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**Proposed ELSH Crematorium,
Nubuamis, Windhoek**

Environmental Management Plan

June 2022

Proponent: **ELSH Cremation Services cc**
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Abbreviations and Acronyms

DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMA	Environmental Management Act
EMP	Environmental Management Plan

1 Introduction

This Environmental Management Plan (EMP) contains practical measures that must be taken to ensure that potentially negative impacts on the biophysical and social environment are minimised or avoided.

Namibia's Environmental Management Act (EMA) (7 of 2007) requires that an EMP be put in place before a project is implemented. This is usually prepared as part of an Environmental Impact Assessment (EIA). The proposed crematorium is not expected to result in significant negative environmental impacts, therefore a scoping-level EIA has been conducted.

This EMP is valid for the planning, construction and operation phases of the proposed ELSH Crematorium in Nubuamis, Windhoek. The closure of the crematorium is not addressed in this EMP. The activities are similar in nature to that of general construction, however it is recommended that closure planning be undertaken by a suitably qualified and experienced professional when closure is expected in future.

This EMP is laid out in the following sections.

- Project overview – a description of the proposed project (Chapter 2).
- Roles and responsibilities – outlines the roles of key agents and their responsibilities according to project phase (Chapter 3).
- Applicable legal requirements – outlines relevant permits and legal obligations (Chapter 4).
- Mitigation tables – provides an outline of the mitigation measures required to ensure that the negative environmental and social impacts are managed in a responsible manner so that impacts are avoided or minimised (Chapters 5-6).
- Monitoring reports – outline of what must be reported in 6-monthly reports to the Environmental Commissioner, as a requirement for the renewal of the Environmental Clearance Certificate after 3 years (Chapter 7).

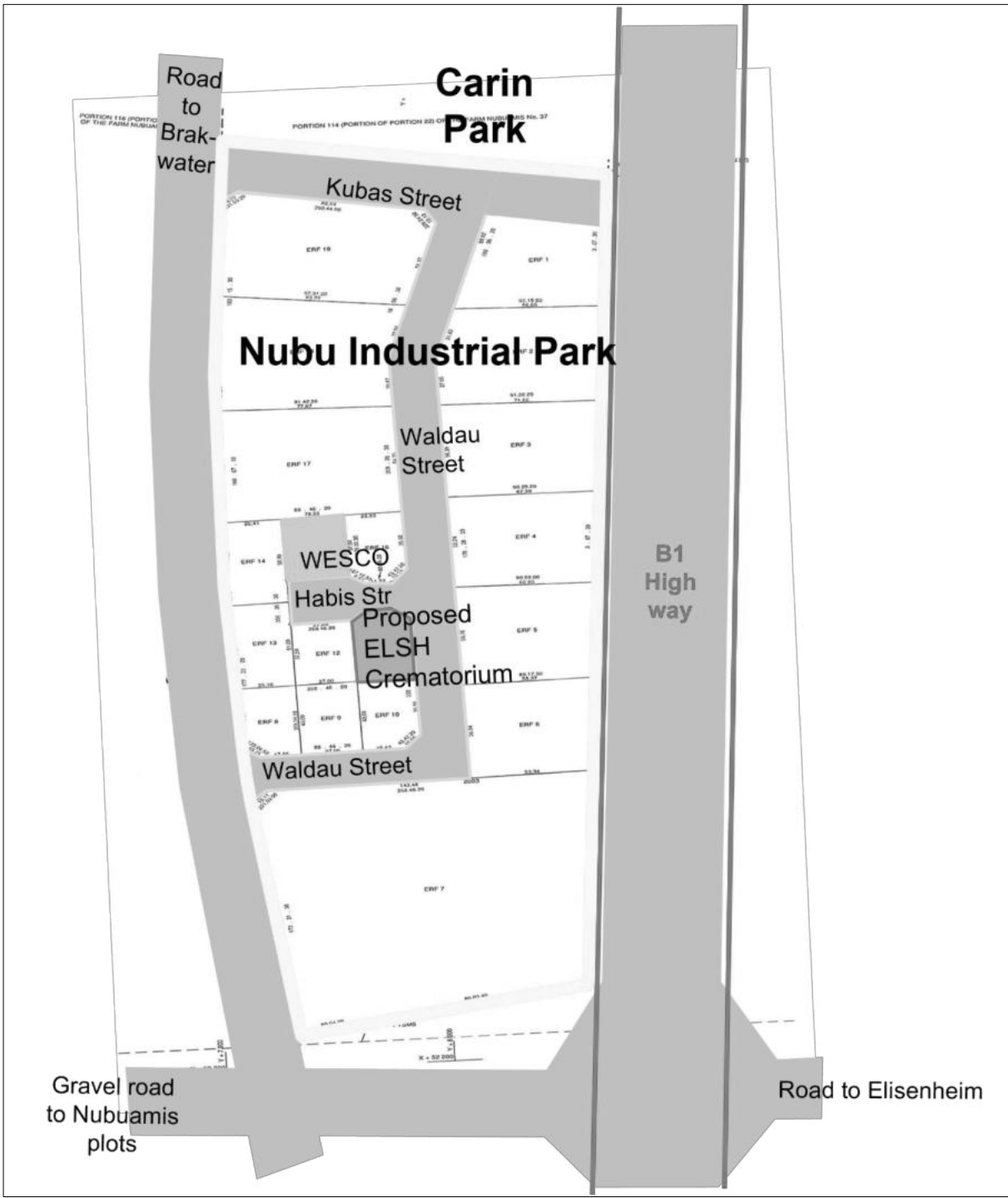


Figure 1-1: Location of proposed ELSH Crematorium in relation to Nubu Industrial Park and surroundings, Nubuamis, Windhoek.

2 Project Overview

2.1 The proposed ELSH Crematorium

The cremation apparatus to be installed is one unit of the American Crematory Model DFE-A-250 (Figure 2-1). This will be fuelled by Liquid Petroleum (LP) Gas.

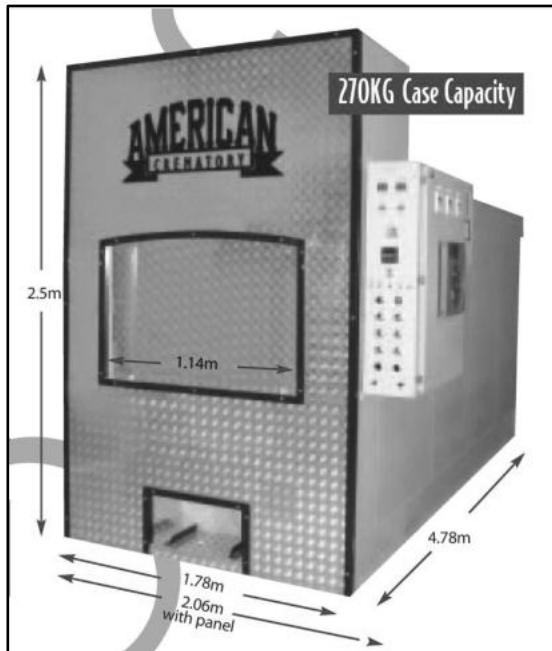


Figure 2-1 Catalogue diagram of the crematory apparatus.

2.2 Proposed activities

Human bodies (cadavers) will be brought to ELSH Crematorium from a mortuary or a funeral home. There will be a mortuary room in the building with capacity for 18 (maximum 21) cadavers. The cadavers will not be kept on site for longer than 48 hours, and if necessary, will be prepared and placed in a coffin for cremation. The crematorium will cremate 6 – 8 bodies per work day.

Visitors to the Crematorium, who will mostly come as mourners at the end of a funeral service, will park their vehicles along the Waldau Street access and parking area that will be created as shown in the architect's drawing (Figure 2-2).



Figure 2-2: Artist's impression of the proposed ELSH Crematorium buildings.

2.3 Construction Phase

The Proponent will appoint a contractor to construct the crematorium and facilities. The construction crew will be accommodated off-site in Windhoek for the duration of the construction works. A relatively small workforce (i.e. approximately 15 people) will be employed during the course of the construction phase. This is expected to last approximately three months. This is an estimate subject to change based on conditions at the time when construction starts.

2.4 Operational features

The operation phase infrastructure and requirements are outlined below.

2.4.1 Water

It is estimated that the water consumption will be approximately 1,000 litres per working day. This water supply will come from a connection to the NamWater pipeline running north-south parallel to and on the west side of the B1 Highway from Okahandja to Windhoek. A supplementary water tank, with capacity of 10 m³, will be established on the site, and will be kept filled by the inflow from the Namwater pipeline. The water storage tank will supply the site with fire water and domestic water as per the relative SANS requirements.

2.4.2 Wastewater Treatment

Sewage water and grey water from the buildings will be carried via standard sewer pipes to a small septic tank system for disposal and treatment of the wastewater from the plant.

2.4.3 Energy

Four LP Gas storage banks consisting of ten 48 kg cylinders each will be installed. The LP Gas cylinders will be replaced on a daily or weekly basis depending on the operational load of the crematorium units. The crematorium unit will be supplied via two of the LP Gas storage banks. Building safety requirements for gas storage, such as fire safeguards, will be included in the design and operations of the Crematorium.

Electricity will be provided by a dedicated offtake from the existing distribution kiosk situated in close vicinity to the property. No additional power lines will be necessary.

2.4.4 Road Access

Road access to site is obtained from Waldau Street which runs along the east side of the property.

2.4.5 Noise

All the cremation apparatus will be enclosed in the building to absorb noise, so that the visitors are not disturbed by this aspect. The operating furnace makes a low-frequency, soft burning noise that is designed to be unobtrusive.

2.4.6 Solid Waste Management

The solid waste will consist of waste from the coffins and the cadavers themselves, and standard domestic waste from the office and small kitchen.

The fine ash and crushed bone fragments derived from the cremation process are completely sterile from the high temperatures of the crematory, and can be safely disposed of. These are packaged in an urn and given to the relatives of the deceased. Metal parts such as surgical pins and plates in the cadavers will be collected in a grate in the crematory apparatus. Such parts are also completely sterilised, and will be added to the standard domestic waste coming from the site. A municipal waste collection service will pick up such rubbish for standard disposal at the Windhoek waste disposal site at Kupferberg.

2.4.7 Air emissions

Cremation is a combustion process in which a coffin and human remains are burned at a high temperature (850°C) in a closed chamber¹. The process is fuelled by LP Gas and produces emissions associated with fossil fuel combustion as well as emissions from the material being burned.

The emissions will be expelled via a chimney stack that will rise 2.5 m above the roof level. This is designed to expel the emissions at sufficient height so that they are well diluted and mixed within a 100 m radius under still conditions.

Namibia does not have air quality regulations, so the WHO standards (consistent with the South African National Ambient Air Quality Standards, NAAQS) are applied (Table 2-1).

¹ O’Keeffe J. 2020. Crematoria emissions and air quality impacts. National Collaborating Centre for Environmental Health, Canada.

The recommendation from the Canadian authorities is that emissions should be tested within one year of installation, and at least once every five years thereafter.

Table 2-1: International assessment criteria for potential pollutants from a crematorium.

Pollutant	Averaging Period	WHO Guideline Value ($\mu\text{g}/\text{m}^3$)	South Africa NAAQS ($\mu\text{g}/\text{m}^3$)
Sulphur Dioxide (SO₂)	1-year	-	50
	24-hour	125 (IT-1)	125
		50 (IT-2) 20 (guideline)	
	1-hour	-	350
10-minute	500 (guideline)	500	
Nitrogen Dioxide (NO₂)	1-year	40 (guideline)	40
	1-hour	200 (guideline)	200
Particulate Matter (PM₁₀)	1-year	70 (IT-1)	40
		50 (IT-2)	
		30 (IT-3)	
		20 (guideline)	
	24-hour	150 (IT-1)	75
		100 (IT-2) 75 (IT-3) 50 (guideline)	
Particulate Matter (PM_{2.5})	1-year	35 (IT-1)	25
		25 (IT-2)	20
		15 (IT-3)	15
		10 (guideline)	
	24-hour	75 (IT-1)	65
		50 (IT-2)	40
		37.5 (IT-3)	25
		25 (guideline)	
Carbon Monoxide (CO)	1-hour		30 000
	8-hour		10 000

IT-1, IT-2 and IT-3 refer to Interim Targets provided by WHO to enable countries to set targets over time that would gradually approach the guideline value.

3 Roles and Responsibilities

The implementation of the EMP is the responsibility of the persons in charge of each of the project phases as outlined in Table 3-1 below.

Table 3-1: EMP implementation roles and responsibilities

Role	Responsibility
Proponent	Ultimately responsible for all aspects of construction and operation of the crematorium.
Project Engineer	Responsible for design aspects and safety apparatus included in the crematorium.
Contractor	Responsible for all construction activity.

The responsibility for the implementation of this EMP lies with the respective entities for each phase, noting that ultimately, compliance with the EMP requirements rests with the proponent.

The Environmental Management Act requires that implementation of the EMP should be monitored. The findings should be incorporated into 6-monthly monitoring reports for submission to the Ministry of Environment, Forestry and Tourism (MEFT): Department of Environmental Affairs and Forestry (DEAF), specifically to the Environmental Commissioner’s office. Renewal of the Environmental Clearance Certificate, after 3 years, depends on the submission and results of such monitoring.

4 Applicable Legal Requirements

The following legal requirements are applicable to the proposed crematorium.

Table 4-1: Legislation applicable to the ELSH Crematorium.

Legislation	Provisions	Contact Details
Environmental Management Act 2007 Environmental Impact Assessment (EIA) Regulations (EIAR) (GG No. 4878)	Activities listed in Government Notice No. 29 of GG No. 4878 require an Environmental Clearance Certificate (ECC). The amendment, transfer or renewal of the ECC (EMA S39-42; EIA Regs19 & 20). Amendments to this EMP will require an amendment of the ECC. The ECC needs to be renewed every 3 years.	Mr Damian Nchindo (Ministry of Environment and Tourism – Chief Conservation Scientist) Tel: 061 284 2701
Labour Act 11 of 2007 Health and Safety Regulations (HSR) GN 156/1997 (GG 1617).	Adhere to all applicable provisions of the Labour Act and the Health and Safety regulations.	
Atmospheric Pollution Prevention Ordinance No. 11 of 1976 (as amended)	A registration certificate is required for emission of noxious or offensive gases, obtainable from ‘the Director of Health Services’.	Ministry of Health and Social Services Tel: 061 203 9111
Public and Environmental Health Act (No. 1 of 2015)	This Act provides a framework for a structured uniform public and environmental health system in Namibia. The act identifies health nuisances, such as chimneys emitting smoke in quantities that can be offensive, injurious or dangerous to health, which are liable to be dealt with. Under this Act, all Local Authorities must take measures to prevent unhygienic or offensive conditions in their jurisdiction, and must prevent occurrence of health risks.	Sec 52: Any party that generates industrial / hazardous waste must register with the Local Authority. The LA must in turn register with the Chief Health Officer.
Road Ordinance 1972 (Ordinance 17 of 1972)	Infringements and obstructions on and interference with proclaimed roads. (S37.1)	The conditions applicable to road accesses should be adhered to.

5 Construction Phase Mitigation Measures

The mitigation measures for the construction phase are presented in Table 5-1. These are the responsibility of the Contractor and the Project Engineer.

Table 5-1: Recommended mitigation measures for construction of the ELSH Crematorium.

Aspect	Impact	Mitigation Measures
Noise	Nuisance impacts and associated negative conflict	The Contractor should as far as possible work during reasonable/generally accepted work hours – 07:00-1900
Waste Management	Soil and groundwater contamination	<ul style="list-style-type: none"> • All precautions are to be taken to prevent contamination of the soil, and surface- and groundwater. • All waste generated during construction should either be recycled or disposed at the nearest designated landfill site. • Waste bins should be provided around the work site. • Washing of equipment contaminated with hydrocarbons on-site, as well as the washing and servicing of vehicles on-site, should take place at a dedicated area, where contaminants are prevented from contaminating soil or water resources.
Health and Safety	Injury or loss of life	<ul style="list-style-type: none"> • The Contractor must adhere to the regulations pertaining to Health and Safety, including the provision of protective clothing. • All flammable materials used for construction should be properly contained to limit the risks of fire. • Fuel tanks (if applicable) on site must be properly banded. • An emergency preparedness plan should be compiled and all construction personnel appropriately trained.
Air emissions	Emission of toxic air pollutants from the Crematorium	<ul style="list-style-type: none"> • The recommended filters and scrubbers must be installed in the crematory to achieve the air quality emission standards required by the WHO.

6 Operation Phase Mitigation Measures and Monitoring

The mitigation measures for the operation phase are presented in Table 6-1 below. These are the responsibility of the Proponent.

Table 6-1: Recommended mitigation measures for the operation of the ELSH Crematorium.

Aspect	Purpose	Mitigation Measures
Operator training	EMP awareness	The appointed Crematory Operator should be trained and be fully familiar with the necessary health, safety and environmental considerations arising from the crematory. This includes optimal operating conditions such as adequate temperature and residence time in the combustion chambers, to ensure complete cremation with minimal emissions.
Crematory maintenance	Operational efficiency and prevention of unwanted emissions	The Proponent should develop a Service Agreement to ensure that the facilities and plant are properly maintained and serviced to the specifications of the manufacturer.
Noise	Noise minimisation	All crematory apparatus should be noise efficient and insulated against generating noise. Equipment should be kept in good repair and any loose or noisy components should be promptly attended to.
Air quality	Prevention of toxic air emissions and odours	The Crematory Operator should follow the manufacturer's optimal cremation guidelines (particularly with respect to temperature and duration of the furnace) to minimise emissions.
Monitoring of air quality	Independent monitoring of air emissions	Air emissions from the Crematorium should be sampled and tested for the following compounds: <ul style="list-style-type: none"> • Particulate matter PM10 and PM2.5 • Carbon monoxide • Nitrous oxides • Mercury • Non-methane volatile organic compounds (NMVOCs) • Polychlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) <p>This should be carried out by an independent air quality specialist, in the first 6 months of operation of the Crematorium. The results should be used to check compliance with the WHO thresholds, and the relevant components of the apparatus must be improved if any thresholds are exceeded. If the air quality test shows non-</p>

Aspect	Purpose	Mitigation Measures
		<p>compliance, a further test should be carried out within the next 6 months to ensure that the problematic emissions have been adequately reduced.</p> <p>Thereafter, air quality testing should be scheduled for 2 years after the last test showing full compliance. Again, if compliance is not achieved, then the apparatus should be adjusted and a further test run within the next 6 months.</p> <p>If air quality compliance is shown, then frequency of tests should be every 5 years thereafter.</p>

7 Monitoring reports

Monitoring reports should be submitted to the Environmental Commissioner every 6 months. These should provide information on the following aspects:

After construction completed:

- Proof of installation of the appropriate design features, namely:
 - Chimney height
 - Mercury scrubbers installed
 - Dust filters installed
- Emissions results from an independent air quality analysis.

During operation:

- Proof of servicing and maintenance of the crematory apparatus, carried out as per the manufacturer's specifications
- Relevant Fitness Certificate issued by CoW
- Emissions results from an independent air quality analysis after 2 years of operation, and every five years of operation thereafter.

Note: The frequency of the above components will not necessarily correspond with the submission of 6-monthly Monitoring Reports. The Monitoring Reports will report on the most up-to-date results of the above components, and do not require that new servicing and fitness certificates must be obtained at 6-monthly intervals.
