

**QUARANTINE WASTE TREATMENT FACILITY
- Darwin Port Corporation -**

**ENVIRONMENTAL ASSESSMENT REPORT
AND
RECOMMENDATIONS**

ENVIRONMENT PROTECTION AGENCY PROGRAM

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Department of Natural Resources, Environment and the Arts

TABLE OF CONTENTS

EXECUTIVE SUMMARY	V
LIST OF RECOMMENDATIONS	VI
1. INTRODUCTION AND BACKGROUND	1
1.1 Environmental Impact Assessment Process	1
1.2 Environmental Impact Assessment History	2
1.3 Regulatory Framework	2
2. THE PROPOSAL	3
2.1 Site Development	6
2.2 Transportation of Waste	6
2.3 Waste Storage	6
2.4 Treatment Process	6
2.5 Ash Storage and Transportation	8
2.6 Waste Water	8
2.7 Issues Not Included in this Environmental Impact Assessment	9
2.7.1 Handling of quarantine and clinical waste prior to entry into the facility	9
2.7.2 Operation of Interim Incinerator	9
3. REGIONAL SETTING	10
3.1 Land Use	10
3.1.1 Existing Environment	10
3.1.2 Surrounding Land Use	10
3.2 Existing Air Quality	11
3.3 Climatic Conditions	12
3.4 Physical Environment	12
3.5 Water	13
3.6 Noise	13
3.7 Biological Environment	14
3.7.1 Terrestrial Flora	14
3.7.2 Terrestrial Fauna	14
3.7.3 Threatened Species	14
3.7.4 Marine and Estuarine Communities	15
3.7.5 Marine and Estuarine Fauna	15
3.8 Cultural Environment	16
1.8.1 Indigenous Heritage	16
1.8.2 Non - Indigenous Heritage	16
4. ENVIRONMENTAL IMPACT ASSESSMENT	17
4.1 Introduction	17

4.2 Use of the Facility	18
4.2.1 Definitions	18
4.3 Licensing	19
4.4 Air Quality	19
4.4.1 Potential Air Emissions	19
4.4.2 Air Quality Control System	21
4.4.3 Public Information	22
4.4.4 Stack Monitoring Program	22
4.4.5 Commissioning	23
4.4.6 Maintenance and Troubleshooting	23
4.4.7 Effects on Wharf Workers	24
4.5 Waste Management	24
4.5.1 Waste Audit	24
4.5.2 Increase in Waste Incineration	25
4.5.3 Waste Storage and contingencies for Darwin Port Corporation	25
4.5.4 Use of Interim Incinerator	26
4.5.5 Staff Training	26
4.5.6 Medical Waste	27
4.6 Ash Management	27
4.6.1 Ash Quantity	27
4.6.2 Ash Recycling	27
4.6.3 Ash Characterisation	28
4.6.4 Failed Ash Disposal	28
4.7 Greenhouse/ Climate Change	29
4.7.1 Minimisation and Reporting	29
4.7.2 Piping of Gas to Site	30
4.8 Water Management	30
4.8.1 Waste Water	30
4.9 Construction	31
4.9.1 Acid Sulphate Soil	31
4.10 Noise	31
4.11 Environmental Management Plans	31
5. REFERENCES	33
6. APPENDIX 1 TABLE OF COMMITMENTS	34

Abbreviations

AAPA	Aboriginal Areas Protection Authority
ACS	Australian Customs Service
AQIS	Australian Quarantine and Inspection Service
CO	Carbon Monoxide
DBERD	Department of Business, Economic and Regional Development
DCC	Darwin City Council
DPC	Darwin Port Corporation
DPIFM	Department of Primary Industry, Fisheries and Mines (formerly part of the Department of Business, Industry and Resource Development)
DEH	Department of the Environment and Heritage (Australian Government)
DHCS	Northern Territory Department of Health and Community Services (formerly THS)
DPI	Northern Territory Department of Planning and Infrastructure
DLPE	Northern Territory former Department of Lands, Planning and Environment (now the Department of Planning and Infrastructure and Department of Natural Resources, Environment and the Arts)
EPA	Environment Protection Agency
EMP	Environmental Management Plan
EPBC	<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Australian Government)
Ha	Hectares
HCS	Heritage Conservation Services
kg/hr	Kilograms per hour
km	Kilometres
km ²	Square Kilometres
L/s	Litres per second
m	Metres
MAGNT	Museum and Art Gallery of the Northern Territory
MARPOL	Marine Pollution
m ³ /day	cubic metres per day (1m ³ = 1000 litres)
m ³ /hr	cubic metres per hour (1m ³ = 1000 litres)
mg/m ³	milligrams per cubic metre
ML	Megalitres (1ML = 1 million litres)
ML/y	Megalitres per year
MW/a	Megawatt per annum
NAQS	Northern Australian Quarantine Strategy
NEPM	National Environment Protection Measure
ng/m ³	nanograms per cubic metre
Nm ³ /s	Normal cubic metres per second
NRETA	Northern Territory Department of Natural Resources, Environment and the Arts
NOI	Notice of Intent
NPI	National Pollutant Inventory
NT	Northern Territory
PAH	Polycyclic Aromatic Hydrocarbons
PER	Public Environmental Report
PM _{2.5}	Particulate Matter with equivalent aerodynamic diameter less than 2.5 micrometres
PM ₁₀	Particulate Matter with equivalent aerodynamic diameter less than 10 micrometres
POP	Persistent Organic Pollutant
QWTF	Quarantine Waste Treatment Facility
RDH	Royal Darwin Hospital
SEPP-AQM	State Environment Protection Policy – Air Quality Management (NSW)

t	Tonnes
TCLP	Toxicity Characteristics Leaching Procedure
t/y	Tonnes/year
TSP	Total Suspended Particulate

EXECUTIVE SUMMARY

This report assesses the environmental impacts of the proposal by Darwin Port Corporation (DPC) (the proponent), for the Quarantine Waste Treatment Facility to be located at East Arm Wharf approximately 7km south of Darwin City, Northern Territory. The project would involve the incineration of quarantine, medical and other waste up to 450kg/hr over a project life of a minimum of 20 years. The primary chamber of the incinerator is designed to operate between 750°C to 950°C and the secondary chamber at 1200°C. The air pollution control equipment proposed for the facility is a dry system that involves injecting lime and activated carbon into the gas stream, after the temperature of the gas stream has been reduced, then collecting this material in a baghouse. Incinerator ash will need to meet leachate criteria before disposal to landfill at Shoal Bay Waste Disposal Site.

This Assessment Report reviews the Public Environmental Report (PER), public comments, and additional information obtained during the assessment process. Information, comments and advice provided by Northern Territory Government agencies and previous studies undertaken in the region have also been used in the preparation of this report.

Environmental assessment is the process of defining those elements of the environment which may be affected by a development proposal and of determining the significance, risk and consequences of the potential impacts of the proposal. Recommendations arising from the assessment address methods to mitigate these impacts.

Major Issues

The principal environmental issues associated with the proposal are:

- The management of air pollutant emissions including particulates, acid gases, trace metals, trace organics and odour;
- Waste management, classification and quantification including storage and handling of quarantine and clinical waste;
- Disposal of ash to landfill and potentially the treatment and disposal of ash that does not meet leachate criteria;
- Greenhouse and climate change impact; and
- Water management.

Conclusions

The Environment Protection Agency (EPA) Program considers that the environmental issues associated with the proposed project have been adequately identified. Appropriate environmental management of a number of these issues has been resolved through the assessment process, while the remainder will be addressed through monitoring and response actions, the Construction Environmental Management Plan (CEMP) and Operational Environmental Management Plan (OEMP) and any licensing.

The final plans for the proposal will be subject to review to the satisfaction of the relevant Northern Territory Government agencies prior to the operation of the Quarantine Waste Treatment Facility.

Based on its review of the PER and the submissions from relevant Northern Territory Government agencies, affected stakeholders and the public, the EPA Program considers that the project can be managed without unacceptable environmental impacts. This is provided that the environmental commitments and recommendations detailed in the PER, this Assessment Report and in the OEMP/ CEMP are implemented and managed under the

environmental management system for the project and are subject to regular reporting and compliance auditing.

List of Recommendations

RECOMMENDATION 1

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **Identified in the Quarantine Waste Treatment Facility, Public Environmental Report; and**
- **Recommended in this Assessment Report (No. 55).**

All safeguards and mitigation measures outlined in the Public Environmental Report are considered commitments by Darwin Port Corporation and are included in Appendix 1 of this report.

RECOMMENDATION 2

In accordance with clause 14A of the *Administrative Procedures of the Environmental Assessment Act*, the proponent shall advise the Minister of any changes to the proposal for determination of whether or not further environmental impact assessment is required.

RECOMMENDATION 3

The focus on the use of the incinerator must be to minimise the amount of waste that is incinerated. The proponent must not incinerate any waste that does not meet the listed definitions.

RECOMMENDATION 4

It is recommended that Schedule 2 of the *Waste Management and Pollution Control Act* be amended to include the quarantine waste treatment facility.

RECOMMENDATION 5

Darwin Port Corporation is to develop and implement procedures to ensure that the frequency and duration of bypass operations are minimised.

RECOMMENDATION 6

The operator of the incinerator must provide a report to the regulatory authorities reviewing the air quality system on the incinerator in the event of significant new developments in incinerator air quality control systems or at the latest prior to the eleventh year of operation. The review must include the efficacy of the current system in comparison to other available air quality control systems and the availability of alternatives to incineration. The review should take into account any changes in the waste stream and likely future requirements. Subsequent reports should be undertaken at least every 10 years.

RECOMMENDATION 7

Information must be publicly available that summarises the air emissions control techniques, the impacts on air quality and how the proposed design meets national and international requirements.

RECOMMENDATION 8

Develop stack monitoring procedures for approval by the EPA Program and Environmental Health, Department of Health and Community Services at least three months prior to the operation of the incinerator. Procedures should include a testing regime and reporting schedule. They must be incorporated in the Operational Environmental Management Plan and made available publicly.

RECOMMENDATION 9

Procedures are to be developed for incorporation into the Operational Environmental Management Plan for the maintenance regime for the air quality control system and processes that should be undertaken when the facility is not operation to specification, for example when the plume coming from the stack is any colour but white.

RECOMMENDATION 10

A communication and complaints system is to be developed to allow the public including workers at East Arm Wharf, to be informed of incinerator operations.

RECOMMENDATION 11

As part of a comprehensive occupational health and safety strategy, a health testing procedure should be developed for incinerator operators to identify any potential health impacts associated with working at the facility.

RECOMMENDATION 12

The proponent is to undertake a controlled audit of quarantine waste in consultation with AQIS to determine the nature of the waste stream and to facilitate potential waste minimisation initiatives to reduce the amount of waste requiring specialised treatment. This should be undertaken within two years and repeated when significant increases in waste are treated or at a minimum of 5 yearly intervals.

RECOMMENDATION 13

The proponent must outline any criteria that would warrant the increase in the amount of waste that could be sent to the incinerator. Written confirmation from AQIS and other waste treatment facilities such as Shoal Bay Waste Treatment Facility is required if waste is no longer able to be treated by means other than incineration. The focus on the use of the incinerator must be to limit the amount of waste incinerated.

RECOMMENDATION 14

An awareness and training program in waste classification and segregation be developed and implemented to build the capacity of waste generators. This must be included in the OEMP.

RECOMMENDATION 15

The Operational Environmental Management Plan is to include contingency plans for scenarios of incinerator shutdowns and periods of high waste load. This should include the availability of spare refrigerated shipping containers in the region and periods of significant power shortages such as after a cyclone. Segregation practices should also be developed where appropriate so that unsuitable wastes are not sent to landfill after storage.

RECOMMENDATION 16

The use of the interim incinerator beyond the conditions above is not acceptable under the current development permit. If the proponent wishes to utilise the interim incinerator after the allowable two year period they will require an additional development permit and further environmental assessment. It is recommended that should the incinerator be used as a backup, that the proponent fulfill the requirements prior to the completion of the two year period to enable environmental assessment to be completed before it is required to be used as a backup.

RECOMMENDATION 17

It is recommended that the OEMP clearly state the quantity of waste to be incinerated on a yearly basis and the associated quantity of ash. Any increase of waste incineration must be justified.

RECOMMENDATION 18

It is recommended that the proponent examine options for ash recycling in discussion with the Department of Planning and Infrastructure.

RECOMMENDATION 19

It is recommended that a testing regime be developed and implemented that provides Toxicity Characteristics Leaching Procedure (TCLP) testing periods and criteria to ensure suitability of ash for disposal at Shoal Bay Waste Treatment Facility. Testing should occur over a period that demonstrates continuity in results. The regime must be incorporated into the Operational Environmental Management Plan.

RECOMMENDATION 20

A contingency must be prepared for dealing with ash that fails the TCLP test. This contingency is to be in place prior to commissioning the incinerator. The contingency must include how failed ash can be treated, locations for treatment, safe transportation of failed ash and appropriate disposal facilities. The contingency must also contain processes for disposing of quarantine waste that contains heavy metals and is removed from the waste stream prior to incineration.

The contingency must be approved by the EPA Program and the Department of Health and Community Services. The procedure must be included in the Operational Environmental Management Plan.

RECOMMENDATION 21

It is recommended that the proponent incorporate measures for the ongoing monitoring, investigation, review and reporting of greenhouse gas emissions in the Operational Environmental Management Plan.

RECOMMENDATION 22

It is recommended that the proponent join the Australian Government's Greenhouse Challenge Plus program as a framework for monitoring and reporting greenhouse emissions and achieving ongoing improvement in emissions management.

RECOMMENDATION 23

It is recommended that the proponent discuss with the Department of Planning and Infrastructure the possibilities of establishing a gas pipeline connection to the site or design considerations that would need to be taken into account if a gas pipeline was introduced in the longer term.

RECOMMENDATION 24

It is recommended that a trade waste agreement should be developed to maintain acceptable quality of wastewater being delivered to the onsite Waste Water Treatment Plant. The proponent will need to meet any requirements imposed by the EPA Program Environmental Management section for discharge licensing associated with the onsite waste water treatment plant.

RECOMMENDATION 25

It is recommended that the Darwin Port Corporation explore options for using recycled water in the adiabatic quench to minimise the use of potable water in the system.

RECOMMENDATION 26

It is recommended that an acid sulfate soil management plan be included in the Construction Environmental Management Plan.

RECOMMENDATION 27

Revised management plans covering construction and operation of the Quarantine Waste Treatment Facility are to be submitted to the EPA Program and Environmental Health, Department of Health and Community Services for approval prior to commencement of construction and operation. In preparing each management plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report and recommendations made by the Northern Territory Government with respect to the proposal. The plans shall be referred to relevant NT Government Agencies for review prior to finalisation.

RECOMMENDATION 28

It is recommended that the Department of Health and Community Services be referenced throughout the management plans, specifically Environmental and Public Health. These areas should be included in any reporting requirements, risk assessments, emergency response sub plan, responsibilities in sewage management and complaints management flow charts.

The Harbour Master should also contact the Department of Health and Community Services in the emergency response sub plan.

RECOMMENDATION 29

It is recommended that the NT *Public Health Act* be listed in the relevant legislation sections in the OEMP and CEMP.

1. INTRODUCTION AND BACKGROUND

This report assesses the environmental impact of a proposal by Darwin Port Corporation (DPC) to build and operate an incinerator located at East Arm Wharf approximately 7km South of Darwin City, Northern Territory. The project would involve the incineration of quarantine, medical and other waste up to 450kg/hr over a project life of a minimum of 20 years. The project, referred to as the 'Quarantine Waste Treatment Facility' is located on reclaimed land within the confines of DPC boundaries (Figure 1).

DPC ('the proponent') proposes to use incineration to dispose of quarantine, medical and other waste. The proposal includes the installation of air pollution control equipment. This would consist of a dry system that involves injecting lime and activated carbon into the gas stream, after the temperature of the gas stream has been reduced, and collecting this material in a baghouse. Incinerator ash will need to meet leachate criteria before disposal to landfill at Shoal Bay Waste Disposal Site.

This Environmental Assessment Report is based on a review of the Public Environmental Report (PER); comments from the public and NT Government agencies on the PER; and prepared in response to those comments and additional information obtained during the assessment process.

1.1 Environmental Impact Assessment Process

Environmental impact assessment is based on adequately defining those elements of the environment that may be affected by a proposed development, and on evaluating the significance, risks and consequences of the potential impacts of the proposal at both local and regional levels. This Assessment Report describes the adequacy of the PER submitted by DPC in achieving these objectives. The report also evaluates the adequacy of the commitments and environmental safeguards proposed by the proponent in order to avoid or mitigate potential impacts associated with the proposed Quarantine Waste Treatment Facility.

Where it is determined through the environmental assessment process that the potential impacts associated with aspects of the proposal can be adequately managed through the strategies presented by the proponent in the PER, these strategies are supported in the Assessment Report. Where it is determined that the potential impacts cannot be adequately managed through the safeguards presented by the proponent, additional safeguards are recommended to ensure that should the proposal be approved, it can proceed in an environmentally acceptable manner. The safeguards may be implemented at various levels within the planning framework of the project and include (but are not limited to):

- design and layout of facilities;
- management of construction activities; and
- management of processes used in operation at the facility (i.e. inputs and outputs).

The recommendations made in this report form the basis of advice to the NT Minister for Natural Resources, Environment and Heritage on the environmental issues associated with the project and are to inform a decision by the Minister for Planning and Lands as to whether or not the project should be given development consent.

1.2 Environmental Impact Assessment History

DPC lodged a development application with the Department of Planning and Infrastructure in June 2005, proposing the construction and operation of an incinerator for waste disposal on East Arm Wharf. The proposal was referred to the EPA Program, formerly the Office of Environment and Heritage, as a Notice of Intent in June 2005.

In August 2005, the NT Minister for Environment and Heritage determined that the proposal would require assessment under the *Environmental Assessment Act* at the level of a Public Environmental Report (PER). The proponent was instructed to prepare a PER document to fulfil the NT Government environmental assessment requirements.

Draft guidelines covering issues to be addressed in the PER were developed by the NT EPA Program. The Draft Guidelines were subject to a statutory 14 day public review period in September 2005. Guidelines for the PER were finalised in October 2005, taking into account submissions and comments from various members of the public, non-government groups and NT Government agencies. The NT Minister for Natural Resources, Environment and Heritage directed the proponent to prepare the PER addressing matters set out in the final guidelines.

Due to the timeframes for developing a PER and the poor quality of the existing Fort Hill Incinerator, DPC submitted a development application for the construction and operation of an Interim Quarantine Waste Treatment Facility. This interim facility was required to receive quarantine waste to maintain the operations of the Darwin Port. The Minister determined in January 2006 that the interim facility could be managed under an Environmental Management Plan (EMP) for a period of two years while the permanent facility (the focus of this PER) was being commissioned.

DPC submitted a PER on the Quarantine Waste Treatment Facility to the NT EPA Program in August 2006. The PER underwent a statutory public exhibition period of 28 days from 4 September 2006 to 2 October 2006, with the EPA Program accepting comments up to the 9 October 2006. During the public exhibition period, the PER was also circulated to NT Government advisory bodies for review and comment. One public submission was received.

Following the review of the PER, this Assessment Report was prepared to report on the outcomes of the environmental assessment process, and to make recommendations on the environmental issues associated with the proposal, for consideration by the Minister.

1.3 Regulatory Framework

The NT Government has jurisdiction over environmental and other legislation relating to the siting, construction and operation of the proposed Quarantine Waste Treatment Facility. Environmental assessment was undertaken in accordance with the requirements of the Northern Territory *Environmental Assessment Act (1982)*.

Under the provisions of the *Environmental Assessment Act (1982)*, the Minister for Natural Resources, Environment and Heritage will inform the NT Minister for Infrastructure and Transport of the findings of the review and assessment of the environmental aspects of the proposed action. The Minister for Planning and Lands will determine whether or not to approve the proposal, and if approved what conditions should be attached. The Assessment Report will also be used to inform the issue of any environment protection approval or environment protection licence in the event the facility is included in Schedule 2 of the *Waste Management and Pollution Control Act*.

2. THE PROPOSAL

The proposal involves the construction and operation of a high temperature incinerator located within an existing fenced area of approximately 2.5 hectares at East Arm Wharf, approximately 7km south of Darwin City, within DPC boundaries. The facility will include the following structures:

- Gatehouse;
- Transit Shed;
- Incinerator (within an incinerator building); and
- Two 30 kL above ground LPG storage tanks.

Of the above structures, the gatehouse and transit shed already exist and are functional within the day-to-day wharf operations (i.e. all that remains to be built are the incinerator and incinerator building, and the LPG storage tanks).

It is proposed that the facility receive quarantine material by truck and process such material on a 24 hour a day, seven days a week basis during an envisaged 20 year life. The facility will process between one and seven tonnes per day of waste, dependant on sea and air traffic. The facility will close for approximately one month per year for routine maintenance.

The incinerator will be designed to accept between 300 – 450 kg/hr of waste although this will actually depend on the volume, bulk density and calorific value of the waste. The primary chamber is designed to operate between 750°C to 950°C and the secondary chamber at 1200°C.

A summary of the key characteristics of the proposed project is provided in Table 1.

Table 1: Summary of the Proposed Project

Component	Proposed Project
Incinerator type	Not yet finalised, dependant on contract supplier.
Incinerator Life	Minimum of 20 years (air quality control system to be reviewed after 10 years).
Capacity	300 - 450 kg/hr dependant on volume bulk density and calorific value of waste.
Operating Temperatures	750°C – 950°C primary chamber and 1200°C Secondary Chamber.
Air Quality Control System	Dry System, injection of lime and activated carbon. Other controls explored in more detail in Section 2.4.
Electricity Requirements	Connected to DPC's existing power supply 150 kWh at 100 amps (normal) and 200 kWh at 200 amps (maximum).
Gas Requirements	Two 30 kL above ground tanks. The incinerator will consume 150kg of fuel per hour approx. One tank per week.
Water Requirements	500L/h of potable water will be required for the operation of the incinerator. Water will be sourced from existing mains. Water will also be required for fire protection.
Sewerage	Amenities constructed within the incinerator building will be connected to the current sewerage system.
Waste Storage	All waste will be received in a sealed and secure fashion as per AQIS requirements. Where wastes are to be stored for longer than 24 hours the

Component	Proposed Project
	waste will be stored in refrigerated shipping containers located within the transit shed.
Waste Ash Management	Ash and residues, and the lime/carbon waste need to meet leachate criteria for disposal to landfill at Shoal Bay.
Transport of Waste	Quarantine waste will be brought to the facility by trucks from the East Arm Wharf, Stokes Hill Wharf (in the case of cruise liners), Fort Hill Wharf, Iron Ore Wharf, Darwin Naval Base (and other regional defence operations) and Darwin International Airport, as required. In addition, the Royal Darwin Hospital and other health care services will potentially ship small quantities of biomedical waste not suitable for treatment by autoclave. The trucks will access the site through the gatehouse, along the main sealed road, and enter the site east of the transit shed.
Hours of Operation	Up to 24 hours a day, seven days a week.
Air Emission Sources	25m Stack.

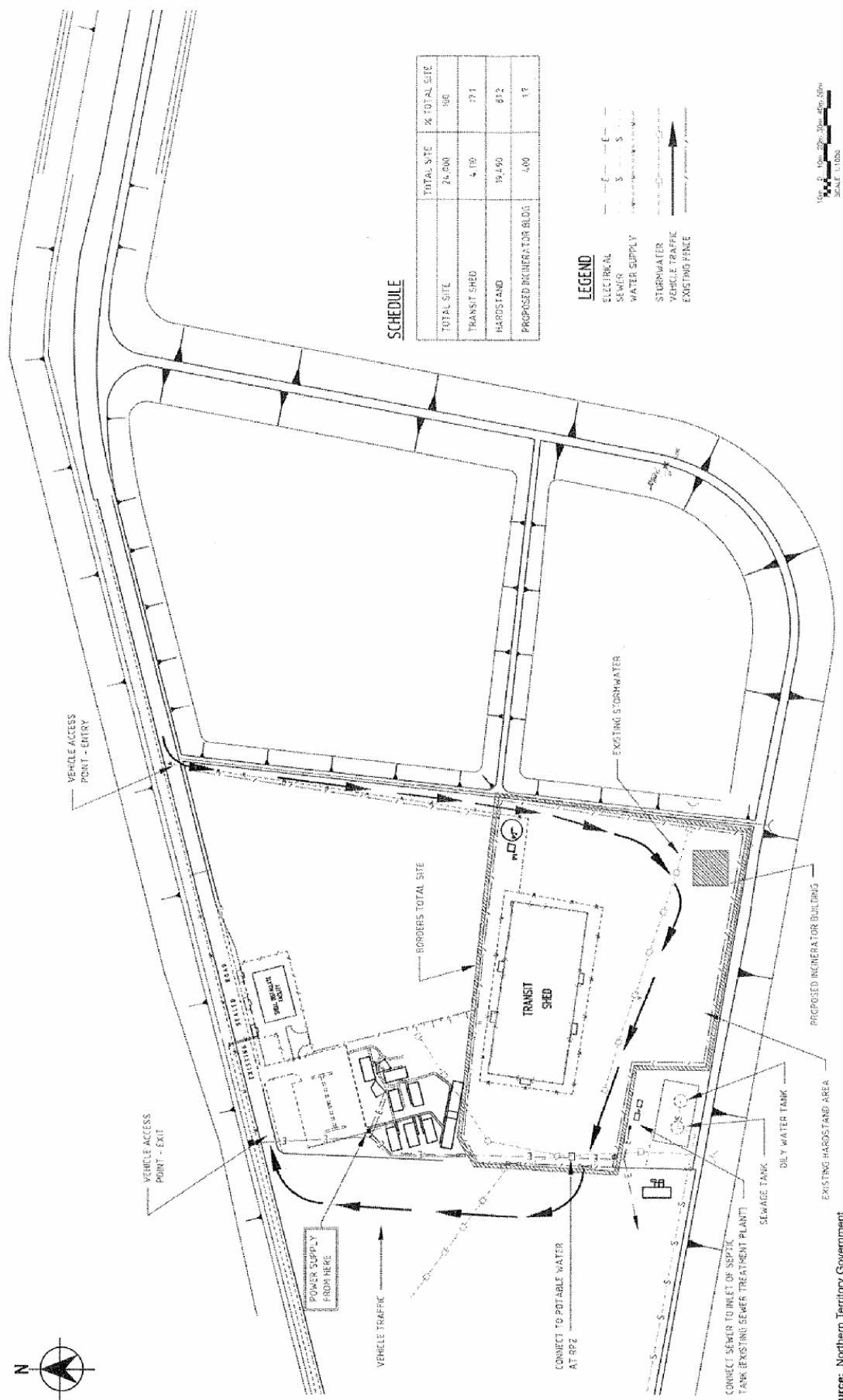
The key aspects of the Quarantine Waste Treatment Facility proposal are listed below:

- Site Development;
- Transportation of Waste;
- Waste Storage;
- Treatment Process; and
- Ash Storage and Transportation to Disposal.

Facilities associated with the incinerator operation would include those listed below:

- Incinerator;
- Air quality control system;
- Gatehouse;
- Transit Shed;
- Two 30 kL above ground LPG storage tanks;
- Access road; and
- Offices and car park.

The footprint of the proposed project is shown in Figure 1.



2.1 Site Development

The incinerator is proposed to be constructed at the East Arm Port Facilities, located on reclaimed land that was developed as part of the Stage 1 East Arm Port Expansion. The site proposed for construction is currently a bitumen surface approximately 80m south of an existing transit shed. The transit shed is located approximately 1,000m west of the existing gatehouse entrance. The project site is owned by the Darwin Port Corporation and is zoned Development Zone – Zone DV under the East Arm Control Plan 1998. A quarantine waste treatment facility is a permissible use under this zone with consent.

2.2 Transportation of Waste

Quarantine waste will be brought to the facility by trucks from the East Arm Wharf, Stokes Hill Wharf (in the case of cruise liners), Fort Hill Wharf, Iron Ore Wharf, Darwin Naval Base (and other regional defence operations) and Darwin International Airport, as required. In addition, the Royal Darwin Hospital and other health care services will potentially ship small quantities of biomedical waste not suitable for treatment by autoclave. The trucks will access the site through the gatehouse, along the main sealed road, and enter the site east of the transit shed.

2.3 Waste Storage

All waste will be received in a sealed and secure fashion as per AQIS requirements. Where wastes are to be stored for longer than 24 hours, the waste will be stored in refrigerated shipping containers located within the transit shed.

The trucks will proceed to a weigh station/loading bay or to designated storage areas within the incinerator building or transit shed. The waste bins will be loaded onto the waste loader. The waste loader will hydraulically lift the waste to a height above the waste loading chute; tip the waste into the loading chute from where it is hydraulically rammed into the primary chamber through an automated fire door.

2.4 Treatment Process

Primary Combustion Chamber

The primary combustion chamber is to be a stepped hearth configuration into which waste is automatically fed from the waste loading chute via a hydraulic ram and automated fire door. Temperatures in the primary chamber will vary from 750°C to 950°C and will operate in either an oxidising or reducing mode via controlling the available combustion air through a set controlled air cycle. A quench system will ensure that the primary chamber temperatures do not exceed 950°C, to avoid slagging of glass wastes onto the refractory.

The stepped hearth allows burnt wastes to be progressively moved through the incinerator and allows sufficient residence time for complete burn out of wastes. This movement also allows for some mixing of the wastes, thus avoiding the situation in static hearths where some wastes can escape incineration by being insulated by other waste materials. The resultant ash and residues from the chamber are deposited in an ash pit where water mist sprays cool the waste without making it wet.

The primary chamber will be able to accept up to 450 kg/hr (average) of waste although this will actually depend on the volume, bulk density and calorific value of the waste. A minimum throughput of 300 kg/hr is envisaged during the initial commissioning and operations.

Secondary Combustion Chamber/Afterburner

The secondary combustion chamber or afterburner must be able to fully oxidise and destroy the emissions from the primary chamber. It will be designed to operate at 1200°C, with a minimum residence time of two seconds under oxidising conditions. This temperature will also ensure that sufficient turbulence occurs between waste gases and flame gases through the length of the chamber. At this temperature and residence time all unburnt organics or other species not fully oxidised will be completely burnt (oxidised).

Adiabatic Quench

An adiabatic quench uses water to rapidly reduce gas temperatures (and consequently gas volumes) after the secondary combustion chamber/afterburner. This is particularly important as it is now recognised that dioxins and associated furans are generated via a process of reformation at around 550°C. By getting below this temperature as quickly as possible the opportunity for dioxin formation is reduced.

Ceramic Tube Heat Exchanger

Further heat is taken from the gas stream via a ceramic heat exchanger, which provides opportunities for the generation of hot water and/or steam for bin cleaning and the cleaning of waste loading and receiving areas. There is potential for co-generation in the future.

Rotary Contactor

Lime and activated carbon are injected into the gas stream where they mix with the waste gases before being deposited onto the fabric filter particulate collector (baghouse).

Fabric Filter Dust Collector (baghouse)

The fabric filter particulate collector (baghouse) collects the lime and activated carbon mix through which the waste gases must pass. As the waste gases pass through the filter cake on the bags, the lime neutralises over 95% of the hydrogen chloride present as well as some of the other acid gases present. The activated carbon serves to collect residual organics, dioxins/furans and heavy metals ensuring that the waste gases exhausted to atmosphere meet designated emission criteria. The activated lime and carbon mix must first pass leachate tests before being sent to landfill with the ash.

Induced Draft Fan

The large induced draught fan sucks the waste gases through the system ensuring that there is negative pressure throughout, such that if a fire door is opened, or any inspection portal, gases will flow into the incineration facility and not from it. After the processes of the air quality control system listed above, the fan blows air up the exhaust stack for discharge to atmosphere.

Exhaust Stack

The exhaust stack ensures that emissions can disperse to the levels required under a range of operating conditions, including an emergency bypass mode whereby emissions are discharged directly to atmosphere due to a critical failure of control equipment. For example, if the adiabatic quench fails then emissions must temporarily pass to the atmosphere to avoid a baghouse fire. Emissions leaving the stack will include particulates, acidic gases, and trace metals and organics.

De-ashing Facility

The ash pit collects ash and other non-combustible residues in a large steel bin. After removal and cooling, this ash can be disposed of to landfill if relevant leachate criteria are met. If leachate criteria are exceeded then immobilisation of ash would be required prior to disposal

to landfill. Non-combustible components of the quarantine waste stream, such as glass and metal, also remain in the ash.

2.5 Ash Storage and Transportation

The incinerator is designed to accept up to 450 kg/hr of waste although this will actually depend on the volume, bulk density and calorific value of the waste. A minimum throughput of 300 kg/hr is envisaged during the initial commissioning and operations.

URS (2005) indicates that based on processing approximately 295 tonnes per year of waste (consistent with initial operations of the proposed incinerator), an estimated 59 tonnes of ash will be produced (approximately 80% reduction in solid waste). This quantity of ash relates to approximately 25 x 3m³ bins of ash and equates to 1 x 3m³ bin delivery of ash to landfill each fortnight. Future quantities of ash are reported by URS 2005 to be double current rates by 2025 with an estimated 673 tonnes of waste being incinerated. This results in approximately 135 tonnes of ash being produced in the year 2025 and delivery of one 3m³ bin to landfill each week. Primarily the waste ash is produced in the primary chamber with additional small quantities from deposits throughout the process equipment and baghouse residues.

Characterisation of Ash

The proponent proposes to use the Toxicity Characteristics Leaching Procedure (TCLP) (DEC 2004), to estimate the potential for the waste to release chemical contaminants into a leaching liquid. This TCLP test is generally used Australia-wide to determine how a waste should be managed. The contaminants that will be tested for in a TCLP test include metals such as beryllium, cadmium, chromium, lead, mercury, nickel and silver and other organic and inorganic contaminants. Ash that fails a TCLP test must be sent to a hazardous waste landfill or be immobilised prior to disposal at an accepted solid waste class landfill. There are no hazardous waste landfills in the Northern Territory.

Methods of Handling and Disposal of Ash

The incinerator will be equipped with a hydraulic lifter for lifting and tipping the 3m³ ash bins into a feed hopper. A continuous ash removal system within the incinerator allows the ash to fall into the bin. The ash bins are then loaded onto a truck and once the ash has been cleared for disposal (following appropriate physical and chemical testing) it will be taken for disposal at the Shoal Bay landfill.

The bins are securely attached to the transport vehicle and also covered to prevent dispersion of the ash on the journey.

Once unloaded at the landfill, the ash will be immediately covered with other waste to prevent dispersion into the air.

2.6 Waste Water

The proposed incinerator will consume up to 500 L/hr of potable water in the adiabatic quench designed to reduce gas temperatures rapidly to avoid the formation of dioxins via de novo synthesis. The gases will be rapidly cooled from the afterburner to about 200°C so that they can be passed through the dry scrubbing system. The adiabatic quench will not produce any waste water as it will all evaporate within the gas stream. The use of potable quality water avoids impurities in the water being emitted to the atmosphere when the water vaporises.

An existing onsite waste water treatment plant will be utilised to deal with any waste water and sewage.

Waste water will be produced from ash bin washing. High-pressure hot water or a steam lance will be used to sanitise bins before they go back into recirculation. This involves minimal water use, but is dependent on the number of ash bins to be cleaned. The waste water would be suitable for discharge to the onsite treatment plant but some of it may also be utilised in the quench (during which it will be evaporated).

Waste water will also be produced from the washing of bins that contained quarantine waste. These will be washed at the existing AQIS supervised container washing facility. Waste water will then be directed to the onsite waste water treatment plant which is owned and managed by Darwin Port Corporation. This plant is not yet licensed by the EPA Program.

2.7 Issues Not Included in this Environmental Impact Assessment

It should be noted that there are a couple of issues associated with this proposal that are not within the scope of the current environmental assessment process. These are: handling of quarantine and clinical waste prior to entry into the Quarantine Waste Treatment Facility and the operation of the interim incinerator.

2.7.1 Handling of quarantine and clinical waste prior to entry into the facility

The management of quarantine and clinical waste prior to entry to the facility is the responsibility of quarantine and medical authorities or those responsible for the creation of the waste.

2.7.2 Operation of Interim Incinerator

The operation of the interim waste incinerator is not covered by this assessment report. It is covered by an Environment Management Plan specifically produced for that facility. Operation of the interim facility beyond the initial two year period of approval provided by the Minister or for the treatment of anything but quarantine waste will require additional environmental assessment.

3. REGIONAL SETTING

The location of the proposed Quarantine Waste Treatment Facility is Darwin, Northern Territory's East Arm Wharf, located approximately 6 km SE across Frances Bay from Darwin's CBD, and 10km by road from the Berrimah industrial area. East Arm Wharf is in the East Arm of Darwin Harbour.

3.1 Land Use

3.1.1 *Existing Environment*

The project site is owned by the Darwin Port Corporation, currently existing as a bituminized surface near a transit shed. The wharf area is reclaimed land developed as part of the Stage 1 East Arm Port Expansion. The site is zoned Development Zone – Zone DV under the East Arm Control Plan 1998. Under the East Arm Control Plan the following developments may occur:

- Development of major strategic industries including gas based, road, rail or port related industries; and
- Major industrial development that is of strategic importance to the future economic development of the Territory.

A variety of industrial and port uses and facilities are located east and west of the site. These include:

- Shipping berths able to cater for up to Panamax Class vessels and third generation container vessels. Vessels serviced currently handle general cargoes, live cattle exports, liquid and dry bulk imports, containerised/ breakbulk and specialized heavy lift cargoes, and offshore rig tender service vessels;
- Bulk liquids transfer facilities able to berth up to 80,000 dwt (deadweight tonnage) vessels;
- Sealed hardstand and undercover cargo handling facilities, with a further 18 hectares of area bunded for planned future reclamation;
- Railway access links the Adelaide to Darwin railway and national rail network to an Intermodal Container Facility with capacity to handle in excess of 250,000 TEU (20 foot equivalent units) per year, and includes a rail mounted Portainer Crane with 70t lifting capacity; and
- A future capacity exists for the provision of three quay cranes able to handle third generation container vessels.

3.1.2 *Surrounding Land Use*

The East Arm Precinct is dedicated to industrial uses. Surrounding land uses are also primarily industrial. A nearby Business Park Industrial area includes a fuel storage area, quarry and train terminal. Other nearby land uses include:

- A popular public boat ramp;
- Passenger terminal for the Ghan;
- Kormilda College secondary high school (>900 students and 180 staff);
- Charles Darwin National Park, protecting nationally significant mangrove wetlands, woodlands and Indigenous and Non-Indigenous historical sites;
- Wickham Point Liquid Natural Gas Plant, with its associated sub-sea gas pipeline and loading facilities for large gas-tanker vessels; and

- Population centres of Palmerston (24,000 people) and Darwin City (70,000), which lie 7.5 and 7km away respectively, by line of sight. Palmerston is due east of the QWTF.



Figure 2 - Land Uses in the Vicinity of the East Arm Wharf

3.2 Existing Air Quality

The air quality at East Arm Wharf is typical of an operational port and is reflected in the surrounding industrial areas. The nearest sensitive receptors are Government House (Darwin CBD) and Kormilda College (Figure 2).

Background Data

Twenty-four hour averaged $PM_{2.5}$ and PM_{10} data (particulate matter of diameter less than 2.5 and 10 microns respectively) from Casuarina, and hourly averaged PM_{10} data from Palmerston, exists from October 2004 to September 2005. Recorded $PM_{2.5}$ data is not available from Palmerston. Twenty-four averaged PM_{10} concentration recorded at Casuarina predominantly displays a range of 0 – 35 $\mu g/m^3$, which is lower than that recorded at Palmerston, where 1-hour averaged PM_{10} concentration is predominantly within the range of 0 – 50 $\mu g/m^3$. Concentrations above these ranges occur in both datasets, however with greater frequency at Palmerston.

As background air monitoring was not undertaken as a part of this study, historic NO_x , SO_2 and CO levels are unknown. The major source of carbon monoxide emissions in the Darwin airshed is currently from burning and wildfires.

The supplied ambient monitoring data is considered to be representative of the particulate matter concentration in the vicinity of the proposed incinerator, and indicate that background levels of particulate matter are high in the locality, particularly during the dry season. The high particulate matter readings are primarily due to dry season bushfires.

3.3 Climatic Conditions

Local Climate and Meteorology

Darwin has a tropical climate consisting of a wet and dry season. The dry season extends from approximately March to September, and displays moderate temperatures, low humidity and winds predominantly from the east. The wet season occurs for the remaining months and tropical cyclones, thunderstorms and monsoon rain are common, in association with high temperatures and humidity.

Local sea breezes and vertical temperature profiles alter both diurnally and with wind direction, depending on whether flows are coming off the land or water. During the wet season, winds are predominantly from the west, and in the dry season from the east. Figure depicts the annual distribution of wind direction and speed at East Arm Wharf.

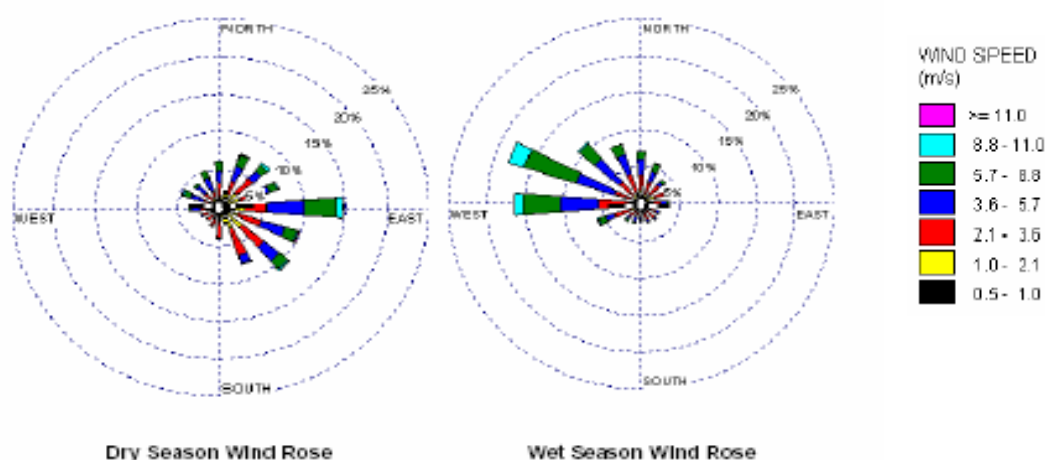


Figure 3 - Seasonal Wind Patterns at East Arm Wharf

3.4 Physical Environment

Two major landforms comprise the area; the bustard and littoral systems. The bustard land system forms the hinterland and hinterland margin and is characterised by rolling hills forming a low plateau rising to 24m. The slopes are gentle (2 to 5%) and relief is up to 10m. On the lower slopes a laterite profile has been formed while on the upper slopes the soils are lithosoils. The lithosol soils have high gravel content (40 to 70%) and are shallow with sandy textures resulting in excellent drainage making them poor for urban or extensive agricultural use. The texture of the lithologies range from siltstones and sandstones to coarse quartz conglomerates.

The littoral land system forms the fringe and is dominated by the mangrove community. Topographically the littoral land system has negligible relief and slope and is inundated at peak tides. The mangroves grow in a mud substrate, dominantly made up of clay materials and quartz silt. Mangrove mud areas surrounding the wharf that are not constructed of fill material are likely to contain potentially acid sulphate soils.

When the Wharf was constructed fill was taken from an undeveloped hill in the surrounding area. The wharf was constructed with clean fill and a thick top covering of road base material from a local quarry followed by a bitumen top covering.

The East Arm Port has been developed through the reclamation of land. The process of settling of this land was recorded for 30 months for a period ending 30 June 2002. The results indicated that there was 48 mm of settling that occurred during this time. Settling has ceased.

3.5 Water

Surface Water

A north-south trending ridge that can control runoff dominates the area surrounding the incinerator site. Well-developed drainage channels are absent from the area as the catchment area is small.

East Arm Port has a series of stormwater drains established on site that run northwest-southeast, north of the incinerator site. The current stormwater management at East Arm Wharf consists of a series of stormwater collection pits that exit the site at various points into the ocean.

The interim incinerator, located next to the site of the proposed incinerator, has a dedicated triple interceptor before discharge to stormwater.

Groundwater

Groundwater at the East Arm Wharf is not naturally occurring, except for seawater infiltration. Water levels are tidally influenced with up to eight metre fluctuations per day. Groundwater levels follow seawater levels.

Surrounding Aquatic Environment

The East Arm of Darwin Harbour is the estuary of the Elizabeth and Blackmore Rivers. It experiences daily and seasonal fluctuations in salinity depending on the rate of recent freshwater inflows and tidal stage. The runoff contains suspended particles, inorganic and organic nutrients, waste derived from the developed and undeveloped sections of the catchment as well as effluent from the wastewater treatment lagoon at Palmerston and Berrimah. This is discharged in the tidal tributaries of East Arm.

The high tidal range in Darwin Harbour results in large areas experiencing two different environments. Intertidal areas may be inundated by up to 8m of seawater on high tides, alternating with exposure to sunlight, air, and high temperatures at low tides.

The seabed around the proposed area is characterised by a diverse mosaic of intertidal mudflats, coral rubble banks, reef rock, sand banks, rocky islands, coral rubble slopes, channel beds, mud and sandy seabeds making available a variety of marine habitats to biota at various depths.

The turbidity of Darwin Harbour is naturally high due to suspension and re-suspension of sediments from the extensive mud flats by tidal currents, wind, waves and from suspended particles in stormwater runoff. The high turbidity restricts light penetration into the water column and limits primary productivity.

3.6 Noise

Noise monitoring was undertaken to determine ambient noise levels. Calculated background day, evening and night time noise monitoring results for three locations are provided in Table 1.

Table 1 - Average Noise Monitoring Results

Location	Day	Evening	Night
	7 am to 6 pm	6 pm to 10 pm	10 pm to 7 am
1. Government House	42.6 dB(A)	38 dB(A)	41.8 dB(A)
2. East Arm Wharf	30.9 dB(A)	32.3 dB(A)	30.8 dB(A)
3. Kormilda College	45.4 dB(A)	45.8 dB(A)	39.4 dB(A)

3.7 Biological Environment

3.7.1 Terrestrial Flora

Five dominant vegetation communities are described in the PER as being present in the surrounding area: Melaleuca Forest; Littoral Woodland Zone; Eucalypt Woodland; Vine-Thicket; and Mixed Woodland. These communities are typical of the Darwin region. The incinerator site is an area of reclaimed land. No established vegetation communities occur on the East Arm Wharf.

3.7.2 Terrestrial Fauna

The PER indicated that the fauna of the area is representative of the coastal Northern Australia. Surrounding islands represent a relatively minor high tide roosting area for birds including migratory waders. Eight species of mammal have been recorded in the area including the grassland melomy, the northern brown bandicoot, the agile wallaby, antilopine kangaroos, the northern quoll and the northern brushtail possum. Most of the species observed are typical of disturbed or semi-disturbed areas around Darwin. Diggings from feral pigs were also observed in this area. The survey found a total of seven reptiles at the site all of which are generally common in the Darwin area. Three species of carlia skink and the prickly gecko were observed along the mangrove fringes.

Survey data results provided by the Department of Natural Resources, Environment and the Arts (NRETA) indicate that 107 species of reptile, 36 species of mammal, and 289 species of birds have been surveyed within a 10 kilometre buffer zone around the incinerator site.

NRETA survey data identifies four feral animals in the buffer zone of the incinerator site including the feral pig (*Sus scrofa*), feral cats (*Felis catus*), water buffalo (*Bubalus bubalis*), and cane toad (*Bufo marinus*).

3.7.3 Threatened Species

Of the species discussed in the previous section, seven are threatened species identified under the *TPWC Act (1993)*. The *Environment Protection and Biodiversity Conservation Act (1999)* (*EPBC Act*) identifies 15 species of fauna for the Darwin Harbour area.

Two species of threatened flora are listed by NRETA as existing within a 10-kilometre buffer zone of the incinerator site. These are *Cycas armstrongii* and the bladderwart *Utricularia singeriana*, and are protected under the *Territory Parks and Wildlife Conservation (TPWC) Act 2000*. None of the listed species are known to have established communities or habitats on the East Arm Wharf.

3.7.4 Marine and Estuarine Communities

Mangrove Communities

Darwin Harbour has over 20,000 hectares of mangrove communities that occupy the intertidal area parallel to the coastline. Darwin Harbour has a total of 36 of the 51 species that are known to occur in the Northern Territory. Mangrove communities generally comprise well-defined community zones at particular heights in the tidal zone and on particular strata.

3.7.5 Marine and Estuarine Fauna

Coral Communities

The coral reefs are an important component of the Darwin Harbour ecosystem but are limited in distribution due to natural factors including the high turbidity of the water and availability of suitable substratum. The coral reefs are therefore limited to a depth of approximately 7m where the light penetration is sufficient for photosynthesis. The most significant coral communities are located at Lee Point, Nightcliff, East Point, Weed Reef, Channel Island and South Shell Island.

GHD conducted a baseline coral survey in 2005 of four coral communities in the harbour – the South Shell Islands, Weed Reef, Wickham Point and Channel Island. Common corals from these sites, which usually occur in elevated ambient turbidity, include *Mycedium* and *Goniopora spp.* The low coral species diversity of the Darwin Harbour sites described as being normal for very silty coastal or near-shore reefs.

Mammals

The PER reports a lack of knowledge of the importance of Darwin Harbour for marine mammal populations. Dolphins are present but are generally reported from the more open waters. Dugong population's estimates for Darwin Harbour have ranged from low to moderately high, associated with shallow coastal areas where there are seagrass and algal beds. Significant seagrass and algal beds are located in East Arm around Sth Shell Island, Middle Arm north of Channel Island, off Mandorah and outside Darwin Harbour off Casuarina Beach and Fannie Bay.

Reptiles

Several species of turtles have been recorded in Darwin Harbour including the green turtle, flatback turtle, and hawksbill turtle. The turtles are known to breed within Darwin Harbour but breeding grounds have not been recorded within the proposed site or surrounding area.

Saltwater crocodiles populate the tidal rivers and open waters of northern Australia and are also known to frequent Darwin Harbour. However the Parks and Wildlife Service of the Northern Territory maintain a management plan for Darwin Harbour, trapping and relocating crocodiles to safer environments.

There are various species of sea snakes found in the Darwin Harbour and they are common around the mangroves, mudflats and open waters. The NRETA survey data has identified several species that are common to the harbour.

Other Marine Biota

Darwin Harbour, including East Arm supports a large variety of rich, diverse habitats and marine biota, which also support popular recreational fisheries. Target species include barramundi, jewfish, mackerel, trevally, threadfin salmon, snapper, mangrove jacks and mud crabs.

3.8 Cultural Environment

3.8.1 Indigenous Heritage

The Port Expansion Master Plan was approved as part of the Environmental Impact Statement prepared for development of the Wharf. It was noted that Catalina Island and the associated sand bar are of cultural significance to the Aboriginal people and that the area is to be protected from the impacts of construction and activities undertaken at East Arm Wharf. Archaeological sites have been noted in this area, including a large shell midden of particular significance due to its potential research value.

3.8.2 Non - Indigenous Heritage

The East Arm Wharf site was first established as a quarantine station in 1931. During the war years the area was used by the Allied Intelligence Bureau to launch raids on Singapore Harbour. A flying boat base was also developed for use by the US Navy and the RAAF as well as anti-aircraft positions for the defence of Darwin.

During the years after the war the WWII facilities were sold and the quarantine station decommissioned. The area was later used as a receiving point for refugees and as a detention centre for boat crew from seized illegal fishing boats.

A report conducted for the East Arm Port Expansion EIS 1994 identified 32 sites of WWII significance. Much of the quarantine station was destroyed or dispersed in the early 1930's. The WWII sites associated with Allied Intelligence Bureau are considered to be of national and international significance and their heritage value is likely to increase with time. Despite the significance of some of the sites they are not currently declared as heritage sites under the *NT Heritage Conservation Act*.

There are a number of historical ship and aircraft wrecks located in Darwin Harbour which also serve a recreational purpose as artificial reefs for fishermen and divers. The wrecks include a number of Catalina flying boats lost during WWII during the Japanese raids on Darwin and associated accidents.

4. ENVIRONMENTAL IMPACT ASSESSMENT

4.1 Introduction

The purpose of this Assessment Report is to evaluate the environmental protection measures of the project proposal and to determine whether the proposal can proceed without unacceptable environmental impacts. This is done by identifying potential environmental impacts and evaluating the corresponding safeguards or prevention measures suggested by the proponent. Where the proposed safeguards are considered insufficient, or where a safeguard is significantly important, recommendations are made in this Report to complete or emphasise those commitments made by the proponent.

The environmental acceptability of this project is based on consideration of the following from the PER:

- adequacy of information outlining the proposal (particularly which structures or activities are likely to impact the environment);
- adequacy of information on the existing environment (particularly environmental sensitivities);
- adequacy of information on the range and extent of potential impacts; and
- adequacy of the proposed safeguards to avoid or mitigate potential impacts.

Acceptable environmental outcomes for this project are dependent on the proponent developing management plans in consultation with relevant stakeholders to the satisfaction of the NT Government; and implementing all environmental commitments identified in the PER as well as those presented in this Assessment Report. Appropriate environmental management of these issues will be addressed through monitoring and management actions detailed in comprehensive management plans to be included as part of the Operational Environmental Management Plan (OEMP) and Construction Environmental Management Plan (CEMP).

The EPA Program considers that the environmental issues associated with the project have been adequately identified. Appropriate environmental management of some of these issues has been resolved through the assessment process, while the remainder will be addressed through monitoring and management actions detailed in issue-based management plans, included as part of the OEMP and CEMP and through licensing. The EPA Program considers that the project can be managed in a manner that avoids unacceptable environmental impacts, provided that the environmental commitments and recommendations made in this Assessment Report and in the final issue-based management plans are implemented, with regular reporting and compliance auditing.

Subject to decisions that permit the project to proceed, the primary recommendations of this assessment are:

Recommendation 1

The proponent shall ensure that the proposal is implemented in accordance with the environmental commitments and safeguards:

- **Identified in the Quarantine Waste Treatment Facility, Public Environmental Report; and**
- **Recommended in this Assessment Report (No. 55).**

All safeguards and mitigation measures outlined in the Public Environmental Report are considered commitments by Darwin Port Corporation and are included in Appendix 1 of this report.

Recommendation 2

In accordance with clause 14A of the *Administrative Procedures of the Environmental Assessment Act*, the proponent shall advise the Minister of any changes to the proposal for determination of whether or not further environmental impact assessment is required.

The principal environmental issues associated with the proposal are:

- The management of air pollutant emissions including particulates, acid gases, trace metals, trace organics and odour;
- Waste management, classification and quantification including storage and handling of quarantine and clinical waste;
- Disposal of ash to landfill and potentially the treatment and disposal of ash that does not meet leachate criteria;
- Greenhouse and climate change impact; and
- Water management.

The remainder of Section 4 deals with issues raised in the government and public submissions to the PER and the proponent's commitments to environmental management provided within the PER. In addition, recommendations to strengthen environmental management strategies and safeguards are presented. Some issues were adequately addressed in the Supplement and require no further discussion. The outstanding environmental issues that remain are addressed below.

4.2 Use of the Facility

4.2.1 Definitions

The proposed quarantine waste treatment facility will receive waste from a number of sources, including:

- **Clinical and Related Waste** is that waste which has the potential to cause injury, infection or offence, and includes sharps, human tissue, laboratory waste, animal waste resulting from medical, dental or veterinary research or treatment, that has the potential to cause disease: or any other waste, arising from any source, as specified by the establishment. Related wastes are defined as wastes within the waste stream, which constitute, or are contaminated with cytotoxic drugs, chemicals, or pharmaceuticals;
- **Quarantine Waste** is any material foreign to a region or country that is capable of being a host to insects, helminths or other parasites, diseases (e.g. bacteria, viruses, fungi, prions, etc), weeds, or any other organisms that are not existent, or prevalent, in that region or country, and that are capable of being a threat to the health and well being of indigenous or local ecosystems, people, or local plant and/or animal industries; and
- **Related Waste** in the context of quarantine wastes, are materials associated with quarantine wastes, or wastes, depending on the standard of segregation applied, that may or may not contain quarantine wastes. Related wastes may also constitute wastes with similar characteristics or hazards (e.g. biohazards associated with clinical and related wastes), or potentially hazardous wastes generated within the operational precincts of the DPC and Darwin Airport, that can be managed and treated in the same way as quarantine wastes in order to protect public health and the environment. Non quarantine designated wastes from potentially high risk sources where the competent authority (e.g. DPC, ACS,

AQIS, AMSA, EPA, DHCS) deems the waste to be of potentially high risk due to its origin, or nature, may also be considered to be related wastes.

Recommendation 3

The focus on the use of the incinerator must be to minimise the amount of waste that is incinerated. The proponent must not incinerate any waste that does not meet the listed definitions.

4.3 Licensing

The proposed quarantine waste treatment facility will require development consent under the Planning Act however it does not currently require licensing under the *Waste Management and Pollution Control Act*. To ensure the environmental performance of the facility, specifically through the setting of environmental conditions and limits, the EPA Program recommends that the facility become a scheduled activity under the *Waste Management and Pollution Control Act*.

Recommendation 4

It is recommended that Schedule 2 of the *Waste Management and Pollution Control Act* be amended to include the quarantine waste treatment facility.

4.4 Air Quality

4.4.1 Potential Air Emissions

The combustion of quarantine, medical and other wastes have the potential to negatively impact on human and environmental health. The proposed incinerator will produce particulates, acid gases, trace metals, trace organics and odour. The incinerator has the ability to bypass the air quality control system when there is an emergency. Although emergencies are not expected to occur frequently it is possible that the air quality system may be bypassed up to twice a year to prevent catastrophic failure of the incinerator and risk to operator safety. Scenarios that could cause bypass might include the failure of the adiabatic quench system which would allow hotter gases through and cause the baghouse to catch on fire or when there is too much pressure in the system. When the air quality system is bypassed, the incinerator automatically shuts down. Emissions will continue to be released from the stack for between 30 to 60 seconds. The expected discharge characteristics are listed below in Table 2.

Table 2. Discharge Characteristics

Scenario	Waste Feed (kg/hr)	Stack Height (m)	Exhaust Temperature (°C)	Exhaust Velocity (m/s)	Stack Diameter (m)
Normal	450	25	180	12.8	0.58
Bypass	450	25	900	15.6	0.58

The maximum in stack concentrations for normal and bypass operations are compared with the Draft NT Government Release Limits where available in Table 3. The data in the table was supplied by Advanced Combustion Engineering (ACE) with the exception of heavy metals (supplied by GHD) and PAH's (National Pollutant Inventory) and are based on raw data from similar treatment processes.

Table 3. In-stack Concentrations for Normal and Bypass Operations

Constituent	Normal Operation (mg/m ³)	Bypass Operations (mg/m ³)	NT Draft Release Limits (mg/m ³)
Total Suspended Particulates (TSP)	35	250	100
CO	150	150	150
SO ₂	100	100	100
NO _x	200	30	350
HCl	50	150	NA
HF	5	10	25
PAH's (as BaP)*	10	50	NA
Hg (inorganic)	0.2	0.2	2
Pb	2	2	3
As	2.5	2.5	10
Cr (as CR VI)	2.5	2.5	10
Ni	2.5	2.5	10
Sb	2.5	2.5	10
Cd	0.1	0.1	10
Dioxins	0.1 ng/m ³	3.0 ng/m ³	0.1 ng/m ³

(*Mass rates are based on maximum in-stack concentrations and dry exhaust flow rates of 0.625 Nm³/s corrected to 7% oxygen; except dioxins corrected to 11% oxygen)

Atmospheric dispersion modelling was performed using meteorology representative of the proposed incinerator positioning on East Arm Wharf. In the absence of relevant NT standards the NT EPA Program requested that Victorian EPA State Environment Protection Policy – Air Quality Management (SEPP – AQM) guidelines be used to assess the compliance of all constituents over three averaging periods (3 minute, 1 hour and 24 hour) with the exception of 24 hour PM_{2.5} and PM₁₀. For 24 hour PM_{2.5} and PM₁₀ the NSW Department of Environment and Conservation (DEC) design criteria were adopted.

A variety of stack heights were modelled however full compliance was only achieved with heights of 25m and above. The nearest sensitive receptors to the site are Government House (5.5km away) and Kormilda College (6km away). The stack height has therefore been designed to be 25m high.

Ambient modelling results and a health risk assessment undertaken by GHD have confirmed this assumption. Modelling shows that even in air quality control system bypass the ambient standards identified by the NT EPA Program would be met. The modelling does not show compliance with NSW DEC criteria as the ambient standards are already exceeded on occasion due to dry season fires. The EPA Program considers that the particulate matter contribution from the incinerator is not likely to significantly increase the background concentration of PM. Peak ground level concentrations (GLC) were located within 1km of the stack and therefore reduced levels of concentration would be evident at the nearest sensitive receptors.

Table 3 shows that in-stack concentrations will meet relevant limits for stack emissions. Bypass operations are expected to occur once or twice a year for up to 60 seconds, however many of the emission levels will still be met when the air quality control system is not in operation. Dioxins for example, will meet in-stack criteria with the air quality concentration system, however when the system is bypassed these amounts will exceed limits. While bypass situations are not expected to be frequent occurrences and are not expected to exceed 60 seconds, DPC needs to be vigilant in ensuring that the frequency and duration of bypass

operations is minimised, particularly in light of expected dioxin in-stack concentrations (refer section 4.4.6).

Recommendation 5

Darwin Port Corporation is to develop and implement procedures to ensure that the frequency and duration of bypass operations are minimised.

Although GLC modelling results are low, it is noted that the critical constituents are identified as the heavy metals, and to a lesser extent Polycyclic Aromatic Hydrocarbon's (PAH). Simulations of both scenarios indicated that the lowest margin of compliance (with the exception of PM) was predicted for the heavy metal constituents arsenic and chromium VI over a 3 minute averaging period, however the predicted GLC is less than the design criteria for these elements by a factor of approximately 1.7.

The proposed air quality control system for the facility will significantly reduce the possible impacts from the incinerator and is considered current best practice. The control of gases such as NO_x, SO₂ and CO and organic compounds is generally a function of the combustion efficiency of the incinerator secondary chamber. The expected combustion efficiency for the emission control chamber will exceed 99.95%.

The EPA Program considers that the estimation of emissions is representative of an incinerator of this type. The identification of sensitive receptors is correct and the meteorological conditions are accurately identified. The EPA Program is satisfied that the modelling is accurate and that ground level concentrations will meet the requirements of the Victoria EPA SEPP – AQM and NSW DEC guidelines, except for PM due to high background concentrations.

The EPA Program is satisfied that the incinerator represents best practice and will meet emissions requirements and international agreements including the Stockholm Convention and the European Union Waste Incineration Directive.

4.4.2 Air Quality Control System

The proposed air quality control system is a dry system that involves injecting lime and activated carbon into the gas stream after the temperature of the gas stream has been reduced, and collecting this material in a baghouse. The successful minimisation of impacts will rely on the correct operation and maintenance of the incinerator and pollution control system.

The proposed design meets the best practice requirements of the Stockholm Convention on Persistent Organic Pollutants and includes control techniques discussed in the convention guidelines including:

- Afterburner;
- Rapid quench system (to avoid dioxin/ furan formation);
- Scrubbing process;
- Sorption process; and
- Particulate collection.

The PER recommends that the air quality control system be reviewed after 10 years of operation. Due to the likelihood of improvements in air quality control technology over the next decade and beyond and the tightening of national and international guidelines, it is recommended that the system be reviewed to ensure that best practice goals are maintained over the life of the incinerator.

Recommendation 6

The operator of the incinerator must provide a report to the regulatory authorities reviewing the air quality system on the incinerator in the event of significant new developments in incinerator air quality control systems or at the latest prior to the eleventh year of operation. The review must include the efficacy of the current system in comparison to other available air quality control systems and the availability of alternatives to incineration. The review should take into account any changes in the waste stream and likely future requirements. Subsequent reports should be undertaken at least every 10 years.

4.4.3 Public Information

The PER provides satisfactory discussion of options for treatment of quarantine waste and has provided the use of an incinerator as the best option available due largely to limitations on transport and deep burial of quarantine waste imposed by AQIS.

However, the use of incinerators in general has become an issue of public concern and it is necessary that information be made available to inform the public. The public should be able to access information about the operations of the incinerator and the potential health and environmental impacts.

Stack monitoring undertaken for the incinerator should be available for public information on request and a communications strategy should be developed to keep the public informed about the operations of the incinerator.

Recommendation 7

Information must be publicly available that summarises the air emissions control techniques, the impacts on air quality and how the proposed design meets national and international requirements.

4.4.4 Stack Monitoring Program

The most significant emissions aspect of the quarantine incinerator will be air emissions from the stack. A formal air emission monitoring program must be implemented in conjunction with regular inspections of the plume from the stack.

The PER states that stack emissions will be monitored in accordance with the Draft Monitoring and Reporting Protocols for the Proposed Incinerator for East Arm Wharf (DIPE 2003). Stack emission samples will be taken as required by the Australian Standard AS4323.1-1995 (Stationary source emissions – selection of sampling positions) and a specialist air quality monitoring expert will undertake the stack monitoring. This approach is considered standard practice and therefore acceptable to the EPA Program.

The proposed incinerator will be fitted with a Continuous Emissions Monitoring System (CEMS) and data acquisition system (DAS) to collect and record various stack emission parameters as required by the EPA Program.

Based on the established best practice pollution control technology suggested for the incinerator, the EPA Program is confident that the proposed incinerator and air quality control system will suitably control emissions that are likely to result from the waste stream outlined in the PER. However, the breakdown of the waste stream is not accurately known due to the inability to access the content of quarantine waste bags. This means that the exact nature of

the emissions from combustion is also unknown. It is recommended that a stack monitoring program be established to ensure that the incinerator is operating as designed and that the waste stream contains what it is assumed to contain. If monitoring shows unexpected emissions, or exceedence of the stack emission criteria the waste audit (Recommendation 10) may need to be expedited, and/or incineration ceased until the source of exceedences is identified.

The Air Quality Management Sub Plan in the PER states that periodic stack monitoring procedures will be developed. Both the frequency and procedures for monitoring of stack emissions must be developed in consultation with the EPA Program and Environmental Health, Department of Health and Community Services at least three months prior to the operation of the incinerator and incorporated into an approved Operational Environmental Management Plan.

Recommendation 8

Develop stack monitoring procedures for approval by the EPA Program and Environmental Health, Department of Health and Community Services at least three months prior to the operation of the incinerator. Procedures should include a testing regime and reporting schedule. They must be incorporated in the Operational Environmental Management Plan and made available publicly.

4.4.5 Commissioning

It is anticipated that during commissioning of the incinerator and air quality control system that there is the possibility that air emissions from combustion will be higher than usual operations. Due to the likelihood of these higher emissions, there is a greater risk of air emissions impacting on human health. Darwin Port Corporation should maintain close contact with the EPA Program and Environmental Health, Department of Health and Community Services during this period to report the results of any stack emissions testing.

The Pollution Response Line should be made aware of any commissioning before it occurs and the need for a communications strategy should be considered so that any public impact from an abnormal plume is properly managed. Consideration should also be given to prevailing winds when first commissioning burns are undertaken.

4.4.6 Maintenance and Troubleshooting

The air quality control system, including the design of the proposed incinerator will significantly reduce the emission of air pollutants. The successful minimisation of impacts will rely on the correct operation and maintenance of the incinerator and pollution control system.

Considering the lack of continuous maintenance and general up keep of the Fort Hill Incinerator it is proposed that a supplier certified maintenance regime be built into the Operational Environmental Management Plan to ensure that the incinerator and air quality control systems are maintained as per manufacturer requirements.

The PER states that one of the indicators that the incinerator is not working as required would be the presence of a plume that is any colour but white. However the PER or draft OEMP do not specify what the procedure would be if this was witnessed. The OEMP needs to be a single reference document that also includes troubleshooting and contingencies.

Recommendation 9

Procedures are to be developed for incorporation into the Operational Environmental Management Plan for the maintenance regime for the air quality control system and processes that should be undertaken when the facility is not operation to specification, for example when the plume coming from the stack is any colour but white.

4.4.7 Effects on Wharf Workers

The PER addresses possible health impacts on sensitive receptors located some distance away, including those at Kormilda College. As discussed previously the EPA Program is satisfied that these impacts will not significantly affect the health of those sensitive receptors. However, little consideration is given in the PER to workers on the wharf and possible health implications, particularly during air quality control system bypass situations.

It is recognised that wharf workers are not considered sensitive receptors; however there is the possibility that workers could be negatively affected by emissions, particularly during bypass operations.

Recommendation 10

A communication and complaints system is to be developed to allow the public including workers at East Arm Wharf, to be informed of incinerator operations.

Recommendation 11

As part of a comprehensive occupational health and safety strategy, a health testing procedure should be developed for incinerator operators to identify any potential health impacts associated with working at the facility.

4.5 Waste Management

4.5.1 Waste Audit

The nature of the quarantine waste stream is unknown due to limitations imposed by AQIS preventing the inspection of quarantine bags. In order to better define the requirements of the incinerator, impacts on air emissions and the contents of waste ash it is necessary to undertake a waste audit to determine the contents of the waste stream and whether efficiencies in waste segregation can be implemented to limit the quantity of waste incinerated.

Due to the limitations imposed by AQIS it is recommended that Darwin Port Corporation or the NT Government as a whole, including the Minister for Health and Community Services, the Minister for Natural Resources, Environment and Heritage and the Minister for Planning and Lands seek AQIS approval and supervision for a waste audit.

Recommendation 12

The proponent is to undertake a controlled audit of quarantine waste in consultation with AQIS to determine the nature of the waste stream and to facilitate potential waste minimisation initiatives to reduce the amount of waste requiring specialised treatment. This should be undertaken within two years and repeated when significant increases in waste are treated or at a minimum of 5 yearly intervals.

4.5.2 Increase in Waste Incineration

The PER states that initially the facility will treat 295 tonnes of waste per annum, approximately the amount currently treated at Fort Hill incinerator. The PER identifies 2500 tonnes of waste in the regions that could possibly be incinerated in the proposed incinerator. This increase in incinerated waste is significant and as this waste is currently sent to landfill, possibly unnecessary.

The PER states that 88% of 2500 tonnes of waste proposed to be incinerated is not quarantine waste. As this waste is not quarantine it is currently free to be inspected. This is waste collected at Darwin airport and ports that is currently sent to land fill. Waste should not be sent for incineration unless it can be shown that it is not suitable for recycling or other disposal methods.

Recommendation 13

The proponent must outline any criteria that would warrant the increase in the amount of waste that could be sent to the incinerator. Written confirmation from AQIS and other waste treatment facilities such as Shoal Bay Waste Treatment Facility is required if waste is no longer able to be treated by means other than incineration. The focus on the use of the incinerator must be to limit the amount of waste incinerated.

Recommendation 14

An awareness and training program in waste classification and segregation be developed and implemented to build the capacity of waste generators. This must be included in the OEMP.

4.5.3 Waste Storage and contingencies for Darwin Port Corporation

During shutdowns at the incineration facility, or periods when large quantities of waste arrive in a short time span, contingency plans must be included in the OEMP to allow storage of waste by way of additional refrigerated containers, placed adjacent to the incinerator. These contingencies should include the likely sourcing of refrigeration containers, and what should occur in periods of extended power shortage such as after a cyclone. The storage area must be isolated and clearly marked as quarantine waste until the waste can be treated. Alternate storage areas should be identified by DPC and should follow the established quarantine procedures. Any waste that will require storage for a period exceeding 24 hours will need to be kept in refrigerated containers.

It is proposed that the throughput of the incinerator will be temporarily increased to allow the additional quantity of waste to be processed. Appropriate cleaning of temporary storage facilities will need to be conducted at the completion of their use.

At the risk of an exceptionally large quantity of waste arriving DPC will provide established contingencies in the OEMP that will have secured the sending of 'low risk' quarantine waste (such as food scraps and general waste from cruise ships) to deep burial at an appropriate facility, in consultation with the facility operator.

Recommendation 15

The Operational Environmental Management Plan is to include contingency plans for scenarios of incinerator shutdowns and periods of high waste load. This should include the availability of spare refrigerated shipping containers in the region and periods of

significant power shortages such as after a cyclone. Segregation practices should also be developed where appropriate so that unsuitable wastes are not sent to landfill after storage.

4.5.4 Use of Interim Incinerator

Although the interim incinerator is not being assessed in the PER, its use as a backup has been suggested in the PER and must be addressed, as it is suggested in the PER that it will be used as a backup. Under Section 3.4.1 (Construction Timeline) a reference is made to the interim facility not being decommissioned as it will serve the purpose of a 'backup' facility. It should be noted that this is inconsistent with Conditions 6 and 11 of Development Permit DP06/0165 issued on 11 March 2006 for the purpose of an interim quarantine waste treatment facility:

Condition 6 states:

"The use of the land for the purpose of an interim quarantine waste facility must cease two years from the date of commencement of the use"; and

Condition 11 states:

"The facility shall be used for the purpose of disposal of quarantine waste only."

Recommendation 16

The use of the interim incinerator beyond the conditions above is not acceptable under the current development permit. If the proponent wishes to utilise the interim incinerator after the allowable two year period they will require an additional development permit and further environmental assessment. It is recommended that should the incinerator be used as a backup, that the proponent fulfill the requirements prior to the completion of the two year period to enable environmental assessment to be completed before it is required to be used as a backup.

4.5.5 Staff Training

Staff will be exposed to dangerous clinical and quarantine waste and there is the possibility of personal injury or possible environmental impact by mishandling wastes.

DPC require anyone entering East Arm Wharf to undertake a general induction which includes:

- General site information;
- Speed limits and rules which must be adhered to whilst on the wharf;
- Site specific environmental guidelines; and
- Emergency procedures for events within the wharf.

The PER states that separate inductions will be conducted for the quarantine incinerator. The contractor responsible for commissioning of the facility will provide the initial training to personnel (DPC to specify the number of employees to be trained after the detailed design). DPC will designate personnel to be responsible for the ongoing training of new staff.

The quarantine incineration training is to include, but is not limited to:

- General incinerator operation;
- Operation and maintenance of the pollution control equipment;
- Storage and handling of the quarantine waste and hazardous materials;
- Storage and handling of the waste ash;
- Daily/ weekly/ monthly reporting requirements;
- Adhering to the EMPs; and

- Responding to emergencies.

Records will be kept of people who have undertaken inductions and other forms of training. Training will also be provided on an as-need basis. Hard copies of the EMS and EMP's will be available in the facility's site office.

4.5.6 Medical Waste

The PER states that up to 12 tonnes per annum of medial waste could be incinerated at the facility: 11 tonnes per annum from Royal Darwin Hospital that cannot be autoclaved and one tonne per annum from health care facilities within 300km from Darwin for which no suitable local disposal method exists.

A number of medical wastes cannot be autoclaved, including cytotoxic waste, pharmaceutical wastes, anatomical wastes and some biohazardous wastes.

There is an opportunity with the Department of Health and Community Services to secure incineration services for medical waste produced from Alice Springs and Tennant Creek.

4.6 Ash Management

4.6.1 Ash Quantity

The PER states that URS (2005) indicates that based on processing approximately 295 tonnes per year of waste, an estimated 59 tonnes of ash will be produced (approximately 80% reduction in solid waste). This quantity of ash relates to approximately 25 x 3m³ bins of ash and equates to one 3m³ bin delivery of ash to landfill each fortnight. Future quantities of ash are reported by URS 2005 to be double current rates by 2025 with an estimated 673 tonnes of waste being incinerated. This results in approximately 135 tonnes of ash being produced in the year 2025 and delivery of one 3m³ bin to landfill each week. Primarily the waste ash is produced in the primary chamber with additional small quantities from deposits throughout the process equipment and baghouse residues.

The PER states that the quantity of 295 tonnes per year proposed by USR (2005), is consistent with initial operations of the proposed incinerator. However, the PER also states that the current proposed facility has the ability to treat up to 2500 tonnes per year. This will create significantly more ash than considered in the PER.

Recommendation 17

It is recommended that the OEMP clearly state the quantity of waste to be incinerated on a yearly basis and the associated quantity of ash. Any increase of waste incineration must be justified.

4.6.2 Ash Recycling

The Department of Planning and Infrastructure has suggested that safe ash (ash that meets the criteria in 4.4.3) could be used as filler in asphalt as is done elsewhere with ash from power stations.

Recommendation 18

It is recommended that the proponent examine options for ash recycling in discussion with the Department of Planning and Infrastructure.

4.6.3 Ash Characterisation

The Department of Environment and Conservation, NSW (DEC 2004), define the principal test used for assessing non-liquid waste is the Toxicity Characteristics Leaching Procedure (TCLP), which estimates the potential for the waste to release chemical contaminants into a leaching liquid. This property is called the leachable concentration and the guidelines set different maximum levels of leachable concentration of each contaminant in order for waste to be classified as inert, solid, industrial or hazardous. This TCLP test is generally used Australia-wide to determine how an ash should be treated or disposed of.

The Assessment, Classification and Management of Liquid and Non-liquid Wastes outlines the maximum threshold for contaminants in the ash and these are the contaminants that will be tested for in a TCLP test. Included within this list are metals such as beryllium, cadmium, chromium, lead, mercury, nickel and silver and other organic and inorganic contaminants.

Based on the waste stream identified in the PER it is likely that the waste ash will pass the TCLP test, and be suitable for disposal to landfill. However, ash from the incinerator may fail this test if there are significant amounts of heavy metals in the waste stream. One possible cause of this could be the incineration of a large number of batteries. The inability to access quarantine waste will inhibit the removal of heavy metal containing waste before incineration.

During the initial stages of the incineration operation testing will be conducted on the ash to ensure its suitability to be disposed off to Shoal Bay landfill. Testing will continue until results show a large degree of continuity and the testing regime can then be reduced.

Recommendation 19

It is recommended that a testing regime be developed and implemented that provides Toxicity Characteristics Leaching Procedure (TCLP) testing periods and criteria to ensure suitability of ash for disposal at Shoal Bay Waste Treatment Facility. Testing should occur over a period that demonstrates continuity in results. The regime must be incorporated into the Operational Environmental Management Plan.

4.6.4 Failed Ash Disposal

The PER states that the waste incineration facility will produce an ash that is biologically inert. The ash is classified as a solid waste type that can include putrescible waste and is considered to pose a higher environmental risk than inert waste, and consequently needs to be managed with greater care (DEC 2004). A primary concern relating to the ash product is correct segregation of the wastes containing heavy metals prior to incineration. The PER states that wastes containing heavy metals will be excluded from incineration as they may cause the resultant ash to fail a TCLP test. Ash that fails a TCLP test must be sent to a hazardous waste landfill or be immobilised prior to disposal at an accepted solid waste class landfill.

The PER fails to address how wastes containing heavy metals could be excluded from the waste stream when there is the limitation on opening quarantine bags and thus there is limited information about what is being put in the incinerator.

The activated carbon and lime mix that will be used in the air quality control system will be tested using the TCLP test before disposal to landfill. Failure to meet the test criteria will mean that the mix will need to be treated with ash that fails the test.

The PER also fails to provide reasonable information about what could be done with failed ash considering that there is no hazardous waste landfill or treatment facility in the Northern

Territory. The PER also fails to provide details as to how the waste could be transported and what legislative requirements are required for transportation of hazardous waste. If hazardous waste was to be transported out of the NT then a licensed waste contractor would need to be used and requirements under the National Environmental Protection Measure (NEPM) Movement of Controlled Waste would need to be met.

Recommendation 20

A contingency must be prepared for dealing with ash that fails the TCLP test. This contingency is to be in place prior to commissioning the incinerator. The contingency must include how failed ash can be treated, locations for treatment, safe transportation of failed ash and appropriate disposal facilities. The contingency must also contain processes for disposing of quarantine waste that contains heavy metals and is removed from the waste stream prior to incineration.

The contingency must be approved by the EPA Program and the Department of Health and Community Services. The procedure must be included in the Operational Environmental Management Plan.

4.7 Greenhouse/ Climate Change

4.7.1 Minimisation and Reporting

The PER states that estimated annual greenhouse gas emission from the proposed facility are 9097 tonnes CO₂-e. This represents approximately 0.06% of total Northern Territory greenhouse emissions and 9% of Territory emissions from the waste sector (2004 inventory). The greenhouse gas emission estimates are based on a minimum waste throughput of 300kg/h. As the facility is proposed to have a design throughput of up to 450kg/h, actual greenhouse gas emissions may be proportionally greater than the estimate provided in the PER.

The PER does not consider or estimate the greenhouse gas emissions generated from the construction of the facility, as required under the *NT Environmental Impact Assessment Guide – Greenhouse Gas Emissions*. Construction related emissions from diesel and electricity use would be expected to add to the overall emissions from the proposed facility, and it is noted that the associated draft Construction Environmental Management Plan includes one appropriate measure to reduce greenhouse emissions.

The PER outlines design and operational measures aimed at improving facility efficiency and minimising emissions. It also lists Appendix I measures for the ongoing monitoring, investigation, review and reporting of greenhouse gas emissions that should be included in the Operational Environmental Management Plan (OEMP). The use of a waste heat recovery system identified for investigation is strongly supported. These measures have not been listed in the OEMP and it is recommended that they be included.

Recommendation 21

It is recommended that the proponent incorporate measures for the ongoing monitoring, investigation, review and reporting of greenhouse gas emissions in the Operational Environmental Management Plan.

Recommendation 22

It is recommended that the proponent join the Australian Government's Greenhouse Challenge Plus program as a framework for monitoring and reporting greenhouse emissions and achieving ongoing improvement in emissions management.

4.7.2 Piping of Gas to Site

The PER states that a significant amount of gas is to be used each week: approximately 30kL. It is not mentioned at Section 3.6.2 of the document, but it is assumed that the tanks will be refilled from road tankers. The Department of Planning and Infrastructure has questioned if the proponent has considered the possibility of NT Gas running a pipeline to the site. Alternatively, if a gas supply pipeline were to be run to the port in the long term, it is unclear if the incinerator could be modified to run off gas provided via pipeline.

Limiting the number of road tanker trips required to East Arm Port could significantly reduce the associated road transport related greenhouse gas emissions.

Recommendation 23

It is recommended that the proponent discuss with the Department of Planning and Infrastructure the possibilities of establishing a gas pipeline connection to the site or design considerations that would need to be taken into account if a gas pipeline was introduced in the longer term.

4.8 Water Management

4.8.1 Waste Water

The proposed incinerator will consume up to 500 L/hr of potable water in the adiabatic quench designed to reduce gas temperatures rapidly to avoid the formation of dioxins via de novo synthesis. The gases will be rapidly cooled from the afterburner to about 200°C so that they can be passed through the dry scrubbing system. The adiabatic quench will not produce any waste water as it will all evaporate and enter the atmosphere as water vapour. Recycled water could be used in the quench however any impurities in the water would be added to the atmosphere when the water is vaporised in the quench.

Power and Water Corporation have confirmed that the potable water supplies to the site appear adequate for the project. The EPA Program is of the opinion that there is opportunity for the proponent to explore the option of using recycled water for the adiabatic quench while recognising that there may be limitations due to the quality of the recycled water.

Waste water will be produced from ash bin washing. High-pressure hot water or a steam lance is used to sanitise bins before they go back into recirculation. This involves minimal water use, but is dependent on the number of ash bins to be cleaned. The waste water would be suitable for discharge to the onsite waste water treatment plant but some of it may also be utilised in the quench (during which it will be evaporated).

Waste water will also be produced from the washing of bins that contained quarantine waste. These will be washed at the existing AQIS supervised container washing facility. Waste water will then be directed to the onsite waste water treatment plant which is owned and managed by Darwin Port Corporation. However, the plant does not yet have discharge licence to discharge into the harbour.

The EPA Program is satisfied that the disposal of waste water to onsite DPC sewerage treatment is a suitable management option, provided the sewage system is able to operate effectively to treat the wastes, particularly with respect to disinfection. Any excess ash and bin wash water, not reused within the incinerator should be screened via triple interceptor as proposed within the PER.

Recommendation 24

It is recommended that a trade waste agreement should be developed to maintain acceptable quality of wastewater being delivered to the onsite Waste Water Treatment Plant. The proponent will need to meet any requirements imposed by the EPA Program Environmental Management section for discharge licensing associated with the onsite waste water treatment plant.

Recommendation 25

It is recommended that the Darwin Port Corporation explore options for using recycled water in the adiabatic quench to minimise the use of potable water in the system.

4.9 Construction

4.9.1 Acid Sulphate Soil

Section 5.5.3 (Mitigation Measures) of the PER states that an acid sulphate soil management plan will be prepared if acid soil is located during construction. While it is probable that acid soil will not be disturbed, there is a lot of the material on site and the Department of Planning and Infrastructure recommends that a plan should be included in the CEMP before construction commences.

Recommendation 26

It is recommended that an acid sulfate soil management plan be included in the Construction Environmental Management Plan.

4.10 Noise

Noise monitoring and assessment were undertaken in the PER to determine ambient noise levels and to assess the acoustic impact of the proposal. The basis of the assessment was to ascertain whether the facility would have an acoustic effect on the amenity of residences living in close proximity of the site, during both construction and operation of the facility. In the absence of current NT noise guidelines, use of the NSW noise regulations and guidelines was approved by the EPA Program.

Modelling was undertaken on a worst case scenario, with more than one activity occurring simultaneously. It was found that construction noise would not exceed the criteria and would not therefore have an adverse impact on the existing acoustic environment.

The modelling of the acoustic impacts demonstrated that the operation of the incinerator would not be heard at the sensitive receptors.

4.11 Environmental Management Plans

The Construction Environmental Management Plans (CEMP) and Operational Environmental Management Plans (OEMP) outlined in the PER will need to be revised to incorporate the additional measures for environmental protection and monitoring that are contained in this Assessment Report. The management plans will be working documents for the life of the facility and will require continual review in light of operational experience, monitoring results and changed circumstances.

Recommendation 27

Revised management plans covering construction and operation of the Quarantine Waste Treatment Facility are to be submitted to the EPA Program and Environmental Health, Department of Health and Community Services for approval prior to commencement of construction and operation. In preparing each management plan, the proponent will include any additional measures for environmental protection and monitoring contained in this Assessment Report and recommendations made by the Northern Territory Government with respect to the proposal. The plans shall be referred to relevant NT Government Agencies for review prior to finalisation.

Recommendation 28

It is recommended that the Department of Health and Community Services be referenced throughout the management plans, specifically Environmental and Public Health. These areas should be included in any reporting requirements, risk assessments, emergency response sub plan, responsibilities in sewage management and complaints management flow charts.

The Harbour Master should also contact the Department of Health and Community Services in the emergency response sub plan.

Recommendation 29

It is recommended that the NT *Public Health Act* be listed in the relevant legislation sections in the OEMP and CEMP.

5. REFERENCES

GHD (2006), Darwin Port Corporation, Quarantine Waste Treatment Facility, Public Environment Report.

Department of Environment and Conservation (DEC), NSW (2004), Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-liquid Wastes.

Department of Infrastructure Planning and Environment (2003), Draft Monitoring and Reporting Protocols for the Proposed Incinerator for East Arm Wharf.

European Union Waste Incineration Directive (2006)
<http://ec.europa.eu/environment/air/stationary.htm#2> accessed 9/10/2006

Stockholm Convention on Persistent Organic Pollutants (2006)
http://www.pops.int/documents/convtext/convtext_en.pdf accessed 9/10/2006

URS (2005), East Arm Waste Treatment Facility Draft Notice of Intent. Prepared for Department of Infrastructure, Planning and Environment.

6. APPENDIX 1

TABLE OF COMMITMENTS

The following table summarises the key commitments and statements of proposed preventative and management measures made by the Darwin Port Corporation in the PER and subsequent correspondence and consultations. While not all preventative and management measures proposed by the proponent have been detailed in this table, all commitments and measures proposed, along with the recommendations in this Assessment Report must be fulfilled by the proponent for the project to be implemented in an acceptable manner. These commitments and management measures are to be managed under the projects issue-based Management Plans and Operational Environmental Management Plan.

Commitments/ Safeguards	PER
Climate	5.3
A Construction and Operation Environment Management Plan will be developed by the Darwin Port Corporation (DPC) for the proposed incinerator, which will incorporate measures for the construction and operation of the incinerator during extreme weather events.	5.3.3
Landform	5.4
In the event excavation into marine mud is required an Acid Sulphate Management Plan will be developed by the DPC. Material stockpiled during excavation will be appropriately controlled and disposed of or reburied. Fill that may be imported onto the site during construction will be first certified as “clean”.	5.4.3
Sediment traps will be installed to prevent soil runoff into Darwin Harbour.	5.4.3
DPC commits to monitoring programs being established to evaluate: • Soil erosion, sediment build up and sediment inputs into Darwin Harbour; • Weed and seed introductions and transport; and • landscaping condition and rubbish accumulation;	7.8.1
Water Quality	
To conform to the requirements of the <i>Water Act</i> and the <i>Waste Management and Pollution Control Act 1998</i> , in particular the declared Beneficial Uses for Darwin Harbour water i.e. aquatic ecosystem protection and recreational water quality and aesthetics., the DPC commits to measures detailed in its Water Quality Management Sub Plan to ensure that: • No contaminated water will leave the site during construction; • No contaminant will remain that might contaminate water in future; and • No contamination will occur of Darwin Harbour from the operation of the incinerator.	7.7.7
Noise	
To minimise noise emissions to acceptable levels during the construction phase of the project, the DPC commits to measures detailed in its (Construction and Operation) Noise Management Sub Plans.	7.7.6

Commitments/ Safeguards	PER
DPC commits to a monitoring program to evaluate noise emissions.	7.8.1
Air Quality	5.7
In the event of a malfunction of the incinerator, DPC commits that the incinerator will be switched off immediately to reduce any adverse air quality impacts. The process will not recommence until the issue has been rectified.	5.7.4
Activities on site will minimise or prevent particulate matter emissions and odour from the premises through measures detailed in its (Construction and Operation) Air Quality Management Sub Plans. If a complaint is received, DPC commits that it will be dealt with promptly to ensure that the likelihood of further emissions and complaints are minimised.	7.7.5
During the construction phase DPC commits to: • Minimise production of dust and use dust suppressant if necessary; • Ensure all equipment is well maintained and in good working order; • When equipment and vehicles are not in use they must be switched off; • Minimisation of the area disturbed at any one time; and • Avoid the use of unsealed roads where possible.	5.7.4
DPC commits to a monitoring program to evaluate ongoing air quality and stack emissions.	7.8.1
Greenhouse Gas Management	5.8
The proposed new quarantine waste treatment facility will be designed and operated to minimise total greenhouse gas emissions.	5.8.4
The project Environmental Management Plan (EMP) will include measures for the ongoing monitoring, investigation, review and reporting of greenhouse gas emissions and abatement measures.	5.8.4
Waste Management	5.9
To protect the environment and personnel from quarantine waste and ensure that it is handled following DPC procedures, the DPC commits to measures detailed in its Quarantine Waste Management Sub Plan.	7.7.2
DPC will establish a waste management program with the following control measures incorporated: • Wastes appropriately segregated and stored by waste type; • Procedures in place for handling quarantined material that are consistent with the appropriate legislation; and • Quarantine waste management procedures to be controlled by appropriately authorised and responsible personnel.	5.9.3
DPC will establish a monitoring and reporting system including: • Daily inspections to be conducted during preparations to confirm waste management requirements are complied with focus placed upon the effectiveness of waste segregation procedures; • Incidents, accidents and complaints (including non-compliance) related to waste disposal will be investigated, documented and improvement strategies implemented; and • Environmental Incidents Forms will be completed for any form of environmental concern, including all spills and leaks. If any incident causes, or threatens to cause, pollution resulting in any degree of environmental harm, the EPA Program will be informed within 24 hours of first becoming aware of the situation.	5.9.3
Non-approved waste arriving on site will be immediately identified and reported to the incinerator supervisor. The Waste Management Program will incorporate a procedure for arrival of non-approved waste.	5.9.3

Commitments/ Safeguards	PER
The management and operation of the proposed facility will be undertaken by DPC to ensure that the risks associated with the potential biological hazards are minimised during the handling of the waste and eliminated in the waste treatment process. Standard operating procedures will be developed by the DPC to ensure a high standard for secure management of quarantine and related wastes.	5.13.1
To minimize the generation of waste, maximise material reuse and manage in accordance with EPA Program Environmental Guidelines [Assessment, Classification and Management of liquid and Non-liquid Wastes, and relevant legislation] and the <i>Waste Management and Pollution Control Act 1998</i> , the DPC commits to measures detailed in its Construction Waste Management Sub Plan, and the (Operation) Waste Handling and Storage Sub Plan.	7.7.3
To protect employees and the environment from spills, leaks and accidents involving dangerous substances that can cause soil, surface water and ground water contamination and can be a health and safety hazard, the DPC commits to measures detailed in its Dangerous Goods Management Sub Plan.	7.7.4
DPC commits to monitoring programs being established for: - Fuels, Dangerous Goods and Quarantine materials; and - Waste Management compliance;	7.8.1
Residue and Ash Handling	5.10
During the initial stages of the incinerator's operation DPC commits to the ash being tested to ensure its suitability for landfill in terms of toxicity leaching characteristics. The disposal of ash will be governed by the following measures: - All transport of ash will be in covered bins; and - The ash will be immediately covered with other wastes to prevent dispersion at landfill.	5.10.4
Transport	5.11
To minimise the impact of construction and operation traffic on normal site traffic movements, the DPC commits to measures detailed in its Traffic Management Sub Plan.	7.7.8
Biting Insects	5.12
To minimise the adverse impacts on humans from biting insects during construction and operation, the DPC commits to measures detailed in its Biting Insects Management Sub Plan.	7.7.9
DPC commits to a monitoring program to evaluate biting insect habitat formation.	7.8.1

General Environmental Management	5.13
Once the final design and layout of the proposed facility has been finalised, DPC commits to preparing a management and administration plan discussing: • Waste receipt and storage; • Waste handling and loading; • Incinerator operations guide (including bypass operations); • Incinerator maintenance and servicing guide; • Air Quality Control systems operating guide; • Incinerator ash and residues management (i.e. removal, storage, handling, transport and disposal); • Baghouse waste management (i.e. removal, storage, handling, transport and disposal); • Facility housekeeping guide; • Waste processing record keeping; • Environmental Management Plan (including monitoring requirements and understanding outputs); • Emergency Response Plan (includes scenarios covering leaks, spills, fires, explosions, security breaches, cyclone warnings and procedures, emergency shutdown, emergency waste storage and containment arrangements in the event of a major breakdown or major seizure or requirement for the destruction of high risk quarantine related materials, etc.); and • Staff training requirements.	5.13.6
During the operational phase DPC commits to: • Monitoring of the incineration process and incorporation of interlocks to ensure the process is operating under optimum conditions and is compliant with statutory guidelines; • Monitoring of all raw material and waste streams where possible; • Regular visual monitoring of the plume emissions from the stack to ensure compliance; • Regular staff training to ensure equipment and materials are used in an environmentally sound manner; • Focus on operational training for start up and shut down procedures; • Regular preventative maintenance of equipment; and • Annual review of systems.	5.7.4
DPC commits to requiring anyone entering East Arm Wharf to undertake a general safety induction.	7.4.3
Environmental Policy	
In conjunction with other accountable parties, DPC commits to give due regard to environmental concerns in all facets of Port planning, development and operation in accordance with all applicable environmental laws, policies and regulations.	
DPC commits to develop and maintain systems to identify and minimise the risk of environmental harm from Port development and operation.	7.3
DPC commits to minimise pollution resulting from Port development and operation.	7.3
DPC commits to develop and maintain a framework which sets environmental objectives and targets consistent with the Corporation's activities and services.	7.3
DPC commits to maintain a high level of environmental management through the development and implementation of environmental monitoring, and measuring of programs associated with Port development and operation.	7.3
To Communicate to staff, community and interested parties, the Corporation's progress in meeting the targets defined in their EMS is committed to by DPC.	7.3
Through continual improvement of the Corporations EMS, DPC commits to provide a platform for environmental sustainability in all facets of our activities and services.	7.3

In conjunction with other accountable parties, DPC commits to give due regard to environmental concerns in all facets of Port planning, development and operation in accordance with all applicable environmental laws, policies and regulations.	7.3
Heritage	
In the event Indigenous or non-Indigenous relics are found during the construction or operation of the quarantine incinerator, DPC commits that work will cease and the Department of Natural Resources, Environment and the Arts (NRETA) will be contacted to inspect the finds.	7.7.10 5.14.5 5.14.6