monitored. The primary oxide of sulphur SO2 was undetected at all sites monitored. Measurable VOC levels were detected at the stands in the vicinity of gates 4 -

6 where several aircrafts were preparing for departure. Maximum concentrations of 35 mg/m^3 were measured in this area. The levels at the other areas were undetectable. Carbon monoxide levels measured at SIA reached a maximum of 8 mg/m^3. The local standard for CO emissions is 10 mg/m^3 over an eight- hour period. The data therefore indicates that SIA is within the standard for its CO emissions.

Ten dustfall stations were planted around the perimeter of the airport; the stations were in place for a total of eight weeks. Total suspended particulate (TSP) levels generally ranged between 9.7 and 15.9 mg/m at the all the stations except the now defunct incinerator, where TSP levels were measured at 42.5 mg/m^3/month.

Ambient PM10 measurements were taken at three stations and results showed that inhalable particulate levels at all three sites monitored were elevated when compared with the national standard.

Biological Environment

Sangster International Airport was built on what was originally a large and extensive mangrove lined lagoon. The vegetation that exists on site today represents growth over the past 25 – 30 years, and reflects the history of development on the site. The vegetation is that expected of saline and/or sandy coastal regions.

The site of the incinerator was previously cleared and no mangroves will be removed. The mangroves adjacent to the incinerator site are not expected to be negatively impacted by the construction or operation of the incinerator.

Potential Impacts

An air dispersal modelling exercise was carried out in order to screen the anticipated emissions from the incinerator. The main objectives of the study are to obtain estimates of the likely emissions that the incinerator will produce under normal operating conditions, and the effect after dispersal on ambient air quality.

The National Resources Conservation Authority Ambient Air Quality Guideline Document (NAAQD, 1999) sets out the procedures and standards to be followed in carrying out air quality assessments of new emission sources. In order to meet the minimum requirements all significant sources of emissions must undertake at least “screening modelling” to determine if more detailed modelling is required. Detailed modelling is only required if the emissions and ambient air quality standards are exceeded. A screening modelling study was therefore carried out using the SCREEN VIEW air dispersal software package. A screening modelling study was therefore carried out using the SCREEN VIEW air dispersal software package. Comparison of the potential emissions with the Draft Air Quality Standards of NEPA indicated that all emission rates are in compliance with the emission standards, except total chlorinated dibenzo-p-dioxins and furans. In order to reduce the impact of total chlorinated dibenzo-p-dioxins and furans (CDD/CDF) on ambient air quality, the use of an air pollution control (APC) device was applied to the modelling analysis. For refuse incineration applications, CDD/CDF may be controlled using a combination of fabric filter and dry sorbent injection (DSI). By itself, fabric filter is able to minimize the uncontrolled emissions by 92%, while in combination with the DSI, 99.5% reduction efficiency is achievable.

The application of the dual air pollution control technology resulted in an achievement of compliance with the ambient air quality guideline concentration.

Impacts and Mitigation

Table 4.9a: Natural Environment – Potential Impacts and Mitigation Measures	
Potential Impacts	**Mitigation Measures**
Construction Phase Movement of trucks and heavy-duty equipment to and from the project area, as well as construction work and stockpiling of earth material, will contribute to dust emissions. Construction activities will not result in the removal of vegetation, as the site is already bare. that will expose and loosen soil, which can become airborne with medium to strong winds. This would add fugitive dust to the area, which is already dust prone because of previous land clearance. The transport of aggregate for general construction will also contribute to the fugitive dust levels. Construction vehicles will emit air contaminants such as nitrogen and sulphur oxides as well as particulates. ***Operation Phase*** The main air impacts during the operational phase will be from stack emissions and will include SOX, NOX, PM 10, POP and particulates. The levels of these parameters emitted from the incinerator were all shown by air dispersion modelling to be well within the accepted national standards. The modelling also showed that the aerial extent of maximum concentration of emission parameters at ground level within 100m.	*1. Stock piling of earth materials for construction should be carried out within temporarily constructed enclosures to limit fugitive dust. Vehicles transporting earth materials should be covered en route. Mixing equipment should be sealed properly and vibrating equipment should be equipped with dust removing devices. Stockpiles of fines should be covered on windy days.* 2. Provide dust masks to operators in order to protect them from dust impacts. The above mitigation measures are the ultimate responsibility of the developer, working with contractors and subcontractors. *Operations Phase* 1. Furons and dioxins were shown by the model to be slightly higher than the national standards. However, the modeling also showed that with suggested air pollution control devices the expected values would come into compliance with the national standards. 2. On-going operation and maintenance procedures as stipulated by the manufacturer should be adhered to,

	To ensure that the emission parameters do not exceed the national standard. **The above mitigation measures are the ultimate responsibility of the developer.**

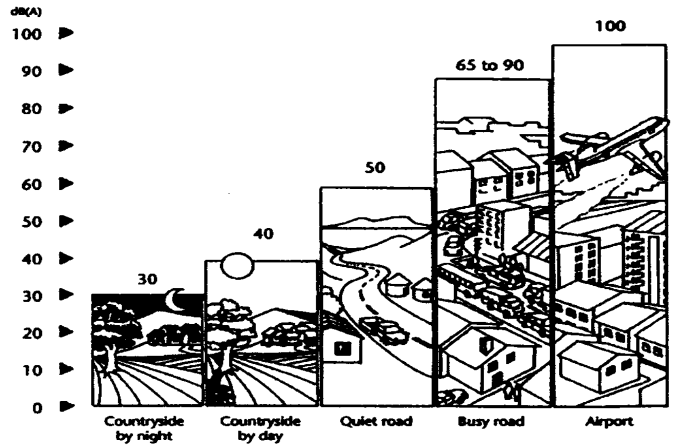
Noise	 *Construction Phase* The noise level is expected to increase during construction with the use of installation machinery and general construction activities. Additionally, the manufacturer's specification for noise in close proximity to the incinerator is in the order of 80dBA.	***Construction Phase*** 1. Noise from construction of the incinerator is not expected to have any significant negative impacts. The World Bank Guidelines (1997) indicates an acceptable noise limit of 90-100dBA for airports. ***Operation Phase*** **2.** During the operation phase workers in close proximity to the incinerator are advised to use appropriate protective devices including earmuffs. The above mitigation measures are the ultimate responsibility of the developer.

Table 4.9b: Social Environment – Potential Impacts and Mitigation Measures		
Environmental Aspect	**Potential Impacts**	**Mitigation Measures**
Employment	***Construction Phase*** Employment opportunities will be created during construction phase. This will mostly be unskilled labour for the duration of the construction activities. *Operation Phase* Small numbers of skilled operators will be required for long term or contract employment.	*Construction Phase* 1. Small numbers of casual labourers will find employment and this is expected to be a positive impact for the surrounding communities. *Operation Phase* 1. Appropriate training for skilled operators must be applied, according to manufacturer's recommendations. **The above mitigation measures are the ultimate responsibility of the developer**
Solid Waste Management	***Construction Phase*** Solid waste generated from the construction activities will include construction debris, and waste generated from the construction camp.	***Construction Phase*** 1. Construction sites generate considerable waste and provision must be made for suitable separation and storage of waste in designated and labeled areas throughout the site and at the site camp. 2. Collection of waste by certified contractors and disposal at an approved site, as recommended and approved by the National Solid Waste Management Authority. 3. Any hazardous waste should be separated and stored in areas clearly designated and labelled, for future entombing and disposal as directed by

	Operation Phase During the operation phase a major positive impact is anticipated in the use of the incinerator for treatment of international waste. The use of the incinerator will reduce levels of respirable particulates (PM 10) and other emissions (SOX, NOX, POP's) that are presently being released by open burning activities. However, an end product of the incineration process is ash, which must be disposed of.	the National Solid Waste Management Authority. 4. Worker training should include instructions on how to dispose of food and drink containers emphasizing the need to protect the coastal environment. 5. Construction camps and work areas must be adequately equipped with portable chemical toilets. 6. Portable chemical toilets must be provided, maintained and removed by a certified contractor. These mitigation measures are the **responsibility of the developer.** *Operation Phase* In accordance with instructions from the NSWMA (Letter of June 29, 2004-Appendix 2) the following mitigation measures are recommended. 1. The Airport Authority should have an analysis of its waste composition at least twice per year, in conjunction with the NSWMA. 2. An agreement must be entered into with the NSWMA for the disposal of the ash. 3. An approved disposal site must be used, which is the Retirement site. 4. Ash waste transported should be correctly containerized to ensure no

		possibility of spillage by wind or gravity. 5. Special/medical waste streams must not be disposed of in the incinerator. Contact must be made with the NSWMA and the Ministry of Health for appropriate disposal. **The above mitigation measures are the ultimate responsibility of the developer.**
Public Health and Safety	***Construction Phase*** Construction will involve transportation and storage of construction material, and proper disposal of construction spoil and any hazardous waste. Increased levels of fugitive dust and construction noise are also public health issues, and the mitigation measures as presented under air quality should be implemented.	***Mitigation Measures*** 1. To minimise risk to the public the construction activities, which will directly affect the movement of traffic and pedestrians, should be properly scheduled and standard construction techniques for sign–posting and flagging should be adhered to. 2. Unnecessary idling of construction related vehicles should be discouraged. 3. Proper sign posting of speed limits and entrances and exits. These mitigation measures are the **responsibility of the developer.**

	Operation Phase During the operation phase there are no major negative impacts anticipated on the general public. The establishment of the incinerator should improve on exiting open burning activities and the release of harmful emissions. Currently, scavengers utilise the uncontrolled dumpsite. The establishment of the incinerator will include security measures to eliminate trespassers. During the operation phase, ash will be produces as and end product.	*Operation Phase* 1. Ensure adequate security including fencing, trained personnel and signage to limit access to the incinerator by unauthorized personnel. 2. In accordance with instructions from the NSWMA (Letter of June 29, 2004) the following mitigation measures indicated above are to be implemented. regarding ash disposal: 3. Special/medical waste streams must not be disposed of in the incinerator. Contact must be made with the NSWMA and the Ministry of Health for appropriate disposal.

Consideration of Alternatives

Consideration of alternatives included “no action”, alternative systems, alternative sites and alternative waste disposal methods.

“No action” would involve continued use of open burning on the airport property as the selected method of treating the international solid waste generated. This alternative would see the continuation of the release of emissions including SOX, NOX, POP’s and respirable particulates (PM 10) in an uncontrolled manner, which would cause continuing contamination of the surrounding air shed.

“Alternative systems” were considered by the AAJ and the Scanship Incinerator SE-1150 was selected and is reported to utilise a new combustion concept based on the latest technology and is designed to meet the most stringent requirements.

Alternative sites would have involved increased clearing. The proposed site is already a disturbed site, and is an improvement over the original site.

Monitoring Plan

A Monitoring Plan will be developed to reflect conditions of the Permit which is granted. The Waste Management Plan will be developed as part of that exercise.

An Emergency Response Plan will also be developed following issuance of the Permit.

CHAPTER 1 INTRODUCTION

1.1 Purpose

This document contains the findings of an Environmental Impact Assessment (EIA) conducted at the Sangster International Airport in Montego Bay by the consultants, Environmental Solutions Limited (ESL). The EIA was commissioned in order to determine the potential impacts associated with the installation and operation of a new solid waste incinerator. Site evaluations and measurements together with partial air-dispersal modelling was carried out between May and June 2004. The report outlines the approach and presents the principal findings of the study.

1.2 Background

The Sangster International Airport (SIA) located in Montego Bay, Jamaica's second city is found at the northwestern tip of Jamaica, Figure 1.1. The SIA is the larger of the two international airports, handles the bulk of tourist arrivals to the country, and directly serves the premiere resort area of Montego Bay and the north coast of Jamaica.

The SIA was built in the 1940's and has seen many renovations from 1951 through 2003. The airport currently occupies an area of 572 acres positioned on coastal flatland adjacent to Montego Bay point. The airport complex consists of a single 8700 foot runway, taxiways, aprons, terminal buildings, charter terminal and other aircraft and passenger support services.

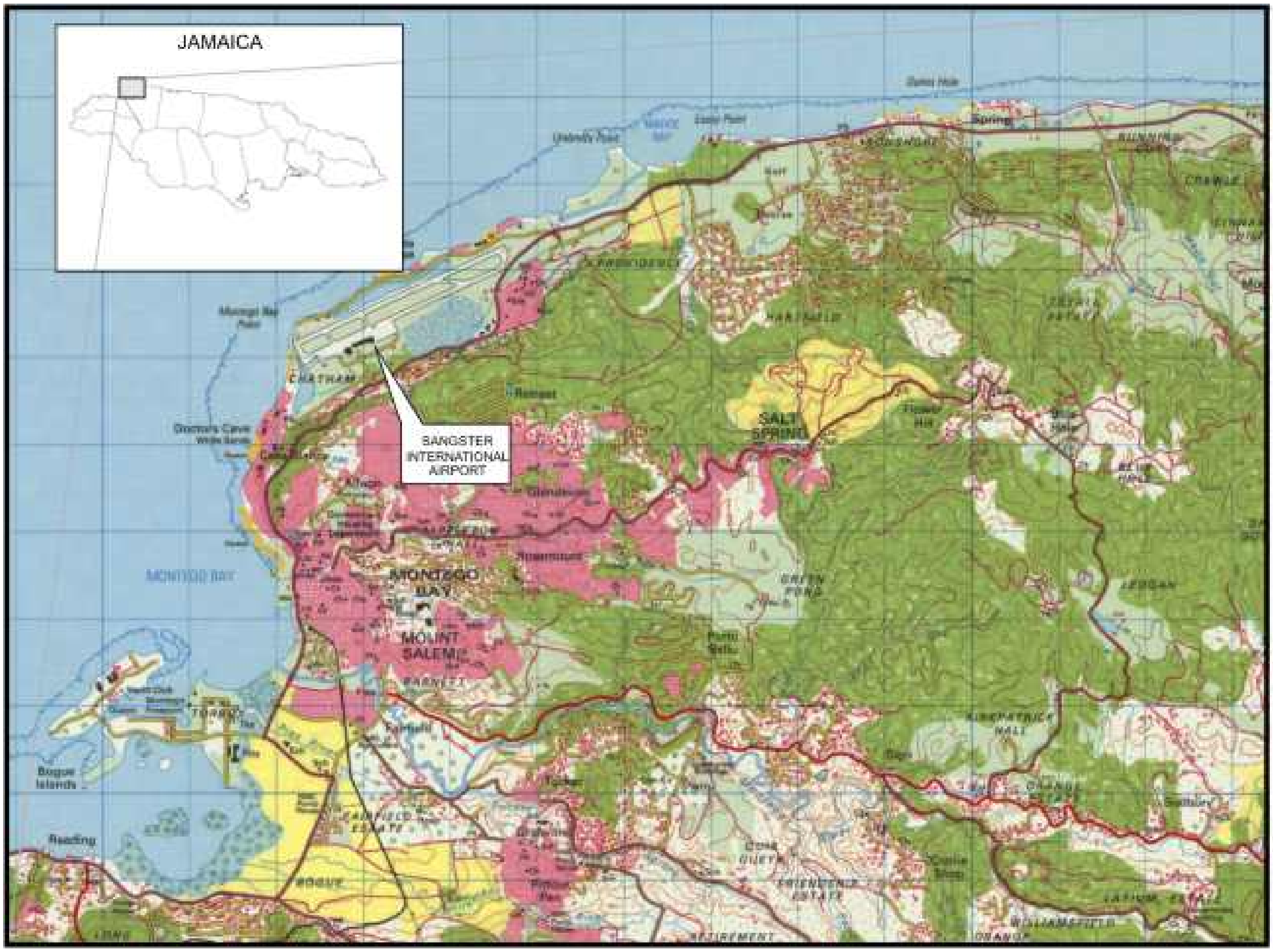


Figure 1.1: Location of Sangster International Airport

The SIA is rated by the ICAO as a category 8 airport. Standard international navigational and landing aids are used, together with a control tower and weather service with 24 hour operation. The present runway capacity is rated as 45/hr with an annual capacity of about 150,000 movements.

The national air carrier Air Jamaica has a hub at the airport which has influenced air traffic considerably. There are now two daily peak periods for air traffic, 10:30 - 12:30 and 3:30 - 5:30. Thursdays and Sundays show the greatest amount of air traffic. The months of December through March are traditionally the period of greatest activity at the airport. Only a few flights arrive or depart after 10:00 pm.

There are a total of 14 operational stands, four of which have unrestricted wide body/apron taxiway clearance. The terminal building services 12 scheduled airlines with 12 customs and 16 immigration/health counters through 11 gates.

Major concessions at SIA include a bank, newsstand, restaurants, car rental agencies and duty free shops. There are two cargo buildings as well as maintenance facilities for small aircraft and jets. The parking area includes public stalls, taxi storage, car rental stalls and coach stalls.

The SIA was operated and maintained by the Airports Authority of Jamaica (AAJ) until early 2003 when it was leased to the private consortium, the Montego Bay Airport Limited, (MBJ) to operate and expand the facilities of the airport. In the transition period the AAJ will finalize the commissioning of a proposed new incinerator to replace the existing method of waste disposal which is indequate and which cannot meet the growing needs of the expanding facility. In keeping with Jamaican environmental regulations relating to the installation of waste disposal facilities, the AAJ commissioned an EIA for submission to the National Environmental Protection Agency (NEPA).

1.3 Terms of Reference

The following terms of reference was submitted by the Airports Authority of Jamaica (AAJ) to NEPA to define the

EIA to be conducted. The general aspects of the EIA to be undertaken as agreed by NEPA (Appendix III) will include the following.

Introduction

Describe the incinerator installation project to be assessed and outline the need for the project.

Background Information

Briefly describe the major components of the proposed project, the implementing agent, along with a brief history of the project. Provide examples of similar installations, specifically referring to the incinerator at the Norman Manley International Airport (NMIA). Briefly outline the experience with previous solid waste disposal practices at the SIA.

Study Area

Describe the location of the project site and indicate the area around the site that will be considered as part of the study area for the EIA. Define a radius of influence around the sites that will circumscribe a suitable airshed for the conduct of detailed air dispersion modelling.

Scope of Work

The EIA will include but not necessarily be limited to the following tasks:

Task 1. Description of the Proposed Project

Describe the setting in which the incinerator will be installed including its location, plant layout and its position in relation to surrounding airport facilities using maps and drawings where appropriate. Characterize the nature of the solid waste to be incinerated including the type and volume of material. Describe the intended operational framework including general procedures, safety provisions, residue disposal, and schedule of operation. Indicate the project life span and plans for providing utilities and support services.

Describe the type of incinerator plant to be installed including manufacturer's specifications, performance characteristics and drawings. Provide manufacturer's operational guidelines specifically outlining safety and emission control procedures as well as recommended maintenance practices.

Characterize the nature of emissions likely to be produced including the composition, volumes, expulsion height, ejection velocity and temperature.

Task 2. Description of the Environment - Assemble, evaluate and present baseline data on the study area, including the following:

a) Physical environment: Summarise the physical setting of the incinerator site including topography, general geotechnical characteristics and drainage. Describe the topography and climate of the airshed. Assess existing air quality within the airshed identifying existing sources of pollution.

b) Biological environment: Describe in general the terrestrial flora, and fauna within the airshed.

c) Socio-economic environment: Describe in general the population and the nature of the main economic activities within the airshed.

Task 3. Legislative and Regulatory Considerations - Outline the pertinent policies, regulations and standards governing project location, land use, environmental quality, and public health and safety.

Task 4. Determination of Potential Impacts – Identify the major issues of environmental concern and indicate their relative importance to the design of the project. Distinguish construction and post-construction phase impacts, significant positive and negative impacts, and direct and indirect impacts. Identify impacts that are cumulative, unavoidable or irreversible. Special attention should be paid to:

Site preparation and construction phase:

- Clearance of site (originally used for burning airport garbage) and disposal of burnt garbage.
- Construction phase impacts including sourcing, transport and storage of earth materials, building construction methods, construction site management, noise, fugitive dust, solid waste disposal, traffic and employment, taking into consideration terminal construction activities currently underway.

Incinerator operation phase:

- Solid waste management during post-construction phase, with particular reference to waste collection, transport, sorting, loading, and disposal of incinerator ash.
- Characteristics of any hazardous materials resulting from or involved in the project, indicating appropriate management strategies (e.g. handling, storage, treatment, disposal). Based on the foregoing include any risk assessment and risk management of hazardous materials.
- Air dispersion modelling to estimate the effect of the expected emissions from the proposed incinerator on

ambient air quality within the airshed. The air dispersion modelling exercise will evaluate the extent and concentration of following pollutants which are typical constituents of solid waste combustion.:- sulphur dioxide, nitrogen oxides (as nitrogen dioxide), TSP, PM_{10}, dioxins, and furans. Potentially sensitive receptor sites will be evaluated.

- Occupational health and safety issues that could result directly from the operation of the proposed incinerator.
- Based on the model results and other available information, prepare an environmental monitoring and reporting plan for the proposed incinerator.
- Reference should be made to the extent and quality of the available data and any information deficiencies and uncertainties associated with the prediction of impacts should be clearly identified.

Task 5. Analysis of Alternatives - Indicate project alternatives (other types of incinerators and no action) including a comparison of the technologies and methods used to control the release of dioxins and furans and other air pollutants and the management of ash from the incinerator facilities. Include a comparison of the performance of incinerator technologies especially with respect to the formation of dioxins and furans based on stack testing.

Task 6. Mitigation and Management of Negative Impacts - Summarise the potential environmental impacts (air quality, water and land) of the project. Develop any required mitigation measures and identify any residual impacts that may exist after mitigation.

Task 7. Development of a Monitoring Plan - Prepare a plan for monitoring the implementation of mitigating measures and the impacts of the project during construction and post-operation phases.

REPORT

The environmental assessment report will be concise and limited to significant environmental issues. The main text will focus on findings, conclusions and recommended actions supported by summaries of the data collected. The environmental assessment report will be organized according to the outline below.

- Executive Summary
- Policy, Legal and Administrative Framework
- Description of Proposed Project
- Description of the Environment
- Significant Environmental Impacts
- Analysis of Project Alternatives
- Impact Mitigation Management Plan

1.4 Environmental Legislation & Associated Conventions

In recent years there has been significant concern regarding the operation of airports in general, particularly as their activities relate to noise pollution. Given the new legislative regime in Jamaica, and the many applicable international regulations, it is essential that all airports improve their current environmental management programme to ensure adherence to these requirements. Airport planning and management must therefore take a new direction in placing emphasis on sound environmental practices.

1.4.1 Local Regulatory Authority

The Natural Resources Conservation Authority (NRCA) has been given in the NRCA Act of 1991 responsibility for environmental management in Jamaica. Since the promulgation of the Act the NRCA has been developing local standards. More recently the Act has been strengthened by supporting regulations which became effective in January 1997 and gave 'teeth' to the Act. The underlying principles which have been used in the development of the Act are:

1. the polluter pays principle, and
2. the cradle to grave approach to waste management

The NRCA Act and its supporting regulations represent a new dispensation in the management of the environment in Jamaica. As a result of the legislation and the monitoring and enforcement mechanisms, which support it, companies will have to change their business approach and develop strategies and programmes to ensure compliance with local requirements.

Permits and Licencing

The following pieces of legislation are applicable to the SIA:

NRCA Act

Air Quality Regulations (DRAFT)

Airports Act

Factories Act

Petroleum and Oil Fuel (landing & storage) Act

Country Fire Law

Public Health Act

Litter Act

Land Acquisition Act

The Office of Disaster Preparedness and Emergency Management Act

Wildlife Protection Act

Port Authority Act

National Solid Waste Management Authority (NSWMA) Act

A brief summary outlining the primary elements of these documents as they relate to the Sangster International Airport is found in the following section.

Airports Authority Act speaks to the conduct of the operations at the country's airports.

The Airports Authority has responsibility for the safe and effective management of the country's airports ensuring that all its activities comply with industry code of practice and regulatory guidelines.

The Factory Act outlines safety (Part II) and health welfare (Part III), measures that the company is responsible for to ensure safe practices. It refers specifically to explosive and flammable substances, fumes and gases. This act forms the most comprehensive document in so far as guidelines for the operation of the airport are concerned.

Petroleum and Oil Fuel (landing & storage) Act extends to the storage of petroleum in quantities greater than one hundred and twenty imperial gallons in a building specially appointed for this purpose by the Minister.

The Country Fire Law details guidelines that must be adhered to for the tendering of fire notices to be served on adjacent occupiers of land, responsibilities of occupying lands to extinguish fires and the relevant punishment of offenses.

The Public Health Act (1985) was established by the Central Health Committee, which advises the Minister and the Local Board of Health in each parish on matters related to health. This Act constitutes the main body of legislation for the management of solid, hazardous and medical waste. The Act also requires that individuals/companies responsible for any construction, repair or alteration should take precautions to prevent particulate matter from becoming airborne. The concentration of airborne particulates should comply with the NRCA's Ambient Air Quality Regulations.

The Litter Act (1986) controls littering in public and private places, establishes implementation responsibility with the Parish council or Local government.

The Land Acquisition Act states that the Commissioner of Lands is responsible for the acquisition of all lands needed by the Government of Jamaica for public purposes. The Commissioner may acquire these lands either by way of private treaty or by compulsory acquisition (if there is no agreement). The Commissioner of Lands may acquire lands on behalf of the Government for the Airports Authority for the purpose of airport activities expansion and also in order to regulate and control future developments that are not compatible with airport activities on lands in the vicinity of the airport.

The Office of Disaster Preparedness and Emergency Management Act (1998) established the Office of Disaster Preparedness and Emergency Management (ODPEM) to develop and implement policy and programmes to achieve and maintain an appropriate state of national and sectoral preparedness for coping with emergency situations.

The Wildlife Protection Act prohibits removal, sale or possession of protected animals, use of dynamite, poisons or other noxious material to kill or injure fish, prohibits discharge of trade effluent or industrial waste into harbours, lagoons, estuaries and streams. Authorizes the establishment of Game Sanctuaries and Reserves.

The Port Authority Act authorizes the Port Authority to declare harbours and establish or alter existing boundaries and manage ports. The Marine Division of the Port Authority is to regulate the construction of structures on or over water, which must be approved by the Marine Division after approval by the Engineering Department.

National Solid Waste Management Authority (NSWMA) Act Authorises the to (NSWMA) manage all solid waste facilities.

Air Quality Regulations (DRAFT) Summary

NEPA Air Quality Standards for new Municipal/ Biomedical Waste Incinerators.	
Pollutant	Value
PM	200 mg/m^3
CO	100 mg/m^3
SO2	300 mg/ m^3
VOC	20 mg/ m^3
Opacity	20% opacity and up to 40% opacity for six consecutive minutes.

Each existing major or significant facility that has been granted a Permit under the Natural Resources Conservation (Permits and License) Regulations 1996 shall submit an Air Pollutant Discharge Licence application by June 30 of the first year promulgation of these Regulations and such application shall be accompanied by the application fee and discharge fees for emissions.

Each new major or significant facility in all source categories will be required to submit an application for an Air Pollutant Discharge Licence immediately after promulgation of the Regulations.

Declarations and Orders

The Beach Control Order (Black Coral) (1979) declares the entire foreshore and the floor of the seas (within the limits of the territorial sea of Jamaica) together with the water lying on that part of the floor of the sea, to be a protected area.

The Natural Resources (Montego Bay Marine Park Order (1992) these regulations would apply to designated Marine

Parks and include restrictions on mining, removal, damage, attachment to, mooring in, etc. of all living and non-living natural resources in the area. It bans dredging, excavating, discharge of pollutants, littering, use of explosives and poisons and fishing except subject to permit, and permits research and collection for educational and research purposes, subject to permit. It provides for zoning, monitoring, enforcement.

International Treaties and Protocols

The International Civil Aviation Organisation (ICAO) Standards for Airport Operations sets guidelines for airport planning, particularly as it relates to land use and environmental controls.

International Convention on Oil Pollution Preparedness Response and Co-operation (1990) requires that all Parties, jointly or individually, take all appropriate measures to prepare for and respond to an oil pollution incident and co-operate and provide advisory services technical support and equipment.

The Convention on Civil Liability for Damage Resulting from Activities Dangerous to the Environment (1993) aims at ensuring adequate compensation for damage resulting from activities dangerous to the environment and also provides for means of prevention and reinstatement.

The Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter (1972) regulates through a licensing regime the dumpling at sea of waste generated on land. The precautionary principle is adopted in the convention.

Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971) An international treaty which protects designated wetlands which are breeding or nesting sites for migratory birds. Also known as the Convention on Wetlands of International Importance.

1.5 Methodology and Approach

The multi-disciplinary team assembled to carry out the work, utilized the Charette-style approach to data gathering, analysis, and presentation whereby team members conducted the reconnaissance investigations together to determine the critical elements for analysis and the issues to be highlighted for the design and planning process. Team meetings were held to discuss the progress of investigations and analyses and facilitate integration of data toward an understanding of the systems at work in both the natural and built environment.

Baseline data for the study area was collected using the following methods:

Windshield Survey

Site Reconnaissance

Aerial Survey

Analysis of Maps and Plans

Literature Review

Desk Top Research

Public Consultations

Field Studies

Laboratory Analyses

Charette Style Consultations

CHAPTER 2 DESCRIPTION OF THE PROJECT

2.1 Need For the Project

The AAJ proposes to construct a new incinerator to replace an existing facility that is inadequate for the present needs of the airport and has been disused for some time. As part of the expansion of the airport and the handover to the new operators MBJ, the AAJ is obligated to commission a new incinerator to burn solid waste collected airside at the airport.

This solid waste is considered as "international waste" and the operating procedures at the SIA has been to burn all "international waste". The burning of "international waste" generated on incoming aircraft has been a general recommendation from the Ministry of Health as a precautionary measure to avoid introduction of deleterious substances and mixing with local waste.

The proper disposal of solid waste has been a problem at the SIA for some time. In general the installation of a purpose built incinerator facility will allow the SIA to dispose of "international waste" in a more controlled and environmentally appropriate manner.

2.2 Nature of SIA International Waste

The international waste is generated on international flights into the SIA and collected by four main handlers, namely American Airlines, AJAS, Air Jamaica and Versair (catering company). A solid waste survey was carried out in 2001 to determine the type and quantities of international solid waste generated at the SIA. The findings indicate that an average of 1680 Kg. of international waste is generated daily with an average of 0.181Kg/passenger per day.

The combustible fraction of the international waste represents 83% by weight. Table 2.1 indicates the classification of international waste as a percentage of total weight. Local regulations and international agreements require all international waste to be incinerated.

TYPE OF WASTE	INTERNATIONAL WASTE %
Paper	34.4
Plastic	24.7
Vegetable matter	24.2
Glass	9.0
Metal	7.2
Unclassified	0.5

Table 2.1 : International waste classification

2.3 Site Description

The site for the proposed incinerator is located to the east of the terminal building about 200 feet south of the runway, where a small burn-box has been in operation since 2003, Figure 2.1. An approximately 650 square foot area

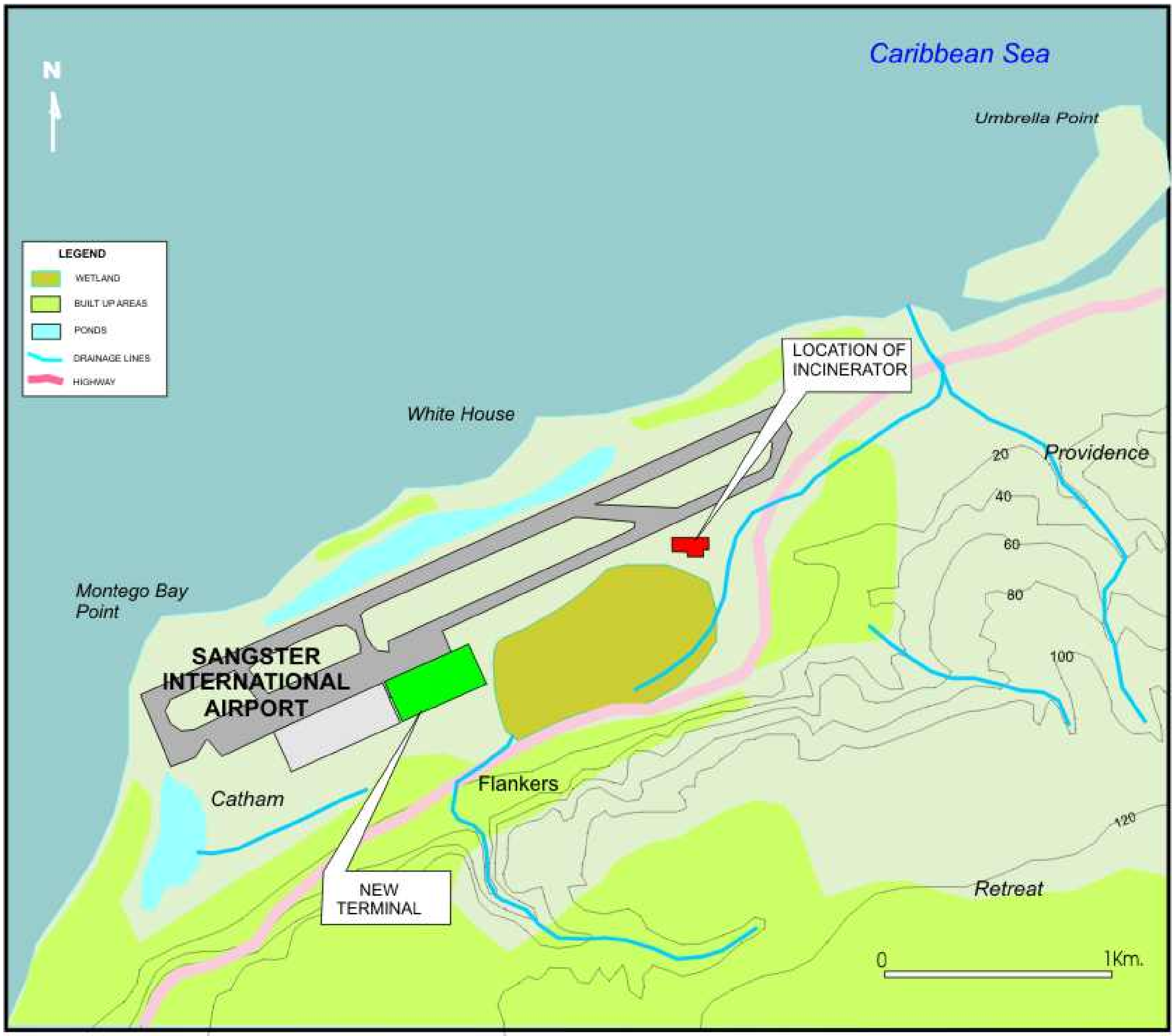


Figure 2.1: Layout of SIA & Location of Incinerator.

consisting of compacted marl has been constructed for the location of the new incinerator building and support structures, Photo. 2.1.

The structure that will house the new incinerator is currently under construction and consists of a steel framed building Photo 2.1 with industrial gauge corrugated aluminium siding, The plan layout of the facility is shown in Figure 2.2 while Figure 2.3 shows the configuration and dimensions of the building.

Photo 2.1 : View of incinerator site looking southward with the new incinerator building in the foreground and the old incinerator in the background.

2.4 Features of the Proposed Incinerator

The main features of the proposed incinerator are described below and detailed specification presented in Appendix 1. The proposed incinerator system is being supplied by Scanship Environmental AS and consists of a multichamber incinerator that uses a semi-pyrolitic two stage combustion process.

The main components of the incinerator system comprise a garbage shredder, silo feeding conveyor screw, garbage silo, incinerator, flue gas fan and emission stack. The

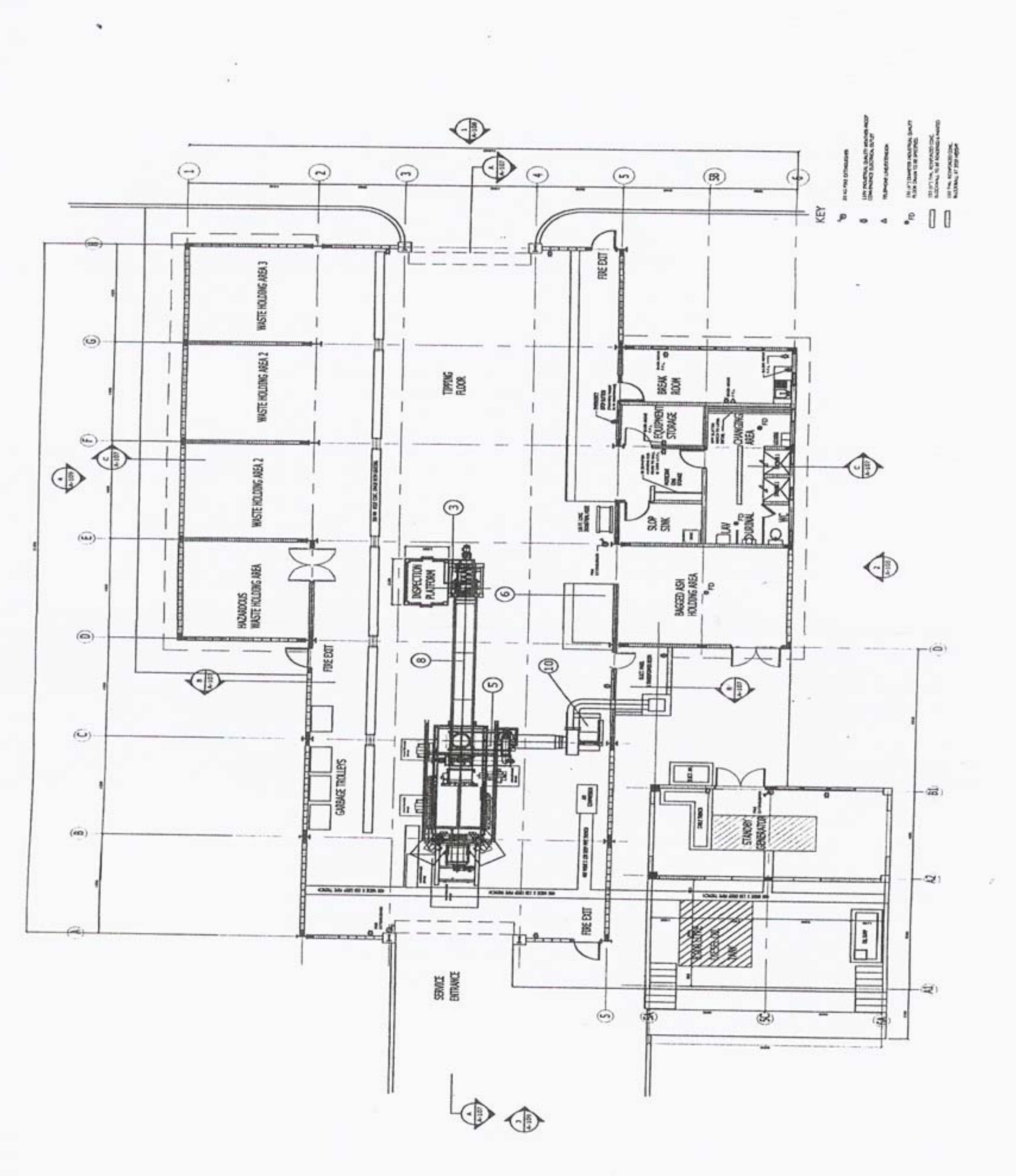


Figure 2.2: Plan of incinerator facility

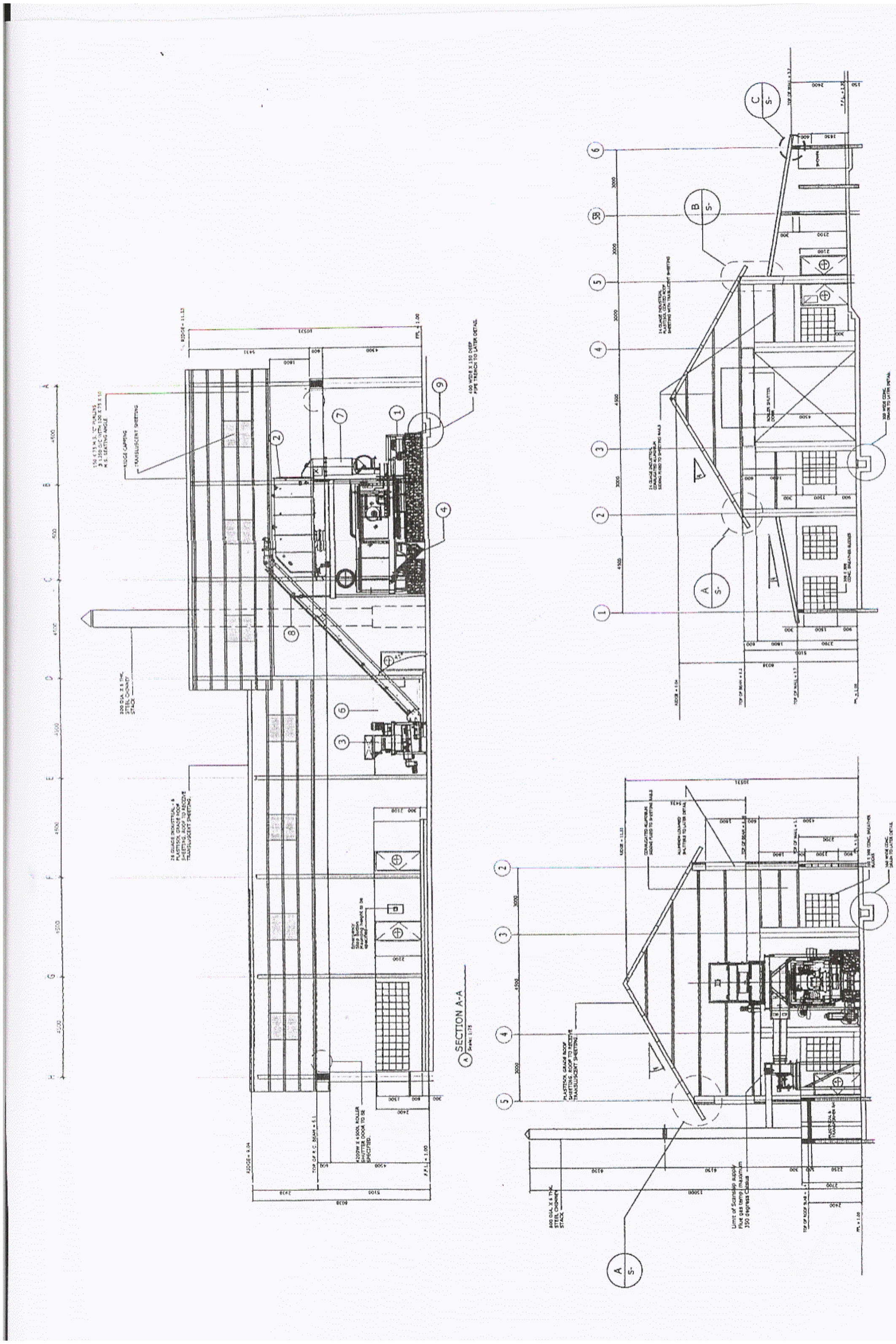


Figure 2.3 Configuration & dimensions of incinerator building

diagram in Figure 2.4 illustrates the configuration of the system diagrammatically.

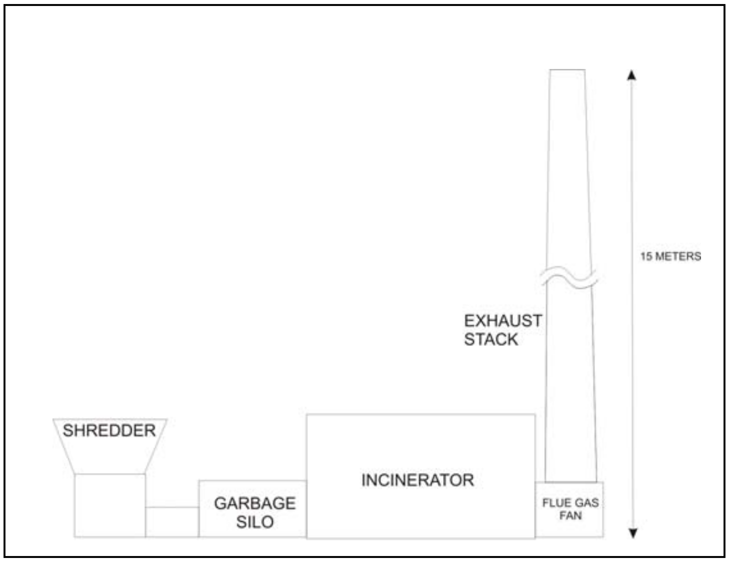


Figure 2.4: Diagram of incinerator system.

Burnable garbage is first fed into heavy duty dry waste shredders that minimize the volume of the waste and homogenizes the burning value. A conveyor screw transports the shredded waste to the garbage silo that is capable of storing garbage for one day of incinerator operation or 12 cubic meters of shredded waste.

Garbage is fed into the incinerator via an intermediate chamber that feeds appropriate portions into the incinerator and isolates the garbage silo from the high temperatures of the incinerator. The incinerator is a fully automated unit that can be remotely operated and monitored.

Incineration takes place in two phases with waste supplied to a primary combustion chamber and then to a secondary combustion chamber. In the primary chamber initial decomposition is achieved by partial pyrolitic incineration at temperatures between 650-950 deg.C.

The complete breakdown of gases and residual components takes place in the secondary zone which acts as a purification zone with combustion temperatures of 850 – 1000 deg.C. An automatic oil burner automatically ignites if the correct temperature is not achieved in either stage.

The incinerator has an automatic continuous ash removal system that allows the system to run continuously without shut down for ash removal. Table 2.2 summarises the main technical specifications of the incinerator.

Flue gas from the incinerator enters a flue gas and mixing gas battery and mixes with ambient air. The flue gas is diluted and the temperature is reduced quickly from about 900 to 300 deg. C.

PARAMETERS	SPECIFICATIONS
Thermal Capacity	1150KW
Temperature in Primary Chamber	700-1000 C
Temperature in Primary Chamber	850-1000 C
Max. Stack Flue Gas Temp.	350 C
Flue Gas Volume	5113 Nm^3/h
Combustion Air Supply (max.)	3000 Nm^3/h
Noise Level (max.)	85 dB (A)
Surface Temperature	15 C (above ambient temp.)
Flue Gas Duct Size	DN 700
Dust Emission at 11% O_2	50 mg/Nm^3

Table 2.2 : Summary of incinerator specifications

The flue gases are pulled from the incinerator through the cooling battery and pushed through the emission stack into the atmosphere. The emission stack consists of a 15 meter steel chimney with a diameter of 80 cm. located to the south of the building.

2.5 Incinerator Emissions & Pollution Control

The manufacturers state that the level of emissions from the incinerator system is low because of the high temperature two stage combustion process that is stated to be in compliance with the 17^{th} BimSch V standard with regards to emissions of CO and No_x (50 mg/m^3 CO and 200Mg/m^3 No_x).

It is further stated that the flue gas cooling system rapidly cools flue gases below 250 Deg. C and therefore reduces the re-formation of dioxin gases. The emission of dioxin gases is stated to meet the 17th BimSch V standard of 0.1 ng/Nm^3 corrected to 11% O_2.

The manufacturers also state that if the measured stack emissions do not meet local air quality standards then air quality control devices should be installed.

2.6 Operational Considerations

The incinerator system can accept a wide range of solid waste types including semi dry food and a high percentage of non-burnable waste such as glass and tins.

Garbage entering the facility will be sorted before being fed into the shredder. Ash generated by the incinerator will be collected in bags and disposed of at the municipal waste disposal facility according to the guidelines set by NSWA (Appendix II).

CHAPTER 3 DESCRIPTION OF THE ENVIRONMENT

3.1 Physical Environment

3.1.1 Climate

Montego Bay has a subtropical to tropical climate with temperatures ranging from 20 to 27 Deg. C in the winter months and 30 to 32 Deg. C in the summer. Mean annual rainfall recorded at the SIA for the period 1963-1999 is 1050 mm with mean monthly rainfall varying from a low of 49 mm in March to a high of 153 mm in October, Table 3.1.

MONTHS	RAINFALL (MM)
January	77
February	61
March	49
April	55
May	102
June	105
July	51
August	84
September	127
October	153
November	101
December	87
Annual Mean	1050

Table 3.1 : Mean monthly rainfall at SIA (mm) . Source JMO.

Annual rainfall maxima show a bimodal pattern. There are typically two ‘rainy season’, during the year between May and June and September to November.

Intense rainfall of relatively short duration is also characteristic of this region occurring as sudden downpours. Maximum 24 hour rainfall estimated at the SIA is presented in Table 3.2 for return periods of between 2 and 100 years.

RETURN PERIOD	**T2**	**T5**	**T10**	**T25**	**T50**	**T100**
RAINFALL (mm)	84	147	188	239	279	316

Table 3.2 : Estimated Maximum 24 – Hour Rainfall (mm)

The wind direction at the SIA is predominantly from the east with recorded wind measurements presented in Figure 3.1. The data indicates that winds from the east occur about 45% of time and 29% of the time from the north eastern sector typically between 7 to 21 knots. Mean wind speeds are generally higher in the daytime with a peak of about 15 knots at 2pm. and a low of 3 knots at midnight. During the night-time there is s strong tendency for wind speeds to come from the south-eastern sector at between 3 and 7 knots.

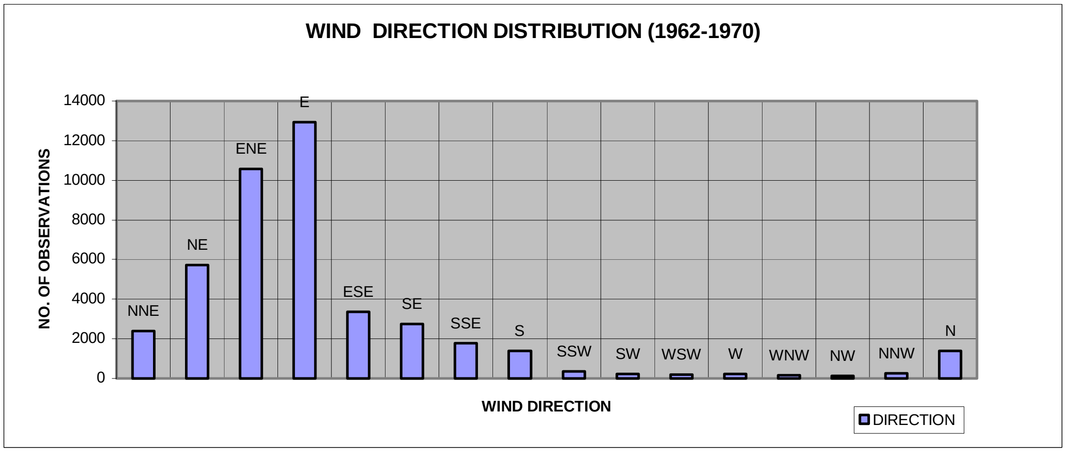


Figure 3.1: Wind direction recorded (1962-1970)

3.1.2 Topography

The site of the proposed incinerator is located on flat land that is adjacent to an area of much degraded mangrove wetland. Measurements around the compacted marl that defines the project site proper indicate a maximum elevation in the order of 2.5 meters above sea level.

The airport property is located on a flat coastal platform which was part of an extensive mangrove wetland and is therefore close to sea level. The platform has very low relief consisting of gentle undulations and broad depressions. A number of ponds exist where these depressions remain filled with water.

A high scarp forms the southern boundary of the platform and consists of a limestone ridge that runs parallel to the coastline attaining an elevation of 120 meters at Norwood, Figure 3.2.

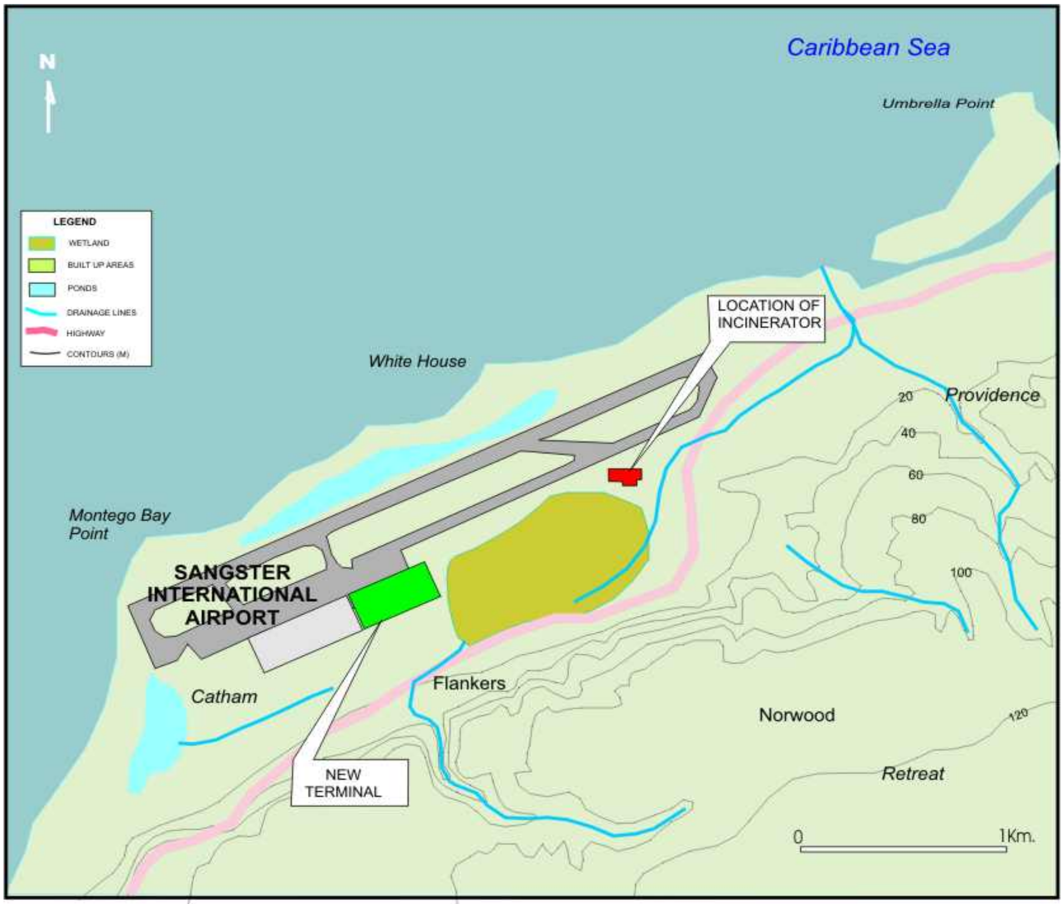


Figure 3.2: Topography and drainage.

3.1.3 Drainage

The low elevation of the entire airport site and the high water table result in generally poor drainage conditions. Surface drainage from the limestone hills to the south is well developed with deeply dissected drainage lines that direct water on to the coastal flatlands close to the wetland adjacent to the site.

Significant quantities of surface flow is generated quite rapidly after heavy rainfall because of the close proximity and steepness of the catchment hillslopes to the coastal flatland area, Figure 3.2

A large portion of this surface runoff will accumulate in the low-lying wetland area to the south of the site. A natural channel passing to the south east of the site, Figure 3.2 carries water from the wetland area to the sea. Some of the water drains from the wetland area via a cut-off drain into the two large ponds located to the south and north of the main runway through culverts. Sluice gates in the northern-most pond regulates the flow of water from the ponds into the sea.

3.1.4 Geology and Geotechnical characteristics

The coastal platform is defined by the upper surface of an exposed raised reef of Pleistocene age. A near vertical fault separates the platform from the limestone hills to the south that belong to the Montpellier Formation which is part of the White Limestone Group, Figure 3.3. This is a sedimentary sequence consisting of medium to thickly bedded white and grey chalks interbedded with biofragmental beds.

The site is an engineered platform constructed of well compacted marl that rests on consolidated soils consisting of marine calcareous sands and silty sand. The soils overlay a thick sequence of reef limestone. Ground water is typically located 3 feet below ground level.

3.1.5 Natural Hazard Vulnerability

Montego Bay like the rest of Jamaica is prone to hurricane force winds, storm surge, earthquakes and flooding from storm events of varying intensity.

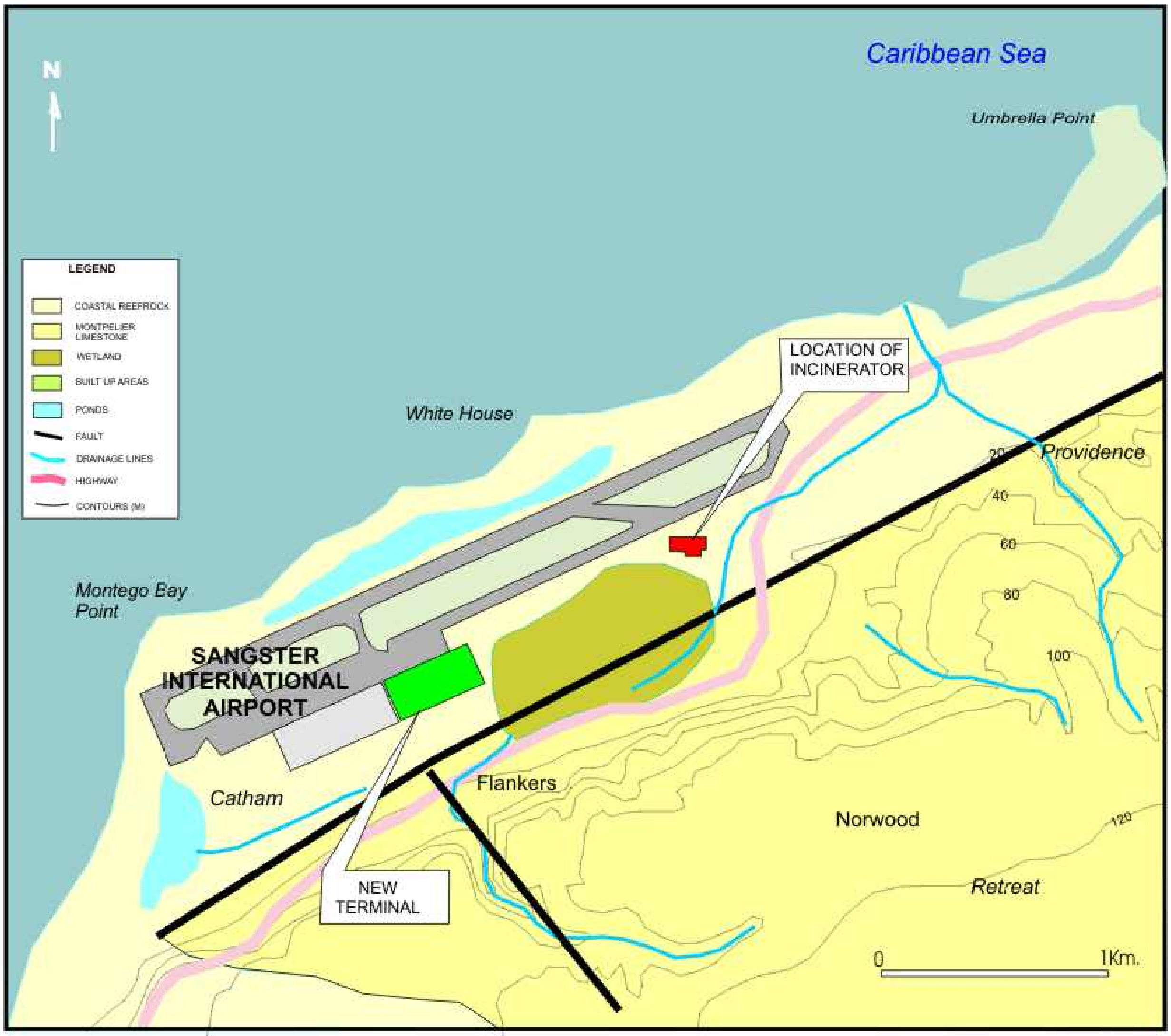


Figure 3.3: Geology.

In 1980 storm surge was recorded in the area from Hurricane Allen and Hurricane Gilbert in 1988 was the last direct hurricane strike in which Montego Bay was affected by wind damage and flooding.

Flooding is characteristic of Montego Bay, and the parish of St. James in which Montego Bay is located, ranks 5th in the number of major events recorded for the island over a 20 year period. Of note also is the tendency to localized torrential downpours which often lead to flooding in the city and the airport environs. The location of the site in a low lying area close to drainage lines and the wetlands indicate that adequate storm water drainage will be required to prevent ponding on the site.

Seismicity is of concern in that the epicentre of the most recent major earthquake in Jamaica is believed to have been located 20km northwest off Montego Bay. In 1957, this earthquake which had a magnitude of 6.5 effected considerable damage to buildings.

Intensity of MM VIII was felt in Montego Bay (Isaacs, 1987). Earthquake records analysed for the period 1874 - 1978 indicated approximately 5 events of intensity MM VI (Pereira 1982) and the probability of such an event has been suggested as 0.71 on the basis of 200 year record. This probability declines for events of increasing intensity viz. MM VII probability of 0.39 and MM VIII probability of 0.15 (Pereira, .1982). The airport has been built on reclaimed land that is highly susceptible to liquefaction caused by earthquake induced ground shaking.

3.1.6 Air Quality

The following describes the ambient air quality at the Sangster International Airport (SIA). The information used to inform the discussions is obtained from a current one-day PM10 ambient air quality investigation and historical data from the 2001 SIA Audit Report. The air shed surrounding an airport is impacted by sources both on and off the airport compound. Measurement of some amount of air emissions at airports is thus practically unavoidable. Possible point sources are:

- Jet blast
- Exhaust from ground transportation (air and landside),
- Incinerators (burn box),
- Boiler stacks,
- Domestic burning of solid waste,
- Open burning

Studies at certain large airports have shown that emissions from these facilities are primarily attributable to automobiles, airport ground vehicles and other urban pollution sources.

Volatile organic compounds (VOC's), oxides of sulphur (Sox), nitrogen oxides (NOx) and carbon monoxide (CO) were measured continuously over two different 8 hour periods at the Sangster International Airport. Measurements of air craft exhaust vapours were taken at the eastern and western perimeter fences, upwind and downwind respectively of the runway.

Nitrogen oxides (NO_x)

Nitrogen oxides were undetected at the sites monitored.

Oxides of sulphur (SO_x)

The primary oxide of sulpher SO2 was undetected at all sites monitored.

Volatile Organic Compounds (VOC's)

Measurable VOC levels were detected at the stands in the vicinity of gates 4 - 6 where several aircrafts were preparing for departure. Maximum concentrations of 35 mg/m^3 were measured in this area. The levels at the other areas were undetectable.

Carbon Monoxide (CO)

Carbon monoxide levels measured at SIA reached a maximum of 8 mg/m^3. The local standard for CO emissions is 10 mg/m^3 over an eight hour period. The data therefore indicates that SIA is within the standard for its CO emissions

Ambient Air-Dustfall

Ten dustfall stations were planted around the perimeter of the airport; the stations were in place for a total of eight weeks. Total suspended particulate (TSP) levels generally ranged between 9.7 and 15.9 mg/m at the all the stations except the one sited opposite the incinerator (now defunct). TSP levels measured at the incinerator site were 42.5 mg/m^3/month.

Current PM 10 data

Ambient PM10 measurements were taken at three stations at the Sangster International Airport. The results are presented in Table 3.3.

The results show that inhalable particulate levels at all three sites monitored were elevated when compared with the national standard. The station at the Texaco Service Station was currently exceeding the standard.

LOCATION	**PM10 – 24hrs $\mu g/m^3$**	**NEPA PM10 24hrs Standard**
Flankers	144.6	$150 \mu g/m^3$
Perimeter fence by Burnbox	153.1	
Texaco Service Station	221.0	

Table 3.3: Ambient PM10 Data for the SIA, May 25, 2004

3.2 Biological Characteristics

3.2.1 Introduction

The Sangster International Airport was built on what was originally a large and extensive mangrove lined lagoon. Aerial photographs taken in the 1950's during construction of the present terminal on the southern side of the runway, show the whole extent of land east of the terminal building, between the runway and the hills, to have been a saline pond subject to inundation during heavy rainfall.

This large area bereft of vegetation at that time, was subsequently filled with marl. Thus the vegetation that exists on that part of the airport site today represents growth over the past 25 – 30 years. The present vegetation reflects this history with few exceptions the vegetation is that expected of saline and/or sandy coastal regions.

3.2.2 Terrestrial Flora

Several species of mangroves along with Leucaena, Almond, Seaside Mahoe, Willow and Guango comprise the macrophyte vegetation. The rest of the vegetation can roughly be divided into two groups; herbs (creeping or erect) and grasses. Both groups have shrubs intermixed. The grass dominated areas, before giving way to pure stands of mangroves or Seaside Purslane, have a transition zone where shrubs intersperse with the grass.

It is of note that the herb Seaside Purslane (Sesuvium "portulacastrum) can be found everywhere i.e it extends from the runway margin through the site to the main road. It was found in pure stands or mixed with other species forming undergrowth except in wet areas predominated by mangroves.

3.2.3 Terrestrial Fauna

The high water table and the topography of the land has resulted in the formation of two large ponds adjacent to the taxi way and the access road. These ponds have provided a habitat, in close proximity to the airside operations, for many species of shore birds. During *ad hoc* observations of the established bird populations in a survey (ESL, 2001, Sangster Airport Audit) nine species were identified and are given in Table 3.3.

The ponds and swampy areas provide a suitable habitat for many species of bird. Additionally, the mangrove areas also provide roosting and nesting areas, particularly for the Cattle Egrets. A large section of mangroves at the western end of the property was removed and what remains is a narrow fringe on which birds still roost and an inundated area with remnants of mangrove trunks visible. To the east of the site for the incinerator is found scrubland while a stand of mangroves, is found to the south and Photo 3.1 and 3.2.

Photo 3.1 View of scrubland

Photo 3.2 View of mangrove stand

Common Name	Scientific Name	Range	Status	Habitat
White Ibis	*Eudocimus albus*	Greater Antilles	Uncommon resident	Mangroves
Cattle Egret	*Bubulcus ibis*	Worldwide	Very common resident	Pastures and open areas
Black Crowned Night Heron	*Nycticoraz nycticorax*	Worldwide, sub species in the Antilles	Fairly common resident	Beaches and wetlands
Royal Tern	*Sterna maxima*	West Indies, N America and W Africa	Common resident	Along coasts
Black-necked Stilt/Common Stilt	*Himantopus mexicanus*	N and S America and West Indies	Common resident	Salt marshes and shallow coastal bays, fresh and saline ponds
Spotted Sandpiper	*Actitis macularia*	N and S America, West Indies	Fairly common winter visitor and transient	Edges of fresh and saline ponds
Little Blue Heron/Blue Gaulin	*Egretta caerulea*	West Indies and the Americas	Common resident. Local population increased by migrants in winter.	Coastal areas
Great Blue Heron	*Ardea herodias*	N, C and S America, West Indies	Common winter visitor	Wetlands
Least Bittern	*Ixobrychus exilis*	West Indies and the Americas	Locally common resident	In rushes, reeds, beside rivers and in marshes
John Crow/Turkey Vulture	*Cathartes aura*	Greater Antilles, N,C and S America	Common resident	All areas

Table 3.3 List of Bird Species observed at Ponds adjacent to SIA Taxiway (2001)

Cows have been observed grazing on the airport property near the round-about at the entrance, while goats were observed on the grassy area between the perimeter fence and the ponds adjacent to the taxiway. Goats are often deliberately placed by their owners inside the perimeter fence to graze and would be attracted by refuse dumps. Access is obtained by cutting the fence or through existing breaches in the fence (Goodwill, A.P.S., Pers. Com).

The animals are sometimes tied on the inside of the perimeter fence. Tied animals may eventually get loose and those that are not tied immediately pose a risk to airside operations. Proper solid waste management practices including the incineration of waste should eliminate refuse piles and reduce the hazard posed by the goats to airport operations.

Other mammals such as rats, mice and the ubiquitous mongoose have been observed on the property and are attracted by refuse piles.

Bird hazard is a major issue for airport safety and there have been on-going efforts to manage the bird population in the airport environs.

3.2.4 Ecosystems

The Mangroves

Several species of mangroves occur on the property (ESL, 1993). The mangroves provide lush greenery to the area and also provide roosting and nesting areas for birds, which pose a threat to aircraft operations. The mangroves also

Serve as a nursery for young fish. Physically they act as buffer between the terrestrial and the marine environment, and filter terrestrial run-off by removing sediments and nutrients, and protecting the terrestrial environment against storm surge and wave action.

As primary producers (photosynthetic organisms) they also serve a vital function in airshed purification by utilising carbon dioxide and producing oxygen. Removal of the mangroves removes the physical buffer for the terrestrial environment against the marine environment; the filtration properties for terrestrial run-off; habitat for fish and birds; green space for aesthetic appeal; and cleansing of the air.

The site of the incinerator was previously cleared and no mangroves will be removed. The mangroves adjacent to the incinerator site are not expected to be negatively impacted by the construction or operation of the incinerator. During the construction phase proper solid waste management practices should be employed including berming of stockpiles to prevent washdown in the event of heavy rainfall and no side tipping of materials into vegetated areas.

Coral Reefs

The offshore reef in the vicinity of the Sandals Montego Bay Resort is well developed, as revealed in a previous study (ESL, 1993), but the substrate in the vicinity of other drains was composed of sand/rubble with patchy seagrass, high turbidity, and a reef structure with obvious siltation stress and a high percentage of dead corals. The coral reefs provide a habitat for many species of fish and shellfish as well as protection from oceanic waves. Coral reefs require clear warm waters to thrive and the high levels of siltation smother coral polyps and result in death of the reefs.

The establishment of the incinerator is not expected to have any negative impacts on the coral reefs, seagrass beds or benthic communities. Proper handling of solid waste will prevent wash down to the coastal zone.

Montego Bay Marine Park

The Montego Bay Marine Park was established in 1992 under the Natural Resources Conservation Authority Act (Natural Resources Conservation Marine Parks Regulations). The boundaries of the Marine Park encompass the northwestern side of the airport compound.

The establishment of the incinerator is not expected to have any negative impact on the operations of the marine park, nor any of the ecosystems contained therein.

3.3 Socio-Economic Environment

3.3.1 Introduction

The Sangster International Airport (SIA) is the larger of Jamaica's two international airports located in the Parish of St. James two miles to the east of the Montego Bay business district. (Figure1.1.)

Montego Bay is the capital of St. James with a population of 140,000 and is the economic focal point of western Jamaica. In addition to being the islands' premiere tourist resort area Montego Bay has developed into a substantial centre for transhipment, light manufacturing, warehousing and tele-informatics industries. The Montego Bay sphere of influence extends to the surrounding parishes of St. James, Trelawny Hanover and Westmoreland.

In order to guide the development of Montego Bay the Greater Montego Bay Redevelopment Company created the Greater Montego Bay Strategic and Development Plan 1994-2014 (GMBRC 2014) that encompasses Montego Bay and surrounding areas.

3.3.2 Demographics

The population of Montego Bay continues to grow rapidly at an estimated annual rate of 2%. About 60% of the population consists of informal 'squatter' settlements and migration into these communities within the GMBRC constitute the fastest growth areas.

A large percentage of the population is between 0-30 and the labour force is estimated at 65,000. The male/female ratio for Montego Bay is 0.92 with females outnumbering males.

The population in Montego Bay during the day is estimated to be in the order of 214,000 with 28% consisting of local commuters, 65% residents and 7% visitors.

3.3.3 Economy

The main economic base of Montego Bay is tourism and accounts for most of the total tourist arrivals with room capacity representing 50% of rooms, and accounting for 5% of the Jamaica's GDP. Since 1969 when significant land reclamation expanded land space along the coastline a number of other industries have grown while agriculture primarily sugar cane cultivation has declined.

Significant growth has taken place in economic areas such as light manufacturing (primarily garments), warehousing, cargo transhipment, agro-industry, tele-infomatics. The Montego Bay Freeport is a significant economic area including cruise shipping facilities, warehousing, hotels and other services.

3.3.4 Infrastructure

Transportation

In addition to the SIA Montego Bay is served by a major transhipment port. The North Coast Highway connects Montego Bay to Negril to the west and when completed will provide a major thoroughfare eastwards to as far east as Port Antonio.

A number of minor roads connect the city of Montego Bay with small town and communities in the hinterland. Recent road improvement works in the city centre have improved the traffic flow that has traditionally been congested. The railway system that has been out of service since 1980 connected Montego Bay to Kingston by narrow gauge line. There are plans to reactivate the service.

Water Supply

Water is supplied to the GMBA by the national water utility company The National Water Commission (NWC). The current demand of 24 million gallons per day(mgd) is supplied from the NWC's Martha Brae and Great River supply systems that has a capacity of 32 mgd.

Sewage Facilities

The NWC operates the sewage treatment facilities serving Montego Bay. The central sewage treatment facility was recently expanded to a capacity of 10.5 mgd with current demand of about 5 mgd. The main sewage treatment facility is located at Bogue and consists of extensive treatment ponds.

Solid Waste Management

Solid waste collection and disposal is the responsibility of the Western Parks and Markets agency. A properly designed and operated solid waste disposal facility is not currently available to serve the GMBA that generates an estimated 80 tonnes of waste daily. The retirement dump site is no longer operational and a new landfill facility is currently being designed to handle about 300 tonnes of solid waste per day.

Electrical Supply

Electricity is supplied to the GMBA by the Jamaica Public Service (JPS) which is the sole supplier of electricity. The total current capacity is about 690 MW with peak demand of 568 MW.

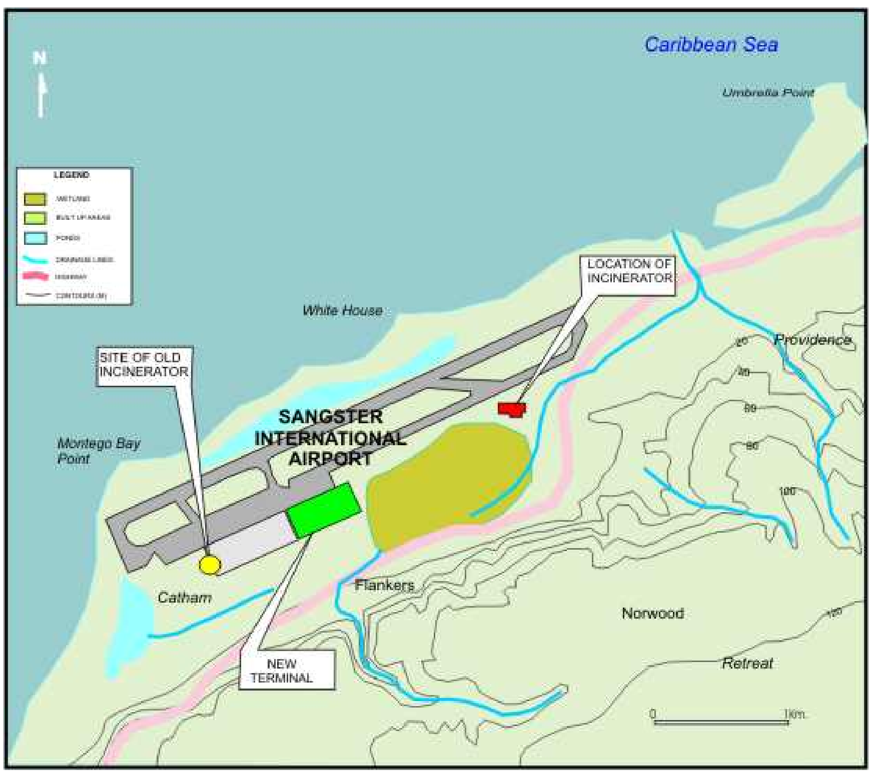
Telecommunications

The GMBA is served by land line services provided by the sole supplier Cable and Wireless Ltd. while mobile cellular service is provided by three local companies. A sophisticated digital teleport facility offers high speed data transfer services while internet service is provided by a number of local providers.

CHAPTER 4 POTENTIAL IMPACTS

4.1 Introduction

The proposed incinerator is intended to replace the old incinerator that has been unused since 2002 because it was badly located and inadequate. Figure 4.1 shows the location of the old incinerator and Photo 4.1 shows the nature of the facility. Since 2003 a temporary burn box has been used at the present site of the new proposed incinerator. This facility shown in Photo 4.2 was also inadequate.



The disposal of international waste at the SIA has followed general guidelines from the health department that international waste be separated from “local waste” and incinerated. The current waste disposal facility is not only inadequate to burn the waste but also is unable to control scavengers from nearby communities and poses a health risk. The proposed incineration facility will provide a comprehensive solution to the disposal of international waste at the SIA.

Photo 4.1: Old Disused incinerator.

Photo 4.2: Temporary burnbox.

In order to assess the potential impacts of the construction and operation of the proposed incinerator and to meet the proposed NEPA requirements for operating incinerators an air dispersal modelling exercise was carried out. The main conclusions of the study are presented below.

4.2 Air Dispersal Modelling

The air dispersal modelling exercise was carried out to assess the potential impact on human health and the environment from emissions from the proposed incinerator. The main objectives of the study are to obtain estimates of the likely emissions that the incinerator will produce under normal operating conditions, and the effect after dispersal on ambient air quality.

The National Resources Conservation Authority Ambient Air Quality Guideline Document (NAAQD, 1999) sets out the procedures and standards to be followed in carrying out air quality assessments of new emission sources. In order to meet the minimum requirements all significant sources of emissions must undertake at least “screening modelling” to determine if more detailed modelling is required. Detailed modelling is only required if the emissions and ambient air quality standards are exceeded.

4.2.1 Methodology

A screening modelling study was therefore carried out using the SCREEN VIEW air dispersal software package. The model estimates the maximum ground-level concentrations and the distance to the maximum. It has the following features:

- Incorporate the effects of building downwash on the maximum concentrations for both the near wake and far wake regions
- Estimate concentrations in the cavity re-circulation zone
- Incorporate the effects of simple elevated terrain on maximum concentrations
- Estimate 24-hour average concentrations due to plume impaction in complex terrain using the VALLEY model 24-hour screening procedure
- Calculate the maximum concentration at any number of user-specified distances in flat or elevated simple terrain
- Examine a full range of meteorological conditions, including all stability classes and wind speeds to find maximum impacts
- Incorporate the input of source parameters, including emission rate, stack height, stack inside diameter, stack gas exit temperature, stack gas exit velocity,

ambient air temperature, incinerator building height, length and width

- With the exception of the 24-hour estimate for complex terrain impacts, the results from SCREEN are estimated maximum 1-hour concentrations.

For this particular project, building downwash was applied. The site location is adjacent to complex terrain features, and hence both complex and simple flat terrains were considered. The full range of meteorological conditions, including all stability classes and wind speeds were also considered for the modelling analysis. For all model runs, the urban dispersion coefficient was applied.

4.2.2 Emission Estimation

A significant step in the conduct of the partial air quality assessment was the use of emission rates from the proposed incinerator. These rates were estimated in accordance with the recommendation outlined in the Ambient Air Quality Guideline Document. According to Davis & Associates (1999), emission rates are estimated in the following order of preference:

- Stack Testing
- Manufacturer's emission data
- Mass balance calculations
- Emission factors
- Engineering calculations

As a new unit is being proposed, stack testing data is not applicable. Certain manufacturer's emission data were apparently available for the proposed unit, but these were not used since the word “standards” was used to describe them. Therefore the emission factors from the United States Environmental Protection Agency (USEPA) AP-42 listing was used. Care was made to perform back-up checks using the mass balance methodology for certain parameters.

Table 4.1 shows the emission rates that were calculated using emission factors from the USEPA AP-42 List.

Pollutants	Emission Factors, lb pollutant/ton waste[1]	Emission Rates, g/s
Particulate Matter (PM)	3.43	0.216540404
Sulphur Dioxide (SO_2)	3.23	0.203914141
Carbon Monoxide (CO)	0.299	0.018876263
Arsenic	6.69E-04	4.22348E-05
Cadmium	2.41E-03	0.000152146
Chromium	3.31E-03	0.000208965
Mercury	5.60E-03	0.000353535
Nickel	5.52E-03	0.000348485
Hydrogen Chloride	2.15E+00	0.135732323
Nitrogen Oxides	3.16E+00	0.199494949
Chlorinated dibenzo-p-dioxins and furans	2.94E-06	1.85606E-07

Table 4.1: Emission Rates for Proposed Incinerator

The pollutants identified include all the criteria ones, as well as those described in the Priority Air Pollutant list that can

[1] Obtained from USEPA AP-42 Emission Factors

possibly be emitted from a refuse incinerator. The emission rates were calculated by the following formula:

Emission Rate = Emission Factor x Waste Feed Rate

Source Inputs	Value	Units
Stack Height	15	m
Stack Inside Diameter	0.7	m
Stack Gas Exit Flow Rate	1.42	m^3/s
Stack Gas Exit Temperature	300	^oC
Ambient Air Temperature	30	^oC
Incinerator Building Height	5 (avg.)	m
Incinerator Building Length	30	m
Incinerator Building Width	20	m

Table 4.2: Source Input Parameters

Source input parameters also represent an important aspect of the modelling analysis. Table 4.2 shows the source input parameters that were obtained from the incinerator system proposal prepared by Scanship Environmental (2002).

Good Engineering Practice (GEP) stack height was calculated as 12.75 m. However the stack was evaluated for potential building downwash effects. Therefore, the building dimensions as listed in Table 4.2 were provided.

4.2.3 Receptor Locations

Receptor locations identify the area of predicted maximum concentrations. With the Screen View model, these locations can either be considered automated (an array of distances) or discrete (specific locations of interest). For this partial assessment, both automated distances (simple flat terrain, with a minimum and maximum distance of 10 m and 5000 m, respectively) and discrete (complex terrain – see Table 4.3) were considered. Simple flat terrain is represented by heights that do not exceed stack base elevation, while complex terrain includes those heights that exceed stack height.

For the automated distances option, the Screen model calculates the maximum concentration across a range of meteorological conditions for the minimum distance given. Screen then computes the concentration for each distance in the array larger than the minimum distance and less than or equal to the maximum. Screen also uses an iteration routine to determine the maximum value associated with that distance to the nearest meter.

Terrain Height Above Stack Base, m	Distance from Source, m
60	500
70	600
80	700
90	800
100	900
110	1000
120	1000

Table 4.3: Discrete Distances

For the complex terrain, the screen model will estimate the worst-case impact at discrete locations defined by a terrain height above ground and a downwind distance. The model estimates the maximum concentration in the following two ways, with the higher of the two estimates being selected as controlling for that distance and terrain height (both estimates are printed out for comparison):

- If plume is at or below the terrain height for the distance entered, the screen model will make a 24-hour concentration using the VALLEY screening technique.
- If terrain is above stack height but below plume centerline height for the distance entered, the screen model will make a VALLEY 24-hour estimate (assuming E or F and 2.5 m/s), and also estimate the maximum concentration across a full range of meteorological conditions using simple terrain procedures with terrain “chopped off” at physical stack height. The simple terrain estimate is adjusted to represent a 24-hour average by multiplying by a factor of 0.4.

With all the input parameters defined, the Screen View model was conducted using the receptor height above ground 0 Meters (ground-level receptors) only.

4.2.4 Results and Discussion

This section documents the results of the entire project, including the proposed emission rates from the incinerator and the predicted concentrations from the dispersion model exercise.

Table 4.4 shows the uncontrolled emission rates that will be generated from the proposed incinerator (as a result of the use of emission factors) and their comparison with the Draft Air Emission Standards. **From the table it is observed that all emission rates are in compliance with the emission standards.**

Parameters	Emission Rates, g/s	Emission Rates mg/m^3	Emission Standards mg/m^3
Particulate Matter	0.217	152.5	200
Carbon Monoxide	0.019	13.3	100
Sulphur Dioxide	0.204	143.6	300

Table 4.4: Emission Rates

Therefore it can be concluded that once the manufacturer of the incinerator complies with the calculated uncontrolled emissions, then compliance with the emission standards is assured. It should be noted that the emission factor for carbon monoxide has an A-rating, while those for sulphur dioxide and particulate matter have a B-rating. The emission factor ratings range from A through E, and therefore it can be concluded that the estimates of the emissions were accurate.

Table 4.5 provides the maximum predicted concentration values of all the modeling analysis performed. It should be observed that the results were compiled for all those averaging periods for which national ambient air quality standards or guidelines (NAAQS/G) exist. Additionally, the Screen model generates 1-hour predicted concentrations for simple terrain and 24-hour concentrations for complex terrain. Where NAAQS/G exists for pollutants with long-term concentrations higher than 1-hour (for simple terrain) or 24-hour (for complex terrain), the conversion factors as provided in the NRCA Ambient Air Quality Guideline Document were used for such conversion.

The results in Table 4.5 revealed compliance with the NAAQS and the Priority Air Pollutants (PAPs) for all parameters, except total chlorinated dibenzo-p-dioxins and furans. For all parameters, the maximum predicted concentrations for the simple terrain occurred at a height of 0 m and a downwind distance of 71 m. For the complex terrain, the worst-case impact occurred at a downwind distance of 500 m and a terrain height of 60 m.

Pollutants	**Averaging Period**	**NAAQS μg/m**	**Backgroundμg/m³**	**Simple Terrain**			**Complex Terrain**		
				Max. Conc. μg/m³	**Distance m**	**Terrain Ht., m**	**Max. Conc. μg/m³**	**Distance m**	**Terrain Ht., m**
PM	1-hour	N/A	N/A	27.42	71	0	N/A	N/A	N/A
	24-hour	150	60	10.968	71	0	2.677	500	60
	Annual	60	15	2.742	71	0	0.5354	500	60
CO	1-hour	40,000	0	2.4	71	0	N/A	N/A	N/A
	8-hour	10,000	0	1.68	71	0	N/A	N/A	N/A
	24-hour	N/A	N/A	0.96	71	0	0.2344	500	60
SO_2	1-hour	700	0	25.77	71	0	N/A	N/A	N/A
	24-hour	280	0	10.308	71	0	2.517	500	60
	Annual	60	0	2.577	71	0	0.5034	500	60
NO_x	1-hour	400	0	25.2	71	0	N/A	N/A	N/A
	24-hour	N/A	N/A	10.08	71	0	2.461	500	60
	Annual	100	0	2.52	71	0	0.4922	500	60
HCl	1-hour	100	0	17.14	71	0	N/A	N/A	N/A
	24-hour	20	0	6.856	71	0	1.674	500	60
Arsenic	1-hour	0.75	0	5.31E-03	71	0	N/A	N/A	N/A
	24-hour	0.3	0	0.0021224	71	0	5.18E-04	500	60
Cadmium	1-hour	5	0	1.92E-02	71	0	N/A	N/A	N/A
	24-hour	2	0	0.00768	71	0	1.88E-03	500	60
Chromium	1-hour	3.75	0	2.64E-02	71	0	N/A	N/A	N/A
	24-hour	1.5	0	0.01056	71	0	2.58E-03	500	60
Mercury	1-hour	5	0	4.47E-02	71	0	N/A	N/A	N/A
	24-hour	2	0	0.017888	71	0	4.37E-03	500	60
Nickel	1-hour	5	0	4.40E-02	71	0	N/A	N/A	N/A
	24-hour	2	0	0.017588	71	0	4.29E-03	500	60
CDD/CDF	1-hour	N/A	N/A	2.35E-05	71	0	N/A	N/A	N/A
	24-hour	N/A	N/A	0.0000094	71	0	2.30E-06	500	60
	Annual	2×10^{-8}	0	2.35E-06	71	0	4.59E-07	500	60

Table 4.5: Summary of Model Predictions with ground level receptor

In order to reduce the impact of total chlorinated dibenzo-p-dioxins and furans (CDD/CDF) on ambient air quality, the use of an air pollution control (APC) device was applied to the modeling analysis.

For refuse incineration applications, CDD/CDF may be controlled using a combination of fabric filter and dry sorbent injection (DSI). By itself, fabric filter is able to minimize the uncontrolled emissions by 92%, while in combination with the DSI, 99.5% reduction efficiency is achievable. Table 4.6 presents the applicable emission rates and modelling results are indicated in Table 4.7.

Pollutant	**Emission Rates, g/s**
Uncontrolled	1.856×10^{-7}
CDD/CDF (Fabric Filter only)	1.485×10^{-8}
CDD/CDF (Dry Sorbent Injection/Fabric Filter)	9.28×10^{-10}

Table 4.6: Emission Rates (with an APC device)

Pollutants	Averaging Period	NAAQS $\mu g/m^3$	Background$\mu g/m^3$	Simple Terrain			Complex Terrain		
				Max. Conc. $\mu g/m^3$	Distance m	Terrain Ht., m	Max. Conc. $\mu g/m^3$	Distance m	Terrain Ht., m
CDD/CDF (FF)	1-hour	N/A	N/A	1.88×10^{-6}	71	0	N/A	N/A	N/A
	24-hour	N/A	N/A	7.5×10^{-7}	71	0	1.83×10^{-7}	500	60
	Annual	2×10^{-8}	0	1.88×10^{-7}	71	0	3.66×10^{-8}	500	60
CDD/CDF (FF/DSI)	1-hour	N/A	N/A	1.17×10^{-7}	71	0	N/A	N/A	N/A
	24-hour	N/A	N/A	4.69×10^{-8}	71	0	1.15×10^{-8}	N/A	N/A
	Annual	2×10^{-8}	0	1.17×10^{-8}	71	0	2.29×10^{-9}	500	60

Table 4.7: Maximum Predicted Concentrations (with APC device)

The application of the dual air pollution control technology resulted in an achievement of compliance with the ambient air quality guideline concentration.

4.3 Analysis Of Impacts & Mitigation Measures

This section identifies the potential impacts and suggested mitigation measures as related to the establishment of the incinerator. Findings of the assessment are presented according to construction and operation phases. The impacts have been determined as major or minor, positive or negative, long term or short term. An Impact Matrix is presented and Table 4.8 and the description of the main aspects are presented in Table 4.9.

Table 4.9a: Natural Environment – Potential Impacts and Mitigation Measures		
Environmental Aspect	**Potential Impacts**	**Mitigation Measures**
Air Quality	***Construction Phase*** Movement of trucks and heavy-duty equipment to and from the project area, as well as construction work and stockpiling of earth material, will contribute to dust emissions. Construction activities will not result in the removal of vegetation as the site is already bare. that will expose and loosen soil which can become airborne with medium to strong winds. This would add fugitive dust to the area, which is already dust prone because of previous land clearance. The transport of aggregate for general construction will also contribute to the fugitive dust levels. Construction vehicles will emit air	1. Stock piling of earth materials for construction should be carried out within temporarily constructed enclosures to limit fugitive dust. Vehicles transporting earth materials should be covered en route. Mixing equipment should be sealed properly and vibrating equipment should be equipped with dust removing devices. Stockpiles of fines should be covered on windy days. 2. Provide dust masks to operators in order to protect them from dust impacts. **The above mitigation measures are the ultimate responsibility of the developer, working with contractors and subcontractors.**

	contaminants such as nitrogen and sulphur oxides as well as particulates. ***Operation Phase*** The main air impacts during the operational phase will be from stack emissions and will include SOX, NOX, PM 10, POP and particulates. The levels of these parameters emitted from the incinerator were all shown by air dispersion modelling to be well within the accepted national standards. The modelling also showed that the aerial extent of maximum concentration of emission parameters at ground level within 100m.	**contractors and subcontractors.** *Operations Phase* 3. Furons and dioxins were shown by the model to be slightly higher than the national standards. However, the modeling also showed that with suggested air pollution control devices the expected values would come into compliance with the national standards. 4. On-going operation and maintenance procedures as stipulated by the manufacturer should be adhered to, to ensure that the emission parameters do not exceed the national standard. **The above mitigation measures are the ultimate responsibility of the developer.**

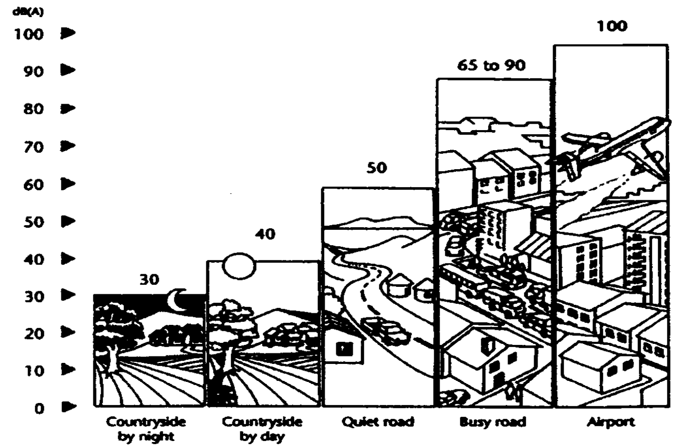
Noise	 *Construction Phase* The noise level is expected to increase during construction with the use of installation machinery and general construction activities. Additionally, the manufacturer's specification for noise in close proximity to the incinerator is in the order of 80dBA.	***Construction Phase*** 1. Noise from construction of the incinerator is not expected to have any significant negative impacts. The World Bank Guidelines (1997) indicates an acceptable noise limit of 90-100dBA for airports. ***Operation Phase*** **3.** During the operation phase workers in close proximity to the incinerator are advised to use appropriate protective devices including ear muffs. The above mitigation measures are the ultimate responsibility of the developer.

Table 4.9b: Social Environment – Potential Impacts and Mitigation Measures		
Environmental Aspect	**Potential Impacts**	**Mitigation Measures**
Employment	***Construction Phase*** Employment opportunities will be created during construction phase. This will mostly be unskilled labour for the duration of the construction activities. *Operation Phase* Small numbers of skilled operators will be required for long term or contract employment.	*Construction Phase* 1. Small numbers of casual labourers will find employment and this is expected to be a positive impact for the surrounding communities. *Operation Phase* 7. Appropriate training for skilled operators must be applied, according to manufacturer's recommendations.

		The above mitigation measures are the ultimate responsibility of the developer
Solid Waste Management	***Construction Phase*** Solid waste generated from the construction activities will include construction debris, and waste generated from the construction camp.	***Construction Phase*** 1. Construction sites generate considerable waste and provision must be made for suitable separation and storage of waste in designated and labeled areas throughout the site and at the site camp. 8. Collection of waste by certified contractors and disposal at an approved site, as recommended and approved by the National Solid Waste Management Authority. 9. Any hazardous waste should be separated and stored in areas clearly designated and labelled, for future entombing and disposal as directed by the National Solid Waste Management Authority. 10. Worker training should include instructions on how to dispose of food and drink containers

	Operation Phase During the operation phase a major positive impact is anticipated in the use of the incinerator for treatment of international waste. The use of the incinerator will reduce levels of respirable particulates (PM 10) and other emissions (SOX, NOX, POP's) that are	emphasizing the need to protect the coastal environment. 11. Construction camps and work areas must be adequately equipped with portable chemical toilets. 12. Portable chemical toilets must be provided, maintained and removed by a certified contractor. These mitigation measures are the **responsibility of the developer.** *Operation Phase* In accordance with instructions from the NSWMA (Letter of June 29, 2004-Appendix 2) the following mitigation measures are recommended. 6. The Airport Authority should have an analysis of its waste composition at least twice per year, in conjunction with the NSWMA

	presently being released by open burning activities. However, an end product of the incineration process is ash, which must be disposed of.	NSWMA. 7. An agreement must be entered into with the NSWMA for the disposal of the ash. 8. An approved disposal site must be used, which is the Retirement site. 9. Ash waste transported should be correctly containerized to ensure no possibility of spillage by wind or gravity. 10. Special/medical waste streams must not be disposed of in the incinerator. Contact must be made with the NSWMA and the Ministry of Health for appropriate disposal. **The above mitigation measures are the ultimate responsibility of the developer.**

Public Health and Safety	***Construction Phase*** Construction will involve transportation and storage of construction material, and proper disposal of construction spoil and any hazardous waste. Increased levels of fugitive dust and construction noise are also public health issues, and the mitigation measures as presented under air quality should be implemented.	***Mitigation Measures*** 4. To minimise risk to the public the construction activities which will directly affect the movement of traffic and pedestrians, should be properly scheduled and standard construction techniques for sign–posting and flagging should be adhered to. 5. Unnecessary idling of construction related vehicles should be discouraged. 6. Proper sign posting of speed limits and entrances and exits. These mitigation measures are the **responsibility of the developer.**

	Operation Phase During the operation phase there are no major negative impacts anticipated on the general public. The establishment of the incinerator should improve on exiting open burning activities and the release of harmful emissions. Currently, scavengers utilise the uncontrolled dump site. The establishment of the incinerator will include security measures to eliminate trespassers. During the operation phase, ash will be produces as and end product.	*Operation Phase* 2. Ensure adequate security including fencing, trained personnel and signage to limit access to the incinerator by unauthorized personnel. 2. In accordance with instructions from the NSWMA (Letter of June 29, 2004) the following mitigation measures indicated above are to be implemented. regarding ash disposal: 3. Special/medical waste streams must not be disposed of in the incinerator. Contact must be made with the NSWMA and the Ministry of Health for appropriate disposal.

4.4 Public Hearing

A public hearing is scheduled for Tuesday July 6, 2004, to present the findings of the Environmental Impact Assessment, as required by the National Environment and Planning Agency (NEPA). The results of this community meeting will be submitted as a separate report, to NEPA, but will still form a part of the EIA process.

CHAPTER 5 CONSIDERATION OF ALTERNATIVES

5.1 Purpose

This section describes the alternatives to the implementation of the proposed project.

No Action Alternative

The ‘No Action Alternative’ means no implementation of the project as proposed, no implementation of the incinerator, and that existing conditions remain. This would see the continued use of open burning on the airport property as the selected method of treating the international solid waste generated.

This alternative would see the continuation of the release of emissions including SOX, NOX, POP’s and respirable particulates (PM 10) in an uncontrolled manner, which would cause contamination of the surrounding air shed.

Alternative Incinerator Systems

The Airports Authority of Jamaica investigated alternative options for the incinerator and these were analysed as part of the bidding and selection process. The Scanship Incinerator SE-1150 was selected and is reported to utilise a new combustion concept based on the latest technology and is designed to meet the most stringent requirements.

Alternative Sites

The previous incinerator was sited in close proximity to the main terminal building. The proposed site is to the east of the airport property, away from the terminal building and therefore away from the travelling public. This location is an improvement over the original site. The proposed site is a disturbed site, previously used for a number of airport support activities, including a land farm and the temporary siting of the existing burn box. The selection of an alternative site may have necessitated additional clearing of vegetative stands or disturbance of other ecosystems.

Alternative Methods of Waste Disposal

The general Ministry of Health requirements that international waste be incinerated and not mixed with local solid waste precludes any other method of waste disposal.

CHAPTER 6 POST CONSTRUCTION MONITORING AND MANAGEMENT PLANS

6.1 Monitoring Programme

If a permit is granted for the proposed project and before the commissioning of the incinerator the AAJ should submit a Monitoring Programme to NEPA. The aim of the Monitoring Programme is to ensure compliance with relevant legislation, implementation of the mitigation measures and long-term minimization of negative environmental impacts.

The Monitoring Programme should include a Construction Plan and Schedule with a description of any proposed phasing of activities, recommended Mitigation Measures and proposed methods of compliance. The Monitoring Programme should also include an Inspection Protocol; planned Supervision of Site Preparation and Construction Activities and implementation of Post Construction Monitoring. During construction fortnightly reports should be submitted to NEPA as well as a final summary report of the effectiveness of the mitigation measures.

The Monitoring Programme will specifically outline a programme of stack emission testing including medium term monitoring provisions. These tests will be carried out in keeping with the requirements of the NEPA and informed by data from similar facilities. The results of these tests will be used to confirm recommended mitigation measures in particular the possible need for the installation of pollution control devices.

6.2 Waste Management Plan

The AAJ will produce a comprehensive Waste Management Plan that will outline the various aspects of the incinerator operations. Included in the Waste Management Plan will be an Emergency Response Plan that will set out the specific procedures for dealing with natural and man-made emergencies.

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APPENDICES

APPENDIX I

APPENDIX II

APPENDIX III