



Environmental Management Plan

Howard Springs Waste Transfer Station

Litchfield Council

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Prepared by:

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	Click to enter a date.			

Basis of Report

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Acronyms and Abbreviations

AACR	Annual Audit and Compliance Report
AHD	Australian Height Datum
ANZG	Australian & New Zealand Guidelines for Fresh & Marine Water Quality (2018)
AS	Australian Standard
Bgl	Below ground level
BoM	Bureau of Meteorology
°C	Celsius
C&D	Construction & Demolition
CP	Community Purpose
DHWQO	Darwin Harbour Water Quality Objectives (2010)
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environment Protection Authority
EPL	Environmental Protection Licence
HS	Howard Springs
km	kilometer
LC	Litchfield Council
LI	Light Industry
m	meter
MSW	Municipal Solid Waste
NATA	National Association of Testing Authorities
NHMRC	National Health and Medical Research Council
NT	Northern Territory
NTPS	Northern Territory Planning Scheme Maps
ULABs	Used lead acid batteries
SAQP	Sampling, Analysis and Quality Plan
SLR Consulting	SLR Consulting Pty Ltd
SOCS	Site of Conservation Significance
The Site	Howard Springs Waste Transfer Station
WMPC Act	<i>Waste Management and Pollution Control Act 1998</i>
WTS	Waste Transfer Station



1.0 Introduction

1.1 Background

SLR Consulting Pt Ltd (SLR Consulting) has been engaged by Litchfield Council (LC) to update the existing Environmental Management Plan (EMP) for the Howard Springs Waste Transfer Station (WTS).

The WTS is located on Lot 5519, 16 Howard Springs Road (the site), approximately 25 km southeast from Darwin city, Northern Territory (NT).

The WTS is a strategic waste management site for the region, open to the public for receiving and diverting waste materials. The site operation incorporates the separation of recyclables, resources and reusable items prior to diversion to off-site markets to reduce the residual waste volumes sent off-site for disposal at a landfill.

The site was previously used as borrow pits and then as a landfill (managed by the Northern Territory Government). The Howard Springs WTS was constructed following closure of the landfill.

1.2 Purpose

The aim of this document is to:

- Manage potential environmental risks associated with WTS operations.
- Facilitate compliance with current legislation, regulations and guidelines.
- Facilitate operational compliance with the conditions of the Environmental Protection Licence (EPL).
- Continuously implement environmental management procedures in an efficient and effective manner throughout the site operations to protect the environment.
- Minimise inconvenience to local residents and other near receptors by minimising dust, odour and noise nuisance from WTS activities.

LC will also develop specific operational procedures for routine and non-routine site activities to guide site operations and ensure they are conducted in a manner that will not result in environmental harm.

1.3 Scope

This EMP describes the existing site and identifies environmental aspects and potential impacts of the Howard Springs Waste Transfer Station and how they will be managed to minimise the risk of environmental harm. This EMP includes the following sections:

- Section 2: A description of site setting and conditions
- Section 3: A brief overview of site infrastructure and operations
- Section 4: Framework for environmental management and continuous improvement
- Section 5: Assessment of identified real and potential environmental risks factors
- Section 6: Environmental management plans for identified risk factors
- Section 7: Emergency Response Plan



1.4 Environmental Commitment

Litchfield Council acknowledges the provisions of the *Waste Management and Pollution Control Act 1998*¹ as providing a general Environmental Duty of Care on all persons and the environment. The Howard Springs Waste Transfer Station aims to be an environmentally responsible operation, operating in compliance with all relevant environmental legislation, the Conditions of the Environmental Protection Licence 278-01 (EPL278-01)² for the site and this EMP.

¹ WMPC Act 1998: <https://legislation.nt.gov.au/Legislation/WASTE-MANAGEMENT-AND-POLLUTION-CONTROL-ADMINISTRATION-REGULATIONS-1998>

² EPL278-01: https://ntepa.nt.gov.au/_data/assets/pdf_file/0005/1452974/epl278-01-litchfield-council-howard-springs.pdf



2.0 Site Overview

2.1 Location

The WTS is located on Lot 5519, 16 Howard Springs Road, approximately 25 km southeast from Darwin city (**Figure 1**).

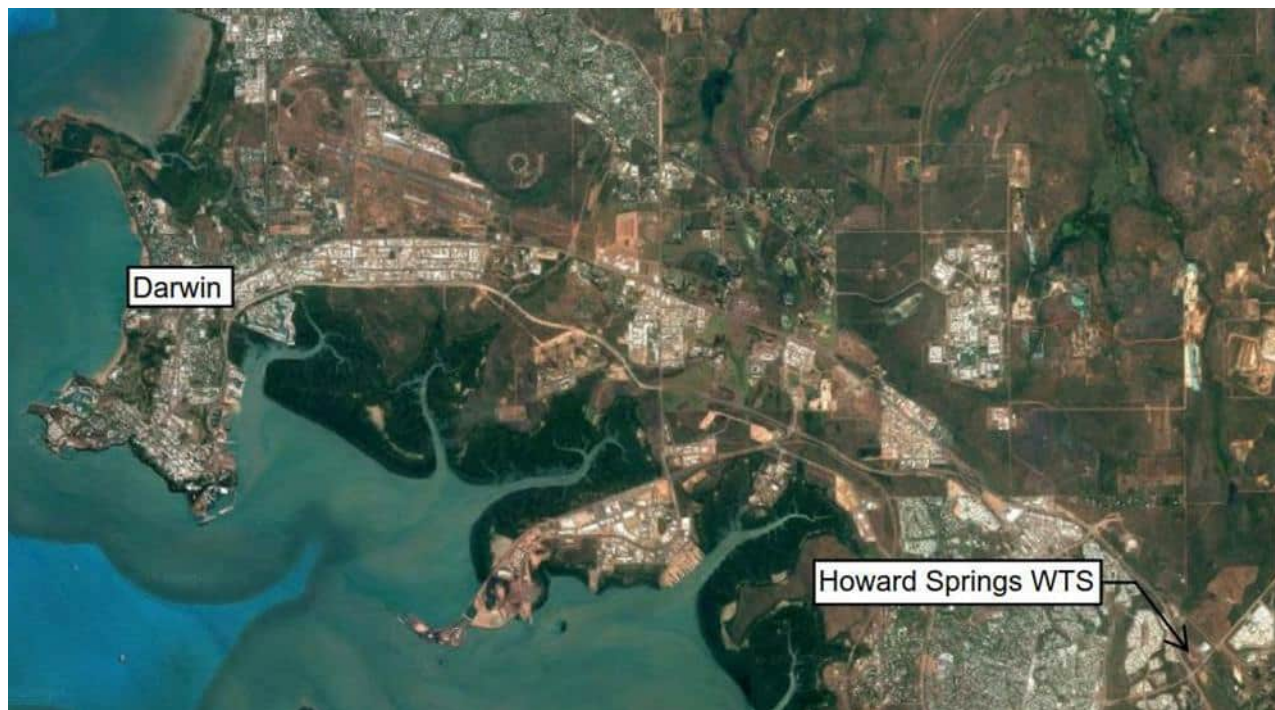


Figure 1: Howard Springs WTS Site Location

2.2 Climate

The climate in the area is tropical, where Wet season spans from November to April; Dry season spans from April to August; and August to November is characterised by a 'build-up' period during which humidity is highest. The average annual rainfall is 1,500 mm with rainfall at its highest between December and March (BoM, 2024)³.

The annual mean maximum temperature is 31.9°C, reaching its highest of 33.3°C during October in the 'build-up'. The annual mean minimum temperature is 24.6°C, reaching as low as 19.3°C during July in the Dry Season (BoM, 2024).

Mean wind speeds range from 8 km/hr in November to 20 km/hr in September (BoM, 2024).

2.3 Geology and Soils

The Howard Springs site is situated within the north western portion of the Pine Creek Orogen which comprises Paeleoproterozoic sedimentary and minor volcanoclastic rocks, unconformably overlying a Neoarchaeon age granitic basement⁴.bo

The majority of the site area (approximately 90%) is underlain by an extensive Cenozoic Age

³ Bureau of Meteorology: <http://www.bom.gov.au/>

⁴ Northern Territory Government, Department of Business, Industry and Resource Development (2004), Noonamah Northern Territory – Sheet 572, 1:100,000 Geological Map Series Explanatory Notes.



regolith unit⁵, whilst the remainder of the site, approximately 10% of the southwest portion, appears to be underlain by the Orosirian age Acacia Gap Quartzite Member.

The regolith unit encompassing much of the site surface of the Pine Creek Orogen. A regolith profile by definition is a vertical section from bedrock to surface and is the product of weathering with or without erosion. The regolith comprises the entire unconsolidated or secondarily re-cemented cover that overlies more coherent bedrock that has been formed by weathering, erosion, transport and/or deposition of older material. Thus, the regolith includes fractured and weathered basement rocks, saprolites, soils, organic accumulations, volcanic material, glacial deposits, colluvium, alluvium, evaporitic sediments and aeolian deposits.

The regolith unit at the site surface (pedolith unit) consists of undifferentiated unconsolidated alluvial, colluvial and residual deposits: consisting of sand, soil, silt, gravel, sheetwash, talus and duricrust and is generally between 4 and 5 m in total thickness. The adjacent Acacia Gap Quartzite Member formed through the regional metamorphism and silicification of quartz sandstone and consists of metasedimentary siliciclastic and sedimentary siliciclastic materials of 50 to 300m thickness. It is probable that the Acacia Gap Group underlies the regolith profile at depths of between 4 and 5 m².

2.4 Topography and Surface Water

The site is generally characterised by gradual grade from north-west to south-east, as well as a built-up area on the southern half of the site (**Figure 2**).

Topographic drone aerial imagery of the WTS site shows that elevations throughout the site range from 49m AHD at the southern perimeter to approximately 33m AHD on the eastern boundary.

No flood analyses have been undertaken for the site. A review of the site suggests that surface water generally flows from west to east, toward a creek system running through the site.

The site is within the Darwin Harbour Region beneficial use declaration zone.

⁵ <https://macrostrat.org/map/#/z=13.4/x=131.1129/y=-12.6131/bedrock/lines/>





Figure 2: Topography and Surface Water

2.5 Hydrogeology

The regional hydrogeology is characterised by the presence of confined aquifers in key geological units, namely the underlying Acacia Gap Unit as well as shallow phreatic (unconfined) aquifers within the overlying regolith profile.

The shallow, unconfined phreatic groundwater system is recharged by rainwater infiltration and the water table depth is likely to be highly dependent on the wet/dry season, with depth to groundwater variable from at or near surface after the wet season to 8-10m below ground surface after the dry season.

Given the dependence on regional recharge through rainfall, the phreatic groundwater is not a reliable resource and is not used for extractive purposes in the area. However, groundwater discharge to surface streams and wetland during periods of elevated water table (during and after the wet season) is likely.

Deeper aquifers within the fractured sediment and meta sediment rocks are likely confined to semi confined aquifers. The depth to the deep aquifer varies from about 40-80m below ground level (bgl), and the standing water level in bores installed into this aquifer is about 10-20m bgl. This aquifer is a reliable resource and used in the area for potable, domestic and irrigation purposes. Water within these fracture rock aquifers is typically of good quality, with flows between 0.5–5.0 litres per second.

Existing bores are located near the Howard Springs WTS (**Figure 3**).

There are no existing groundwater monitoring wells at the site and no routine groundwater monitoring is undertaken.



Direction	Land Use
East	Native residual vegetation (designated for Service Commercial purposes) is located to the east of the WTS. Runoff in this area discharges into a natural watercourse which partially runs through the eastern side of the WTS site. Further west is Aaaa Road, Whitewood Road, Manigurr-ma camp and Good Shepherd Lutheran college.
South	Residual native vegetation (designated for Service Commercial purposes) is also located to the south of the WTS. Beyond this lies Stuart Highway. Further south there are several Urban Residential houses.
West	Stuart Highway and Lambrick Avenue are located adjacent the WTS to the west. Further west, there are several Rural Residential houses and the MacKillop Catholic College.

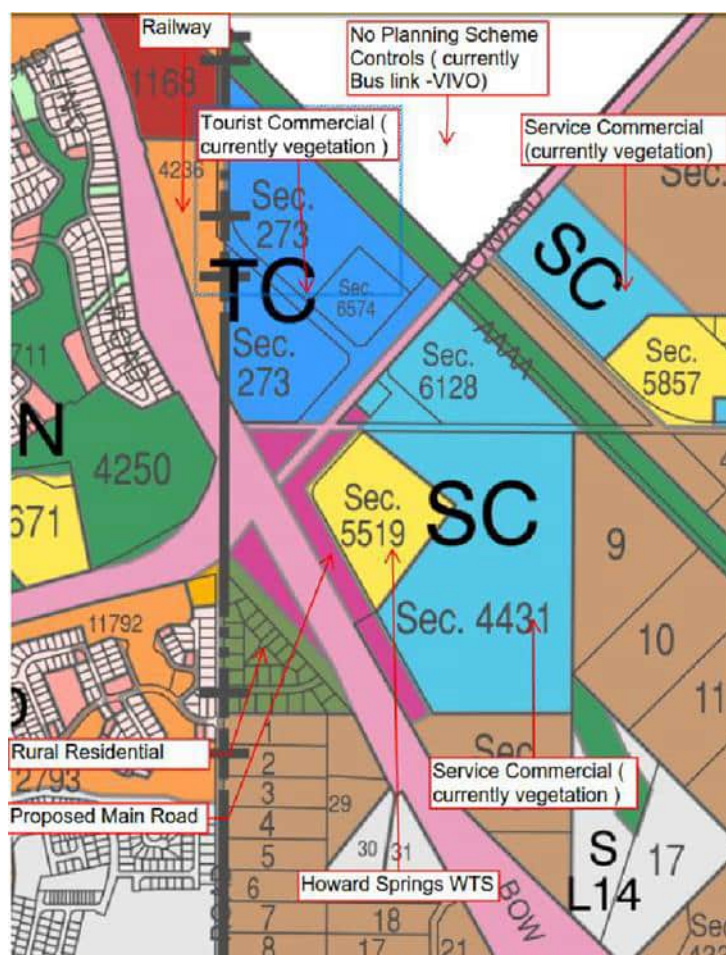


Figure 4: Surrounding Land Use for Howard Springs WTS



3.0 Site Operations

3.1 Infrastructure Overview

The WTS site layout (**Figure 5**) includes the following infrastructure:

- Gatehouse to service waste customers (public and commercial).
- Ancillary informal car parking lot.
- Outdoor elevated MSW tipping area, where waste is directly tipped into bins at grade.
- Waste bins for:
 - Cardboard and paper
 - Commingled recycling
 - Bottles
 - Batteries (LISTED WASTE)
 - Waste oil (in undercover shed) (LISTED WASTE)
- Outdoor (unsealed) hardstand storage areas for the following:
 - Mixed C&D waste and crushed materials
 - Green waste and shredded product
 - Timber/pallets and woodchips
 - Large metals/steel
- Offices.





Figure 5: Site Layout

3.2 Operations Overview

3.2.1 Site Access

Public Access

The site is accessible via the entrance gate just off Howard Springs Road. The site is locked outside of opening hours to prevent unwanted public access. The Howard Springs WTS is open 7 days from 7.00am to 6.00pm and closed on Christmas Day, New Years Day and Good Friday.

Commercial Operators Access

The site will be accessible via the same entrance gate, at the access road off Howard Springs Road, for all vehicles including long haul vehicles.

After hours access for long haul vehicles is not generally permitted.

3.2.2 Staffing

The facility is supervised by Council Waste Staff to manage public access and processing during opening hours.

3.2.3 Recycling Drop-off and Diversion

Green waste delivered to the waste transfer station is placed on hardstand areas and converted into mulch. Mulch is then available for sale to the public.

Several recycling bins are provided at the Howard Springs WTS to promote diversion from landfill. The public is encouraged to sort recyclables into cardboard/paper and comingled waste at home, and then drop them off at the transfer station. Labelled wheelie bins and



other appropriate receptacles are provided to allow for drop off of various materials. Deposits are generally supervised by Council Waste Staff and sorted to ensure waste placed into correct receptacle. Recycled waste is transported for processing off-site by a waste haulage contractor.

3.2.4 Outdoor Waste Storage Areas

Outdoor storage areas have been provided for the remaining waste streams as follows:

- Mixed C&D waste and crushed materials– an area of approximately 500 m² has been provided.
- Large metals/steel – an area of approximately 1,000 m² has been provided.
- Green waste and shredded product – an area of approximately 2,800 m² has been provided for each.
- Cardboard/paper, commingled, bottles, waste oil, batteries, e-waste – the remaining waste streams are to be deposited in the receptacles / bins provided

Customers are to reverse up to the relevant storage areas to deposit waste. Significant capacity is provided for each waste type. Materials are periodically cleared from site by a collection contractor.

3.2.5 Listed Waste

Storage of the following Listed Waste is authorised at Howard Springs Waste Transfer Station:

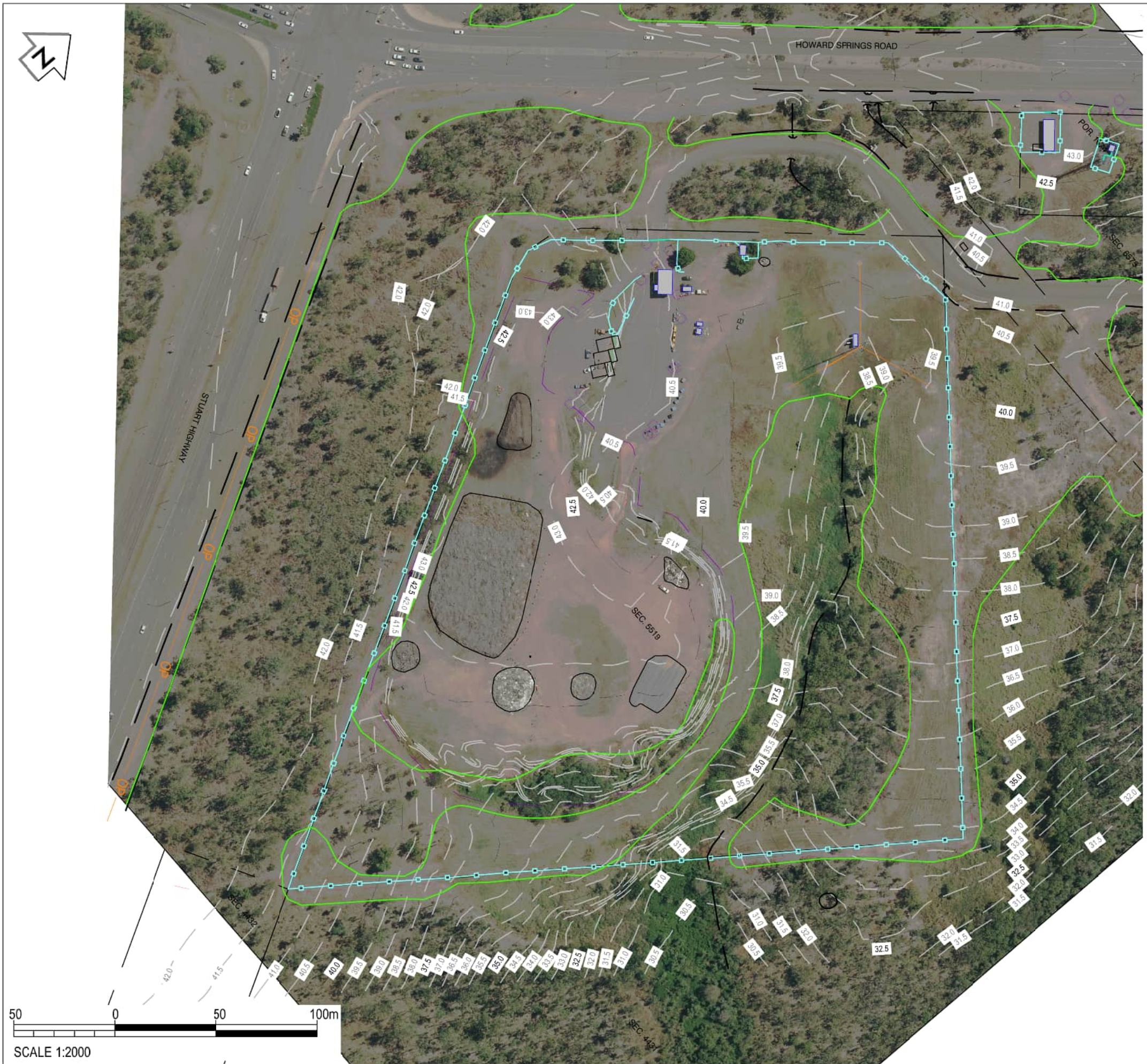
- Used lead acid batteries (ULABs); and
- Waste mineral oils unfit for their original intended use.

3.2.6 Waste Volumes

The waste volumes measured at Howard Springs Waste Transfer Station between July 2023 and July 2024 are shown in **Figure 6**. Gas bottles and aircon materials are transferred to the Humpty Doo WTS. Local residents sometimes drop off tyres categorized as listed waste. They are also transferred to the Humpty Do WTS, which holds an EPL allowing the storage of tyres.

The site holds approximately 700 tonnes of historical mixed C&D waste and crushed materials. The waste is known to be contaminated with asbestos. LC is currently working with Stantec on remedial options, in accordance with the NT environmental regulations.





HOWARD SPRINGS WASTE TYPE BREAKDOWN		
WASTE TYPE	UNIT	TOTAL
AIRCON CERTIFIED DE-GASSED	EA	0
AIRCON NOT DE-GASSED	EA	90.3362
CARDBOARD BINS	TONNES	28.3442
CO-MINGLE BINS	TONNES	0
CONSTRUCTION WASTE COM NO REINFORCING	TONNES	0
CONSTRUCTION WASTE COM WITH REINFORCING	TONNES	0
CONSTRUCTION WASTE DOM NO REINFORCING	TONNES	0
FRIDGES OR FREEZERS CERTIFIED DE-GASSED	EA	0
FRIDGES OR FREEZERS NOT DE-GASSED	EA	0
GAS BOTTLES COMPLETE UNPROCESSED	EA	3
GAS BOTTLES TOP REMOVED AND ADDITIONAL HOLE	EA	0
GREEN WASTE COM CLEAN	TONNES	0
GREEN WASTE COM DIRTY	TONNES	0
GREEN WASTE DOM CLEAN	EA	0
LANDFILL WASTE SHOAL BAY	TONNES	1815.2
MULCH <30 CUBIC METERS	M3	291
MULCH >30 CUBIC METERS	M3	80
NON-LITCHFIELD GREEN DOM CLEAN	TONNES	1
NON-LITCHFIELD UNSORTED WASTE FOM	TONNES	2
MATTRESS (ANY SIZES)	EA	328
SCRAP METAL	TONNES	0
TYRES LIGHT TRUCK / 4WD	EA	0
TYRES LIGHT TRUCK / 4WD CONTAMINATED OR W/RIM	EA	0
TYRES MOTORCYCLE	EA	0
TYRES MOTORCYCLE CONTAMINATED OR W/RIM	EA	2
TYRES PASSENGER	EA	61
TYRES PASSENGER CONTAMINATED OR W/RIM	EA	9
TYRES RACING SLICKS	EA	0
TYRES SUPER SINGLE	EA	0
TRYES TRACTOR LARGE - 1.1M - 2.1M	EA	0
TRYES TRUCK	EA	4
UNSORTED WASTE COM DIRTY	TONNES	22
USED OIL	LITRE	8100
AIRCON TO S&P	TONNES	0

REV	DATE	DRN	DESCRIPTION
B	5.08.24	RP	ISSUED WITH WASTE BREAKDOWNS
A	12/08/24	SS	ISSUED FOR INFORMATION

Howard Springs Waste Management Facility
Site layout for EMP
Figure 6

CLIENT LOGO

ISSUED FOR INFORMATION

SCALE: 1:2000

FIGURE No. B

DRAWN: SS

DATE: 26/07/24

DESIGN:

3.2.7 Residual Waste Drop-off and Removal

An outdoor covered Ro-Ro (hydraulic lid) bin and elevated tipping platform facilities the drop-off of general municipal waste by both the public and commercial operators. The public drop-off bays allow customers to reverse to the concrete kerb edge of the pit and deposit waste into the outdoor bin. A front-end loader with a vibrating attachment operated by Council Waste Staff is used to compress waste in the bins, to maximise capacity and minimise transport required.

Waste haulage contractors then transport the bins to the Shoal Bay landfill.

The covered Ro-Ro (hydraulic lid) bin system has been adopted at the site to prevent ingress of rainfall into the bin preventing leachate generation and potential leakage to the ground.

3.2.8 Access, Traffic Management and Signage

All vehicles access the Howard Springs Waste Transfer Station via the access road off Howard Springs Road.

All vehicles depositing materials at the site are required to pass by the gatehouse upon entering the waste drop-off areas. Council Waste Staff occupy the gatehouse at all times during opening hours to assess all incoming waste and provide direction and guidance to customers.

The outdoor hardstand areas are located both in the upper and lower areas.

All vehicles depositing waste follow the route provided. The route permits access to the outdoor bins and outdoor hardstand areas.

For waste haulage contractors picking up municipal waste bins, a separate exit route is provided.

Speed limits throughout the site are set at 10 km/h. Directional, safety and instructional signage and line marking guides site users to maximise efficiency of traffic movements throughout the site and ensure that all site users are able to do so safely.



4.0 Environmental Management System

4.1 Legislative Requirements, Standards and Codes of Practice

The purpose of the Environmental Management System (EMS) is to provide policy direction, management structure, improvement programs and operational procedures to ensure that environmental aspects and impacts of the site are managed and minimised.

The Environmental Protection Licence and associated application documentation form part of the EMS. The objectives of the EMS are summarised as follows:

- To provide a framework to facilitate operation of the waster transfer station in a practical and environmentally sustainable manner.
- To provide a mechanism to measure operational performance and to implement a program for review and continual improvement.

4.2 Management Structure and Responsibilities

Overall responsibility for the site lies with LC, as the owner and Licensee. LC may engage consultants to assist with the following tasks as required:

- Design or advice for future development of the site.
- Environmental management advice such as for air impact protection (e.g., odour, noise, dust), surface and groundwater management.
- Planning or engineering advice.

Day-to-day responsibilities for carrying out operational procedures associated with the environmental management of the site are allocated to the Council Waste Staff.

The specific responsibilities associated with the various procedures and monitoring programs are detailed further in the following sections and allocated to Council Waste Staff.

4.3 Recording and Reporting Procedures

4.3.1 Record Keeping

The following records shall be kept by LC:

- Copy of conditions of planning consent and authorisation under the *Waste Management and Pollution Control Act 1998*
- Records of the nature and quantities of all waste streams received, including:
 - Source of the Listed Waste
 - Name of the transport company
 - Vehicle registration
 - Description of the Listed Waste
 - Quantity of the Listed Waste
 - Method of disposition i.e storing or recycling
- Records of inspections conducted by staff
- Records of inspections by NT EPA
- Records of non-compliances with the Licence



- Records of complaints received
- Copy of Communication Plan, including a strategy for communicating with members of the public who are likely to be affected by the WTS.
- Copy of EMP
- Emergency Response (contingency) Plan and notification procedures
- Copies of any site reporting
- Evidence and outcomes of any site reviews.
- Records of all matters required by EPL.

LC as the Licensee shall ensure that the above records are kept up to date and readily accessible for future reference.

In accordance with the Licence for the site, LC will complete the Annual Audit and Compliance Report (AACR), which is to be supplied to the NT EPA a minimum of 20 business days prior to the anniversary of the Licence commencement date.

4.3.2 Daily Diary and Passive Inspections

Council Waste Staff will maintain a Daily Diary, recording all relevant details of the day's activities, including weather conditions, dust or litter problems, complaints etc.

Passive monitoring will be conducted by Council Waste Staff as part of the daily operations of the landfill site. Inspections and reporting will be undertaken on an as-needs basis, particularly for the following:

- Significant weather events (wind, cyclone, storm)
- Dust or litter problems
- Complaints

4.3.3 Quarterly Inspection and Report

During March, June, September and December of each year Council Waste Staff will carry out a quarterly inspection of the site and prepare a Quarterly Inspection Report.

A Quarterly Inspection Report Proforma is given in **Appendix A**.

Quarterly inspections shall be undertaken to assess conformance with day to day operational and environmental management procedures, as part of the EMS. These audits will be coordinated with, or may be part of, the quarterly inspections.

Quarterly inspections are a formal internal review of the site (visual) and the approaches (desktop) adopted to assess conformance with procedures and to review and action any recurring issues identified during daily inspections.

For each audit, monitoring issues as well as the on-going management of the site will be addressed, as detailed below:

- Waste Management – waste receipt, handling and removal procedures, efficiency and effectiveness.
- Site management – roads, weighbridge and traffic management.
- Surface water, leachate, air quality and noise management.
- Bird, vermin, pest and weed control.
- Fire management.



A copy of the Quarterly Inspection Report shall be recorded and retained by LC.

4.4 Communication

4.4.1 Internal

Informal internal communication will be achieved largely through regular contact between Council Waste Staff.

A review of the site will be carried out periodically to ensure its continuing adequacy and effectiveness. The outcomes and necessary actions identified during this review shall be communicated internally.

4.4.2 Communication with NT EPA

Communication with the NT EPA will be both formal, through required reporting, and informal through regular contact. Formal reporting shall include:

- Reporting of any incident causing or threatening serious or material environmental harm.
- Waste depot annual returns reporting.
- Reporting of any non-compliance.

NT EPA contact details are as follows:

Email: waste@nt.gov.au

General phone: 08 8924 4218

Pollution hotline: 1800 064 567

4.5 Training

All Council Waste Staff contributing to the operation of the waste transfer station will be trained in appropriate procedures and protocols. Training will be provided for the following, where relevant:

- Daily operational procedures, including receipt and recording of waste from the public and commercial drop-offs.
- Recording and reporting, including inspection timing, frequency and procedures.
- Communication protocols, including internally and with the NT EPA.
- Procedures related to the receipt of complaints.
- Procedures related to non-conformances and corrective actions.
- Implementation of Environment Management Plans, as detailed in this EMP report.
- Implementation of Emergency Response Plan.

Training will be facilitated by the Waste Manager and records kept of staff training undertaken.

4.6 Complaints

A record of complaints taken regarding the operation of the depot will be maintained by Waste Management Staff. Once a complaint is received it is directed to the waste transfer station manager to investigate the complaint, action any remedial measures and close out the issue once satisfactorily dealt with. An example reporting proforma is given in **Appendix**



A.

The complaints shall include the following information:

- Date and time complaint was reported.
- Name and address of complainant.
- Details of the complaint.
- Date and time of events giving rise to the complaint, including weather conditions, and the likely cause at the time of the events.
- An estimation of the temperature, wind speed, wind direction and rainfall at the time of the events giving rise to the complaint.
- Name and position of person receiving complaint.
- Action taken in response to the complaint (if no action was taken, why no action was taken).
- Action taken to prevent a recurrence giving rise to the complaint.
- Records of any other matters required by EPL.

4.7 Non- Conformance and Corrective/Preventative Action

A non-conformance form will be completed by Council Waste Staff as a result of events at the site such as:

- Part of an environmental audit.
- From observations made by personnel on site and recorded in routine inspection reports.
- From complaints made by the general public or by users of the site, and recorded on a complaint form.
- As a consequence of the interpretation of monitoring data.

An example non-conformance reporting form is given in **Appendix A**.

Non-conformance forms will be completed by the Council Waste Staff to provide a traceable record of non-conformances. Corrective and preventive actions will be specified in non-conformance documentation, which will be signed off when appropriate actions have been completed.

The majority of environmental observations made by Council Waste Staff will be most appropriately dealt with through the daily inspections, with the non-conformance system used to address environmental issues as necessary. Similarly, complaints made by users or the community may be dealt with through the non-conformance system, as required.

Procedures for dealing with non-conformance will be based on:

- Identifying the cause of the non-conformance.
- Identifying, recording and implementing the necessary corrective action.
- Making any changes necessary to avoid repetition of the non-conformance i.e. Preventive action.
- Recording any changes in written procedures that result from the corrective and preventive actions.

These procedures will be reflected in future updates of the EMP, for the operation and management of the site.



Procedures to manage non-conformances will include the following details:

- Names and contact details of emergency personnel available 24 hours a day, seven days a week.
- Responsibilities of designated response personnel.
- Location of information regarding on-site hazardous materials and spill containment materials.
- Steps to follow when responding to incidents.
- Recording and reporting environmental incidents.
- Records of any other matters required by EPL.

4.8 Review Process

4.8.1 Annual Review

On an annual basis LC will undertake an annual review of the facility to ensure continual improvement in the management and operation of the landfill site and promote continuous improvement of site management. Information shall be collated and maintained for ready access. Review shall generally consider the following:

- Waste data collation and recording including review of tonnages accepted and removed from site.
- Status of site operations, waste management and site monitoring and compliance with the EMP and Licence conditions.
- Daily and quarterly inspections reporting and response to issues identified.
- Complaints recording and management.
- Non-conformance reporting and resolution.
- Correspondence with NT EPA.

4.8.2 EMP Review

The EMP shall be reviewed and updated annually or after significant changes to site operations to ensure it reflects the status of the site and demonstrates an appropriate level of operation and monitoring.

The EMP review shall consider and update the following site aspects:

- General details
- Layout and development
- Operations
- Monitoring and reporting
- Emergency response plan
- Site records
- Sub-EMPs
- A Risk review should be undertaken following any significant changes to the site operations.



4.8.3 External Audit

External audits may be required for the following:

- In response to an environmental incident.
- In instances where previous audits or NT EPA investigations have suggested non-compliance.
- As otherwise directed by the NT EPA under the *Waste Management and Pollution Control Act 1998*.

Should an external audit be conducted, this is to be undertaken by a suitably qualified third party.



5.0 Environmental Risk Assessment

The risk analysis presented in this report was undertaken in accordance with the principles of AS/NZS ISO 31000:2009. The risk assessment process was undertaken considering potential hazards (defined as impacts to the nearest receptors in each direction) related to the operations of the WTS on human health and the environment based on its current use.

The type of analysis chosen for this risk assessment is a qualitative risk analysis. Qualitative risk analysis gives a general indication of the level of risk and uses descriptive scales to describe the magnitude of potential consequences and the likelihood that those consequences will occur.

The Source-Pathway-Receptor model was used to divide all risk factors between the risk items:

- Potential hazards posed by the site operations (Source).
- Potential for hazard migration (Pathway).
- Presence of human and environmental receptors (Receptor).

The full Conceptual Site Model is provided in **Appendix D**.

5.1 Methodology

The inherent (current) risk aspects were identified following desktop review of the site and a site inspection undertaken.

The rating levels adopted reflect SLR Consulting's degree of belief that a particular event or outcome could occur having been based on a desktop study of the site.

The inherent risk level includes consideration of the existing risk controls in place and considers current and continued (unchanged) use for the site.

Residual risk is the remaining risk rating once proposed risk treatments are established or implemented to mitigate or control the risk.

5.2 Risk Ratings and Definitions

The completed risk assessment matrix details the rating of the risk factors and potential and likely impacts at on-site and neighbouring receptors due to potential WTS operations hazards. Both on-site receptors and off-site receptors have been assessed. The risk categories assessed are explained below:

- For each risk issue potential consequences concerning human health and environmental impact have been considered.
- The desk-top review and site inspection are relied upon for rating consequences and the likelihood which determines the 'inherent' level of risk.
- The outcomes of the risk assessment are reflected in the environmental management plans of Section 6.

Guiding definitions on likelihood, consequence and levels of risk ratings used are presented in respectively **Table 5-1**, **Table 5-2**, **Table 5-3**. The matrix used for rating the level of risk is presented in **Table 5-4**.



Table 5-1: Guiding Definitions of Risk Likelihood

Likelihood	Description
Rare (R)	Will only occur in exceptional circumstances
Unlikely (U)	Could occur
Possible (P)	Should occur at some time
Likely (L)	Will probably occur
Almost certain (AC)	Expected to occur

Table 5-2: Guiding Definitions on Level of Consequence

Level of Consequence	Guiding Definition
Insignificant (I)	Negligible Impact – No or only minor impact to infrastructure or the environment.
Minor (Min)	Minor Impact – Minor impact leading to lost time incident or inconvenient plant shutdown. Minor damage to infrastructure or environment.
Moderate (Mod)	Significant Impact – Short term environmental impact requiring investigation and revised management. Potential litigation.
Major (Maj)	Major Impact – Major impact to infrastructure. Short to long term environmental impact requiring remediation. Low profile litigation.
Catastrophic (Cat)	Catastrophic Impact – Serious impact to infrastructure and the environment requiring remediation. High profile litigation.

Table 5-3: Guiding Definitions on Level of Risk

Level of Risk	Guiding Definition
Extreme (E)	Intolerable risk – Immediate management attention required, action plans and management responsibility specified
High (H)	Intolerable risk – Management action required within operational plans and procedures
Moderate (M)	Acceptable risk – Manage by specific monitoring or response procedures, with management responsibility specified
Low (L)	Acceptable risk – Manage by routine procedures unlikely to need specific resource allocation

Table 5-4: Matrix for Definition of Level of Risk from Likelihood & Consequences

Likelihood	Consequences				
	Insignificant (I)	Minor (Min)	Moderate (Mod)	Major (Maj)	Catastrophic (Cat)
Almost certain (AC)	H	H	E	E	E
Likely (L)	M	H	H	E	E
Possible (P)	L	M	H	E	E
Unlikely (U)	L	L	M	H	E
Rare (R)	L	L	M	H	H



5.3 Quality Risk Assessment

Table 5-5: Howard Springs Waste Transfer Station Qualitative Environmental Risk Assessment

Aspect	Inherent Risk (evaluation of uncontrolled condition)				Residual Risk (assuming treatment / mitigation action undertaken)			
	Hazard / Risk	L	C	RR	Risk Treatment / Mitigation Action	L	C	RR
Waste management	Windblown or uncontrolled litter	AC	Min	H	Adequate storage volume in receptacles provided. Covered bin for deposit and transfer of general municipal waste. Site fenced to retain wind-blown litter on site. Regular site walkovers by site staff to identify litter issues and clean-up as required.	U	Min	L
	Impacts due to presence of pest and vermin	L	Min	H	No putrescible waste left uncovered overnight. Undertake pest and vermin management program (if required). Note occurrences as a component of regular passive monitoring.	U	Min	L
	Untidy waste drop-off areas	L	Min	H	Waste storage areas to be maintained by site staff including placement of all waste to relevant receptacles. Use covered general waste bins	U	Min	L
	Exposure of historical landfill waste	U	Mod	M	No activities to cut into existing waste mass. Where excavation unavoidable seek the guidance of an experienced qualified person ⁷ .	U	Min	L
Hazardous waste	Impacts due to hazardous waste storage, including Listed waste left at the front gate, brought to site undetected.	P	Maj	E	No acceptance of unauthorised hazardous waste. Any presentations refused at the gatehouse. Where detected, ensure immediate appropriate storage and removal to acceptable location. Appropriate bunds for listed wastes. Appropriate number and location of spill kits and staff training. A Waste Receipt Plan will be implemented to screen all construction waste.	P	Min	M
Leachate	Leachate generation and	AC	Mod	E	Avoid activities that encourage contact between surface water and waste	U	Min	L

⁷ under s68 of the Waste Management and Pollution Control Act 1998



Aspect	Inherent Risk (evaluation of uncontrolled condition)				Residual Risk (assuming treatment / mitigation action undertaken)			
	Hazard / Risk	L	C	RR	Risk Treatment / Mitigation Action	L	C	RR
management	exposure to the environment				temporarily stored on hardstand surface. No excavation into existing waste that could result in leachate exposure. Use covered general waste bins Green waste cleared periodically, targeting full turnover every quarter. Maintain hardstand surface condition to minimise infiltration, ponding and contact between surface water and waste temporarily stored on the ground in front of receptacles. Regrade / reshape / repair hardstand surface if considered necessary. Maintain stormwater infrastructure to minimise ponding. Sealed surfaces maintained to minimise infiltration accumulation. Implementation of the Stormwater Management Plan (Appendix C) inclusive of leachate management strategies.			
Surface water management	Spills and leakage of contaminants onto ground	AC	Mod	H	No mulch stockpile watering leading to runoff generation No storage of fuel for site plant and machinery on site. Refuelling (by external supplier) location and protocol established to prevent spills. Covered bin for deposit and transfer of general municipal waste. Appropriate number and location of spill kits and staff training.	U	Min	L
	Impacted water quality due to sediment loading	L	Mod	H	No mulch stockpile watering leading to runoff generation Maintain grassed batters, stormwater infrastructure and detention areas. Routine maintenance of hardstand areas. Avoid activities that generates exposed soils / sediments Implement erosion and sedimentation control plans. Sealed surfaces maintained to minimise infiltration accumulation. Install and maintain stormwater detention basin to capture surface run-off and minimise impact into creek. Implement Stormwater Management Plan inclusive of erosion and sediment controls.	U	Min	L
	Impacted water due to	AC	Mod	E	Refer to Leachate Management above.	U	Min	L



Aspect	Inherent Risk (evaluation of uncontrolled condition)				Residual Risk (assuming treatment / mitigation action undertaken)			
	Hazard / Risk	L	C	RR	Risk Treatment / Mitigation Action	L	C	RR
	leachate exposure							
Dust	Environmental impact (harm or loss of amenity) or complaints due to dust	L	Mod	H	Dust suppression on unsealed tracks will be undertaken using a watercart or manual spraying as required. Low speed traffic environment. Vegetated soil batters and non-sealed areas wherever practical. Maintenance of hardstand and unsealed areas as required. Avoid dust generating work during periods of high winds which may result in dust leaving site. Effective soil stockpile management. Gravel / unsealed surfaces in good condition Sealed surfaces maintained to minimise dust accumulation.	U	Min	L
Odour	Environmental impact (harm or loss of amenity) or complaints due to odour	AC	Mod	E	Passive odour monitoring will be undertaken periodically to assess odour impacts on site. All putrescible wastes stored within a sealed compactor bin until removal from site. Ensure no putrescible waste stored uncovered overnight. Minimise contact between surface water and waste storages. Green waste and general waste regularly transported from site.	U	Min	L
Noise	Environmental impact (harm or loss of amenity) or complaints due to noise.	L	Mod	E	Passive noise monitoring will be undertaken periodically to assess noise impacts on site. Low speed traffic environment. Operations within standard working hours.	U	Min	L
Fire	Increased risk of fire due to poor house- keeping	P	Maj	E	Regular slashing / mowing of vegetated areas will be undertaken by site staff, particularly surrounding higher risk areas (including woodchips). Routine removal of waste and no long term stockpiling of wastes. No smoking in or near waste equipment, disposal areas, stockpiles or surrounding vegetated areas. No-naked-flames policy on site. No overnight storage of waste within trucks / attached trailers.	R	Maj	H



Aspect	Inherent Risk (evaluation of uncontrolled condition)				Residual Risk (assuming treatment / mitigation action undertaken)			
	Hazard / Risk	L	C	RR	Risk Treatment / Mitigation Action	L	C	RR
	Risk of fire due to comingling of incompatible waste streams	P	Maj	E	Clear separation for storage areas for incompatible waste streams. No overnight storage of waste within trucks / attached trailers	R	Maj	H
	Presence of ignition source	L	Maj	E	No ignition sources to be present / allowed on site without a SWMS approved by the site supervisor. Clear signage promoting no-smoking in critical areas on site. Clear signage promoting no naked flames policy on site. No use of angle grinders, welders or similar on site without a SWMS approved by the site supervisor. Routine monitoring and removal of ignition sources Do not utilise the plant that carries a fire risk during periods of warm weather or high winds Safety and hazard signage to be provided at fire risk areas at site Firefighting infrastructure including hydrants, internal fire hoses and fire extinguishers (waste transfer shed) All site plant to be regularly maintained and serviced No fuel storage on site. Implement measures to minimise risk of spontaneous combustion.	R	Maj	H



6.0 Environmental Management Plans

6.1 Routine Inspection and Monitoring

6.1.1 Introduction

Inspection and monitoring programs have been developed to be undertaken Council Waste Staff as a part of everyday operations to maintain the site and control and manage potential environmental risk factors such as those identified in **Table 5-5**.

Monitoring is aimed to ensure that the WTS does not adversely impact the surrounding environment and to provide any early warnings should such impacts possibly occur. The monitoring programs have been developed to reflect the outcomes of the risk assessment undertaken as part of the facility design and in Section 5 above.

The monitoring programs are summarized below. All monitoring shall be conducted by site staff or where nominated by suitably qualified personnel to ensure that environmental targets for each of the monitoring programs are met.

6.1.2 Monitoring Timing, Frequency and Duration

The monitoring schedules contained within this report detail the inspection and monitoring timing and frequencies for each environmental issue addressed by this EMP. Whilst the inspection and monitoring regimes of this report do not specify a minimum duration, it should be noted that monitoring as prescribed shall continue for the operational life of the site.

Additionally, monitoring frequency should be either prolonged or reduced depending on routine review of the EMP and achieving acceptable environmental outcomes.

The risk assessment determined that a low risk profile could be achieved for most identified potential impacts with the implementation of nominated risk treatments or mitigation actions. However, several potential impacts could not be considered to have a low risk rating and will require adherence to the associated monitoring plans. Assuming the nominated mitigation measures are adopted at the site routine, then groundwater monitoring is not required.

6.1.3 Non-Conformance and Corrective Action

A complaints register shall be established. In the event of a complaint or monitoring activities detecting a non-conformance with the EMP, the following activities will be undertaken:

- Inspection of the non-conformance on site.
- Implementation of measures as appropriate to ameliorate the non-conformance.
- Preparation of non-conformance record by the operator and inclusion on a non-conformance register.
- Investigation of reasons for non-conformance and implementation of corrective action to prevent recurrence.

A register of environmental non-conformances shall be kept by LC.

All non-compliances should be recorded and notified as part of licence condition requirement. NT EPA will be informed in accordance with Part 3 Section 14 of the *Waste Management and Pollution Control Act 1998* which is a requirement of the Act regardless of whether an EPL is in place or not.

6.1.4 Inspection and Maintenance

An inspection and maintenance program will be conducted at the site as nominated in the



monitoring plans following this section.

The main purpose of each inspection is to visually assess the integrity and effectiveness of the infrastructure element being inspected for signs of required maintenance or potential future requirements.

6.1.5 General Record Keeping

All records of inspections and monitoring programs shall be maintained by the Council Waste Staff. The following records shall be kept by LC:

- Records of site and records inspections conducted by LC staff.
- Correspondence with or records of inspections by NT EPA.
- All historical and future monitoring reporting (surface water) including procedures, results, interpretations of monitoring by qualified personnel.
- Records of the nature and quantities of all waste streams received at the premises.
- Records of listed wastes.
- Records of complaints and non-compliances.
- Records of any other matters required by EPL.

6.1.6 Annual Review

LC undertake an annual review (or more regularly) of all site activities including inspections and monitoring, non-conformances and corrective actions to assess compliance with this EMP and the acceptance criteria.

6.1.7 Review of the EMP

This EMP shall be reviewed on annual basis or earlier if conditions change, as noted through monitoring or annual review of the site activities. A review of the EMP shall include detailed assessment and historical trend analysis of all monitoring results.

6.2 Environmental Management Plans

The following MP's shall be administered as a part of routine site operations in accordance with the requirements of each MP.



6.2.1 Waste Management

Table 6-1: Waste Management Plan

Waste Management	
	COMMENT / ACTION
Objective	✓ To minimise adverse impacts resulting from waste management procedures on site and maintain environmental amenity. ✓ Minimise windblown or uncontrolled litter throughout the site. ✓ Keep waste storage areas tidy and safe to operate in. ✓ Implement effective pest / vermin management plans. ✓ To ensure control / mitigation infrastructure is maintained.
Location	• Across the site.
Methodology	• Visual monitoring of conditions, site activities and litter. • Visual monitoring for pests / vermin.
Responsibility	• Council Waste Staff.
Frequency	• Full time passive monitoring.
Duration	• Throughout operations of the site.
Acceptance Criteria	Environmental • Minimal litter throughout site, no litter leaving site. • Clean, accessible and safe working areas. • No complaints of litter or pest / vermin issues from the public Infrastructure. • All management infrastructure or control measures are maintained.
General Strategies	Environmental • Regularly tidy waste storage areas. • Regular site walkovers by site staff to identify litter issues and clean- up as required. • No putrescible waste left uncovered overnight. • Undertake pest and vermin management program (if required). • Note occurrences as a component of regular passive monitoring. Infrastructure • Waste storage areas to be maintained by site staff including placement of all waste to relevant receptacles. • Adequate storage volume in receptacles provided. • Site fenced to retain wind-blown litter on site. • Covered bin for deposit and transfer of general municipal waste. • Maintain fenced boundary to minimise risk of windblown litter leaving site
Recording and Reporting	• Internal – Daily and Passive Monitoring and Quarterly reporting, waste data collection • External – for any non-compliance, notification to NT EPA • Records of any other matters required by EPL.
Non Conformance Procedures	• Investigate cause and develop measures to prevent reoccurrence. • Increase frequency of site management actions to reduce the above mentioned issues. • Revisit pest / vermin control program as required.
Management Review	• LC to review waste management outcomes at the time of the EMP review.



6.2.2 Listed and Household Hazardous Waste Storage

Table 6-2: Hazardous Waste Storage Management Plan

Listed and Hazardous Household Waste Management	
	COMMENT / ACTION
Objective	✓ To minimise adverse impacts resulting from receipt of hazardous household waste and maintain environmental amenity. ✓ Prevent deposit of unauthorised hazardous waste. ✓ To ensure control / mitigation infrastructure is maintained. ✓ Ensure staff are trained to adequately respond to spills.
Location	• Across the site.
Methodology	• Visual or CCTV inspection of all waste loads entering the site. • Daily observation of receptacles.
Responsibility	• Council Waste Staff.
Frequency	• Inspection of all waste loads entering the site. • Daily observation.
Duration	• Throughout operations of the site.
Acceptance Criteria	Environmental • No acceptance of unauthorised hazardous materials at the site. • No instances of transport of chemicals to surface water Infrastructure. Infrastructure • No waste contact with surface water as a result of spills or mishandling of hazardous waste.
General Strategies	Environmental • No acceptance of unauthorised hazardous materials at the site. Any presentations refused at the gatehouse. • Hazards waste materials removed by a properly licensed waste contractors on an as needs basis only. Storage volumes to be minimised. Infrastructure • Self-bunded receptacles to prevent waste contact with surface water. • Adequate spill procedure to prevent waste contact with surface water. • Appropriate number and location of spill kits and staff training.
Recording and Reporting	• Internal – Daily and Passive Monitoring and Quarterly reporting, waste data collection. • External – for any non-compliances, notification to NT EPA. • Records of anything required by EPL.
Non Conformance Procedures	• Investigate cause and develop measures to prevent reoccurrence. • Increase monitoring by site staff to prevent unauthorised hazardous waste entering the site. • In the event that unauthorised hazardous waste enters the site, an appropriate contractor shall be contacted by the site manager to dispose of the waste. Ensure appropriate storage and protections of the Listed waste item(s) and remove from site as soon as practical.
Management Review	• LC to review outcomes at the time of the EMP review



6.2.3 Leachate Management

Table 6-3: Leachate Management Plan

Leachate Management	
	COMMENT / ACTION
Objective	✓ To minimise leachate generation and any associated environmental impacts and maintain environmental amenity. ✓ To ensure control / mitigation infrastructure is maintained.
Location	• Waste storage areas.
Methodology	• Visual inspection of site infrastructure including hardstand, undercover storage and green waste containment areas to ensure ongoing functionality. • Management of leachate pond.
Responsibility	• Council Waste Staff.
Frequency	• Daily observations. • Surface water monitoring to be undertaken in accordance with the site Surface Water Management and Monitoring Plan. • Management of water reuse from leachate pond as per the Stormwater Management Plan (Appendix C).
Duration	• Throughout operations of the site.
Acceptance Criteria	Environmental • No measurable water quality impact from leachate generation on site infrastructure. • All minimisation infrastructure or control measures including hardstand, roofed storage and bunded containment areas are maintained.
General Strategies	Environmental • Avoid activities that encourage contact between surface water and waste temporarily stored on hardstand surface. Infrastructure • Maintain hardstand surface condition to minimise infiltration, ponding and contact between surface water and waste temporarily stored on the ground in front of receptacles. • Regrade / reshape / repair hardstand surface if considered necessary. • Maintain stormwater infrastructure to minimise ponding. Sealed surfaces maintained to minimise infiltration accumulation. • Contain leachate generated on green waste areas using containment bunding and leachate storage pond as detailed in the Stormwater Management Plan (Appendix C). • Reuse of stored water from the leachate pond, where practical, to maintain dam capacity as detailed in the Stormwater Management Plan (Appendix C).
Recording and Reporting	• Internal – Daily and Passive Monitoring and Quarterly reporting. • External – for any non-compliances, notification to NT EPA. • Records of any other matters required by EPL.
Non Conformance Procedures	• Cease storage of waste on hardstand surface in front of receptacle until appropriate remedial actions are implemented. • Investigate cause and develop measures to prevent reoccurrence. Ongoing monitoring to assess effectiveness of remediation.
Management Review	• LC to review outcomes at the time of the EMP review.



6.2.4 Surface Water Management

A site visit was conducted to identify a reference site for the surface water monitoring. Reference site should be upstream of the ephemeral waterway, prior merging with the site stormwater runoff. However, several wastes including tyres were observed in the surrounding environment, which could influence the water quality. Therefore, the reference site will be located upstream of the Howard Springs WTS, at a culvert, where rainfalls runoff prior entering the WTS (**Figure 7**).

Table 6-4: Surface Water Management Plan

Surface Water Management	
	COMMENT / ACTION
Objective	✓ To minimise surface water impacts and maintain environmental amenity. ✓ To ensure control / mitigation infrastructure is maintained.
Location	- Reference site (RS1): Upstream culvert, rainfall runoff prior entering the WTS (Figure 7, Photo 1). - On site (HS): south-east WTS boundary in a drainage line that leads to a non-perennial first order (Figure 7, Photo 2).
Methodology	Routine monitoring in accordance with industry best practise and the following: - Australian Standard (AS) 5667.1:1998 Water Quality - Sampling – Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples. - AS 5667.6:1998 Water Quality – Sampling – Guidance on sampling of rivers and streams - The Australian & New Zealand Guidelines for fresh & Marine Water quality (ANZG 2018). Inspect surface water management controls to: - Assess erosion and sedimentation. - Determine maintenance required. - Ensure stormwater discharged from site at a single point.
Responsibility	- Water Quality - Qualified Consultant engaged by LC - Inspection – Council Waste Staff
Frequency	- Water Quality - – Three separate sampling events when surface runoff from the site is occurring, during the wet season from October to April. - Inspection of infrastructure – passive, and after all significant rainfall events.
Duration	Throughout operations of the site, subject to annual review.
Analytical program	- Field observation parameters – colour, odour, depth of water, velocity of flow - Field measured parameters – EC, DO, Eh, pH, temperature, turbidity. - Laboratory measured parameters – pH, EC, TDS, TSS, DO, Temp, Turbidity, major ions (Ca, Mg, Na, K, SO₄, Cl, CO₃ & HCO₃), TOC, BOD, Total Nitrogen (as N), Nitrate, Nitrite, TKN, Total Phosphorus, Heavy Metals (Total and Filtered, As, Cd, Cr¹, Cu, Fe, Hg, Pb, Ni and Zn), TPH and BTEX. <i>E.Coli</i>², PFAS (28 analytes suite). - Analysis will be carried out at NATA accredited laboratories. - Results will be reported to the NT EPA.
Acceptance Criteria	- ANZG (2018): Freshwater default 95% species protection⁸. - Darwin Harbour Water Quality Objectives (2010) (DHWQO): Freshwater rivers and streams⁹. - National health and Medical Research Council (NHMRC) Guidelines for Managing Risks in Recreational Water (2008)¹⁰.

⁸ ANZG 2018: <https://www.waterquality.gov.au/guidelines/anz-fresh-marine>

⁹ DHWQO 2010: https://environment.nt.gov.au/_data/assets/pdf_file/0010/254854/summary_document_wqobs_final.pdf

¹⁰ NHMRC 2008: <https://www.nhmrc.gov.au/sites/default/files/images/guidelines-for-managing-risks-in-recreational-water.pdf>



Surface Water Management	
	PFAS National Environmental Management Plan Version 2.0 (2020) (PFAS NEMP) – Freshwater default 95% species protection¹¹.
General Strategies	Environmental - No bulk storage of fuel for site plant and machinery on site. - Refuelling (by external supplier) location and protocol established to prevent spills. - Covered bin for deposit and transfer of general municipal waste. - Appropriate number and location of spill kits and staff training. - Avoid leachate generation and activities that encourage contact between surface water and waste temporarily stored on hardstand surface. - Avoid activities that generates exposed soils / sediments - Implement erosion and sedimentation plans for any activities that may result in exposed soil areas such as for soil stockpiling or site excavations into earth. - Preserve existing green buffers between site and drainage lines/creek. Infrastructure - Maintain hardstand surface condition to minimise infiltration, ponding and contact between surface water and waste temporarily stored on the ground in front of receptacles. - Sealed surfaces maintained to minimise infiltration accumulation. - Cover MSW bins as appropriate to minimise rainfall ingress. - Install and maintain stormwater detention basin to capture surface run-off and minimise impact into creek. - Maintain grassed batters, stormwater infrastructure and detention areas. - Install a sediment basin at the outlet as detailed in the Stormwater Management Plan (Appendix C). - Minimise disturbance areas onsite. Rehabilitate and revegetate any areas not required for operations as soon as practical to minimise potential for erosion.
Recording and Reporting	Monitoring reports: - A summary report of all sampling undertaken on site will be prepared following each monitoring event and recorded by LC. These summary reports will include: - Account of field observations and conditions prior to and during monitoring. - All field and laboratory analytical data collected during the sampling event. - Rainfall data prior to and during the sampling event. - An assessment of monitoring results against the acceptance criteria and background results. - Photo-evidence of the sampling points. Annual report: - An annual report will be prepared at the end of the wet season including trend analysis, data interpretation and recommendations.
Non Conformance Procedures	- External reporting in accordance with the general duty to report harm as described in Section 4.4.2 where necessary. - Carry out further investigations. - Determine and implement measures to minimise further impacts on surface waters off-site.
Management Review	Carry out further investigations

- There is no trigger value within the ANZG or DHWQO for unspecified chromium (Cr III + VI). Therefore, for conservative purposes, the trigger value for Cr VI will be used as the water quality objective for the assessment.
- The National health and Medical Research Council (NHMRC) guidelines for Managing Risks in Recreational Water are not applicable for the Howard Springs WTS and the trigger values are provided as guidelines only. DHWQO provides trigger values for pathogens such as *Escherichia coli*, which will be used as the water quality objectives for the assessment.

¹¹ PFAS 2020: <https://www.dcceew.gov.au/environment/protection/publications/pfas-nemp-2>



LSC WASTE TRANSFER FACILITIES

SURFACE WATER SAMPLING POINTS

FIGURE 7

LEGEND

- Site Boundary
- Site Entry
- ▲ Surface Water Sampling Location
- Stop Car Here
- Contour - 5m DEM
- Drainage
- Ephemeral Waterway
- Road

Service Layer Credits:
Earthstar Geographics, Maxar



Coordinate System: GDA 1994 MGA Zone 52

Scale: 1:4,500 at A4

Project Number: 680.30105.00000

Date Drawn: 27-Nov-2024

Drawn by: CP

Reviewed by: EA



DISCLAIMER: All information within this document may be based on external sources. SLR Consulting Pty Ltd makes no warranty regarding the data's accuracy or reliability for any purpose.





Photo 1 Surface water sampling - Reference site (RS1)



Photo 2 Surface water sampling -Discharge point (HS)



6.2.5 Dust Management

Table 6-5: Dust Management Plan

Dust Management	
	COMMENT / ACTION
Objective	✓ To minimise adverse impacts resulting from dust generation and maintain environmental amenity. ✓ To ensure control / mitigation infrastructure is maintained.
Location	• Across the site.
Methodology	• Visual / passive monitoring of conditions and potentially dust generating activities.
Responsibility	• Council Waste Staff.
Frequency	• Daily observations.
Duration	• Throughout operations of the site.
Acceptance Criteria	Environmental • No dust generated from works conducted at the site detectable from Howard Springs Road and neighbouring properties. • No dust leaving site. • No instances of dust related complaints from the public. Infrastructure • Dust suppression will be undertaken using a watercart or manual spraying as required.
General Strategies	Environmental • Maintain low speed site traffic environment. • Avoid dust generating work during periods of high winds which may result in dust leaving site. • Effective stockpile management. Infrastructure • Gravel / unsealed surfaces in good condition. • Sealed surfaces maintained to minimise dust accumulation. • Maintenance of hardstand and unsealed areas as required. • Vegetated soil batters and non-sealed areas wherever practical.
Recording and Reporting	• Internal – Daily and Passive monitoring and Quarterly reporting. • For serious non-conformances, notification to NT EPA.
Non Conformance Procedures	• Cease odour or dust generating activities until appropriate remedial actions are implemented. • Investigate cause and develop measures to prevent reoccurrence. • Increase dust suppression actions to reduce dust generation.
Management Review	• LC to review dust management outcomes at the time of the EMP review.

6.2.6 Odour Management

Table 6-6: Odour Management Plan

Odour Management	
	COMMENT / ACTION
Objective	✓ To minimise adverse impacts resulting from odour generation and maintain



Odour Management	
	environmental amenity. ✓ To ensure control / mitigation infrastructure is maintained.
Location	Across the site.
Methodology	Passive monitoring of conditions and potentially odour generating activities.
Responsibility	Council Waste Staff.
Frequency	Daily observations.
Duration	Throughout operations of the site.
Acceptance Criteria	Environmental - No odour generated from works conducted at the site detectable from Howard Springs Road and neighbouring properties. - No odour leaving site. - No instances of odour related complaints from the public. Infrastructure - All odour minimisation infrastructure or control measures are maintained.
General Strategies	Environmental - Passive odour monitoring will be undertaken periodically to assess odour impacts on site. - All putrescible wastes stored within a covered bin until removal from site. - Ensure no putrescible waste stored uncovered overnight. - No contact with putrescible waste and rainfall. - Minimise contact between surface water and waste storages. Infrastructure - General waste regularly removed from site.
Recording and Reporting	- Internal – Daily and Passive Monitoring and Quarterly reporting. - External – for serious non-conformances, notification to NT EPA.
Non Conformance Procedures	- Cease odour generating activities until appropriate remedial actions are implemented. - Investigate cause and develop measures to prevent reoccurrence.
Management Review	LC to review outcomes at the time of the EMP review.

6.2.7 Noise Management

Table 6-7: Noise Management Plan

Noise Management	
	COMMENT / ACTION
Objective	✓ To minimise adverse impacts resulting from noise generation and maintain environmental amenity. ✓ To ensure control / mitigation infrastructure is maintained.
Location	Across the site.
Methodology	Passive monitoring of conditions and potentially noise generating activities.
Responsibility	Council Waste Staff.
Frequency	Daily observations.
Duration	Throughout operations of the site.
Acceptance	Environmental



Noise Management	
Criteria	- Noise levels generated from works conducted at the site in accordance with acceptable WH&S limits. - Minimise noise for adjacent residences and adjacent land users - No instances of noise related complaints from the public. Infrastructure - All noise minimisation infrastructure or control measures are maintained.
General Strategies	Environmental - Ongoing passive noise monitoring to assess impacts. - Maintain low speed site traffic environment Infrastructure. - Noise generating operations during normal working hours.
Recording and Reporting	- Internal – Daily and Passive monitoring and Quarterly reporting. - External – for serious non-conformances, notification to NT EPA
Non Conformance Procedures	- Cease noise generating activities until appropriate remedial actions are implemented. - Investigate cause and develop measures to prevent reoccurrence. - Undertake noise suppression actions to reduce noise generation.
Management Review	LC to review outcomes at the time of the EMP review.

6.2.8 Fire Management

Table 6-8: Fire Management Plan

Fire Management	
	COMMENT / ACTION
Objective	✓ To minimise potential fire risk by managing site conditions. ✓ To ensure control / mitigation infrastructure is maintained.
Location	Across the site.
Methodology	Visual monitoring of conditions and potential risk areas.
Responsibility	Council Waste Staff.
Frequency	Daily observations.
Duration	Throughout operations of the site.
Acceptance Criteria	Environmental - Minimise fire risk by maintaining and monitoring site conditions. - Minimise fire risk by monitoring of machinery and power tools used on site. Infrastructure - Adequately maintained firefighting infrastructure and signage. - Adequately maintained waste drop-off, storage, processing and transfer areas.
General Strategies	Environmental - Regular slashing / mowing of vegetated areas will be undertaken by Council Waste Staff, particularly surrounding higher risk areas (including woodchips). - No ignition sources to be present / allowed on site without a SWMS approved by the Waste Transfer Station Manager. - Do not utilise the plant that carries a fire risk during periods of warm weather or high winds. - No smoking in or near waste equipment, disposal areas, stockpiles or surrounding vegetated areas.



Fire Management	
	• No-naked-flames policy on site. • Routine removal of waste and no long term stockpiling of wastes. • No overnight storage of waste within trucks / attached trailers. • Routine monitoring and removal of ignition sources Infrastructure • Clear separation for storage areas for incompatible waste streams. • Clear signage promoting no-smoking in critical areas on site. • Clear signage promoting no naked flames policy on site Safety and hazard signage to be provided at fire risk areas at site. • Firefighting infrastructure including hydrants, internal fire hoses and fire extinguishers (waste transfer shed) • All site plant to be regularly maintained and serviced. • No bulk fuel storage on site.
Monitoring	• Ongoing visual monitoring of site conditions.
Recording and Reporting	• Internal – Daily and Passive monitoring and Quarterly reporting. • External – for serious non-conformances, notification to NT EPA.
Non Conformance Procedures	• Cease activities that carry a fire risk until appropriate remedial actions are implemented. • Investigate cause and develop measures to prevent reoccurrence. • Immediately undertake maintenance required to reduce fire risk throughout the site. • If a fire occurs, the fire department is to be contacted in the first instance and relevant management staff at LC notified, as well as the NT EPA.
Management Review	• LC to review outcomes at the time of the EMP review.



7.0 Emergency Response Plan

7.1 General

An Emergency Response Plan has been prepared, which:

- Identifies potential risks.
- States who should be notified in case of an emergency.
- Describes short term incident management strategies.
- Outlines long term response measures as required.

7.2 Emergency Contacts

A summary of external emergency contacts is detailed in **Table 7-1**.

Table 7-1: Summary of Emergency Contacts

Contact	Number	Assistance
Fire / Police / Ambulance	000/112	Priority response to emergencies
Palmerston Police Station	89477200	Non-urgent enquires
Palmerston Fire Station and Emergency Service Centre	8936 4880	Urgent enquires
Palmerston Regional Hospital	(08)79799200	Medical assistance
NT EPA Pollution Hotline	1800 064 567	Environmental Incident

7.3 Incident Reporting

The *Waste Management and Pollution Control Act 1998* defines harm as any harm to or adverse effect, or potential harm (including the risk of harm and future harm) or potential adverse effect on the environment (of any degree or duration) and includes environmental nuisance.

Environmental harm or environmental damage may be caused by pollution whether the harm or damage:

- is caused directly or indirectly, or is a direct or indirect result of the pollution; or
- results from, or is caused by, the pollution along or from the combined effects of the pollution and other factors.

Part 3 Section 14 of the *Waste Management and Pollution Control Act 1998* outlines the requirements for the duty to notify of environmental harm and provides a summary of who should notify and when to notify in the instance of environmental harm occurring (**Table 7-2**).

Table 7-2: NT EPA Incident Reporting Requirements

Trigger	Timeframe and Contact Details	Incident Reporting Details
Under Part 3 Section 14, an Incident which causes or is threatening or may threaten to cause pollution resulting in material environmental harm or serious harm: Incidents of any degree or	<24 hrs post incident ntepa@nt.gov.au pollution@nt.gov.au Written response to the EPA within 7 days.	Under Part 3 Section 14, a notification is required to specify (Section 14 Incident Reporting Form – Appendix B): Incident causing or threatening to cause pollution;



Trigger	Timeframe and Contact Details	Incident Reporting Details
duration as required by non-compliance notification conditions of a licence. - An incident occurs in the conduct of an activity; and - The incident causes, or is threatening or may threaten to cause, pollution resulting in material environmental harm or serious environmental harm, the person conducting the activity must notify the NT EPA in accordance with subsection (3) as soon as practicable after (and in any case within 24 hours after) first becoming aware of the incident or the time he or she ought reasonably be expected to have become aware of the incident.	NT EPA Pollution Hotline: Tel: 1800 064 567	- Date & time; - How the pollution has occurred, is occurring or may occur. - Attempts made to prevent, reduce, control, rectify, investigate and/or clean up the pollution or resultant environmental harm caused or threatening to be caused by the incident; and - The identity of the person notifying.

7.4 Surface Water Contamination

In the event of a serious surface water contamination incident resulting in release of contaminated surface waters from the WTS to surrounding areas, such as through an identified leachate outbreak, immediate steps will be taken to contain the contaminated surface water e.g. construction of bunding by using earthmoving machinery.

If a contaminated release, or suspected release off-site occurs, surface water sampling of the contaminated surface waters and the affected watercourse will be undertaken, both during the incident, and for a period of time thereafter, as advised by a qualified appropriate consultant.

The NT EPA Pollution Hotline (see **Table 7-2**) shall be notified and results of investigations retained in case they are required by NT EPA.

7.5 Flooding

In the event of flooding of the site, the site shall be inspected for damage as soon as it is deemed safe to do so.

Any damage to the WTS and stormwater management infrastructure shall be assessed and further actions determined on the basis of the assessments made.

7.6 Fire

Section 6.2.8 provides for fire prevention measures and firefighting procedures. The procedures include where necessary the call out of the NTFRS.

7.7 Earthquake

Should an earthquake occur, earliest reconnaissance of the site will be undertaken to determine any apparent damage. Should any damage be apparent, repair works will be undertaken immediately.



7.8 Cyclone

In the event of a cyclone affecting the site, the site shall be inspected for damage as soon as it is deemed safe to do so. Procedures and contact details in the event of a cyclone are described further in the latest version of the Litchfield Council Emergency Management and Recovery Plan.

Any damage to the WTS and stormwater management infrastructure shall be assessed and further actions determined on the basis of the assessments made.

7.9 Land contamination

In the event of identification of, or events leading to, land contamination the NT EPA Pollution Hotline shall be notified. Contain and secure the site/hazard as soon as safe to do so.

Initiate a contamination investigation in accordance with the NT EPA framework for contaminated sites investigations, with the following, but not limited to:

- Development of a Sampling, Analysis and Quality Plan (SAQP) containing sufficient information to undertake an investigation to assess the presence and nature of contamination. The document will be designed to provide detail to a sufficient level that can be understood and audited by a third party.
- Personnel who have sufficient experience and knowledge of contaminated land sampling and quality control / quality assurance will undertake the site investigation. Sufficient information will be collected throughout the site investigation and development of the SAQP to facilitate an assessment of the impact and can include field notes, bore/soil logs, photographs, and equipment calibration certificates.
- Site investigation report, including a summary of the SAQP, site investigation and provide analysis and interpretation of environmental risk. The report will summarize recommendations to address potential ongoing environmental risk and classify wastes if soils are to be removed from the site.

7.10 Spill Prevention and Response

7.10.1 Preventive Controls

This section provides an overview of the processes in place for spill prevention and response on site to minimise impacts on the surrounding environment.

- All supervisors and personnel working directly with chemicals and hydrocarbons will undertake training in spill prevention and response on site.
- Machinery and equipment will:
 - Have the appropriate license and certificates.
 - Be checked by the operator before using to identify any leakages.
 - Be accompanied by a service and maintenance record.
- All hazardous chemicals and dangerous goods should be stored appropriately as per the Listed and Household Hazardous Waste Storage Plan (**Section 6.2.2**).
- Regular maintenance of equipment should only be carried out in designated servicing locations.
- Appropriate number of spill kits should be placed at strategic area on site (e.g near the waste oil area).



7.10.2 Spill Response Procedure

1. **Stop the leak at the source.**
2. **Contain the spill:**
 - a. Identify proximity of sensitive receptors including the workforce, the surrounding community or the waterways. Also consider the location of ignition sources or incompatible chemicals that may increase the risks presented by the spill.
 - b. Oil and Fuel Spill Kits – are to be used for diesel, fuel, unleaded petrol, hydraulic oils, grease and other petroleum based lubricant spills. They include oil absorbent booms, pillows and pads, kitty litter or peat. The absorbent materials in oil and fuel spill kits **DO NOT ABSORB WATER** (hydrophobic).
 - c. Chemical Spill Kits – are to be used for acids, bases (alkalis), paints, solvents, thinners, coolants, degreasers, herbicides and pesticide spills.

Some options for containing a spill include:

- a. Creating an earthen perimeter bund or using oil absorbent booms to act as a barrier.
 - b. Use of absorbent pads around the edge of the spill.
 - c. Use of hydrophobic booms to restrict the flow of liquid and keep it pooled within the booms; Redirecting the flow of material to an area that poses less safety or environmental risk.
 - d. Identify any other reasonable actions that may improve containment.
 - e. As a last resort, other materials such as sand may be used. Avoid using these materials as they create a large amount of contaminated waste.
 - f. For a solids spill, dust suppression measures may be required if dust is an issue.
3. **Clean-up the spill.**
 - a. Oil/fuel spills, continue to use absorbent materials from oil spill kits. Used and contaminated absorbent materials should be collected in either 220L drums or in lined skip bins (depending on the size of the clean-up. This applies for spills on sealed and gravel areas
 - b. Spills on gravel areas – clean-up will include the absorbent materials used AND any contaminated soil in the area will need to be scraped up and stockpiled on a designated area. When stockpiling, ALL contaminated soil from an oil/fuel spill (hydrocarbon contaminated) **MUST** be placed on a tarpaulin, and also be covered in a tarpaulin to prevent further contamination.
 - c. Notify the NT EPA of the stockpile to ensure likely contaminants are known help organize treatment, reuse or disposal.
 - d. For mineral concentrate spills scrape up the spillage, use contractor to suck up the product or wash down the affected area. Do not let wash waters enter stormwater drains and contact the NT EPA to request the most applicable disposal method. Where possible, the material shall be recovered and recycled. This may apply to:
 - i. ore concentrate
 - ii. sulphur granules
 - iii. chemicals
 - iv. waste oil / grease
 - e. If material cannot be recycled, advice should be sought from the NT EPA on appropriate disposal methods to ensure compliance with the *Waste Management*



and Pollution Control Act 1998.

4. **Restore kits.**
5. **Report the incident as per Table 7-2.**

7.11 Emergency Response Schedule Summary

The Emergency Response Schedule is summarised in the following table.

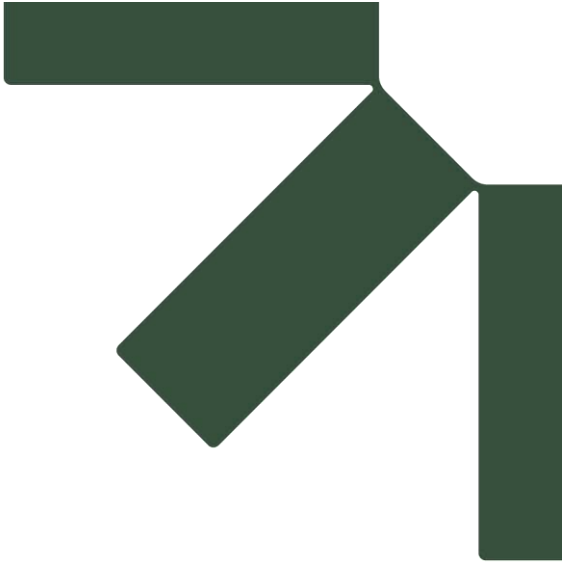
Table 7-3: Emergency Response Schedule

No.	Incident	Comment/Action	If environmental harm is caused	Responsibility
1	Surface Water Contamination	- Contain contaminated surface water e.g. construct bunding using earthmoving machinery. - Sample surface water and receiving body as advised by a qualified consultant.	Notify Pollution Hotline within 24 hours of becoming aware of harm being caused.	LC
2	Flooding	- Assess for damage when safe to do so. - Initiate remedial actions if required.	Notify Pollution Hotline within 24 hours of becoming aware of	LC
3	Fire	Call out fire department immediately.	Notify Pollution Hotline within 24 hours of becoming aware of	LC
4	Earthquakes	- As soon as safe to do so: - Monitor impacts on groundwater, surface water and air quality. - Assess for damage. - Initiate remedial actions if required.	Notify Pollution Hotline within 24 hours of becoming aware of	LC
5	Cyclones	- Assess for damage when safe to do so. - Initiate remedial actions if required.	Notify Pollution Hotline within 24 hours of becoming aware of harm being caused.	LC
6	Land contamination	- Contain and secure the site/hazard as soon as safe to do so. - Develop a contamination investigation in accordance with the NT EPA framework.	Notify Pollution Hotline within 24 hours of becoming aware of harm being caused.	LC



No.	Incident	Comment/Action	If environmental harm is caused	Responsibility
7	Spill	• Stop, contain and clean-up the spill. • Contact the NT EPA for storage and disposal advice.	Notify Pollution Hotline within 24 hours of becoming aware of harm being caused.	LC





Appendix A Example Reporting Proformas

Environmental Management Plan

Howard Springs Waste Transfer Station

Litchfield Council

SLR Project No.: 680.V30105.00102

20 December 2024



DAILY INSPECTION CHECKLIST

Howard Springs Waste Transfer Station

Reporting Day & Date:

Reporting Time:

		Good	Needs Addressing	Comments
OH&S across site	Operational and physical aspects	☐	☐	
Access Conditions & Signage	Condition	☐	☐	
Outdoor hardstand areas	Condition / WH&S	☐	☐	
Resource Drop off Area	Condition / WH&S	☐	☐	
Waste Transfer Shed	Condition/WH&S	☐	☐	
Surface water and erosion	Drainage Infrastructure	☐	☐	
	Hardstand Surface	☐	☐	
Dust control	Dust Conditions	☐	☐	
Odour Control	Odour Conditions	☐	☐	
Litter Control	General Site	☐	☐	
	Fences/roads/offsite	☐	☐	
Noise Control	Audible Noise Issues	☐	☐	
Pest Management	Signs of vermin/pests	☐	☐	
Additional comments				
Signed _____				



QUARTERLY INSPECTION REVIEW

Howard Springs Waste Transfer Station

Date:

Reviewer:

		Issues Are Adequately Addressed	Approach Requires Review	Comments
OH&S across site	Operational and physical aspects	☐	☐	
Access Conditions & Signage	Condition	☐	☐	
Outdoor hardstand areas	Condition / WH&S	☐	☐	
Waste Transfer Shed	Condition / WH&S	☐	☐	
Surface water and erosion	Drainage Infrastructure	☐	☐	
	Hardstand Surface	☐	☐	
Dust control	Dust Conditions	☐	☐	
Odour Control	Odour Conditions	☐	☐	
Litter Control	General Site	☐	☐	
	Fences/roads/offsite	☐	☐	
Noise Control	Audible Noise Issues	☐	☐	
Pest Management	Signs of vermin/pests	☐	☐	
Fire prevention	Site conditions/ Infrastructure	☐	☐	
Vegetation Condition	Condition	☐	☐	

Additional comments

Signed



NON-CONFORMANCE AND CORRECTIVE / PREVENTATIVE ACTION REPORT FORM

Howard Springs Waste Transfer Station

Section 1 - Details of Non-Conformity

Non-Conformance Report Identification Number: _____

Date: _____

Non-Conformance Report By: _____

Function/Area/Type:

Waste Transfer Shed ☐Hardstand ☐Gatehouse ☐Other ☐

Description: _____

Nature of Non-Conformity: _____

Impact of Non-Conformity: _____

Endorsed By NCR Recipient: _____

Date: _____

Section 2 - Auditee Proposed Corrective / Preventative Action Plan

Cause of Non-Conformity (How & why did this happen): _____

Correction Action (fix now) and completion dates: _____

Preventative Action (to prevent reoccurrence) and completion dates: _____

Approved By NCR Recipient: _____

Date: _____

Approved By Works Manager: _____

Date: _____

Section 3 - NCR Close Out

Non-Conformity is Resolved:

NCR Recipient: _____

Date: _____

Works Manager: _____

Date: _____

Root Cause of Non-Conformity has been addressed

Works Manager: _____

Date: _____

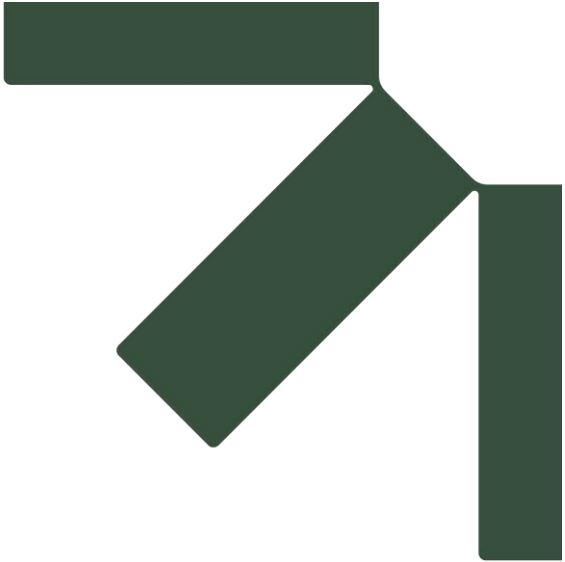


COMPLAINT REGISTER Howard Springs Waste Transfer Station			COMPLAINT # :
TAKEN BY:	DATE:	TIME:	
COMPLAINT FROM:			
ADDRESS:			
CONTACT PHONE:			
NATURE OF COMPLAINT:			
ACTION TAKEN:			
SUMMARY:			



ATTACHMENTS:





Appendix B Incident Report Form (WMPC Act Section 14)

Environmental Management Plan

Howard Springs Waste Transfer Station

Litchfield Council

SLR Project No.: 680.V30105.00102

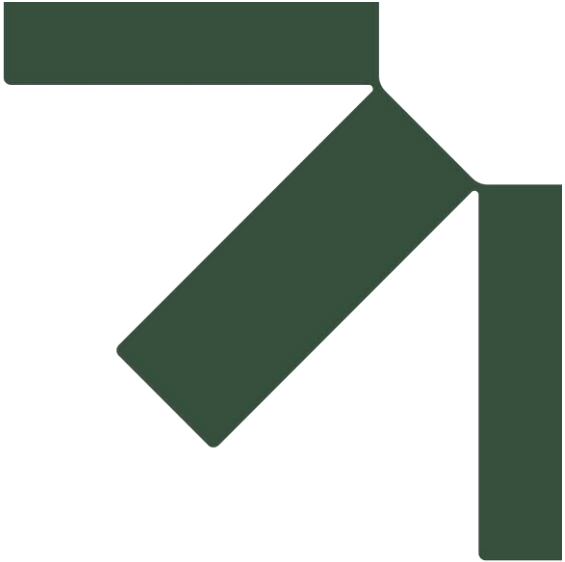
20 December 2024



SECTION 14 INCIDENT REPORT (*Waste Management and Pollution Control Act*)

Date and Time of Notification:	
Person / Company:	
Incident:	

(a) the incident causing or threatening to cause pollution	
(b) the place where the incident occurred	
(c) the date and time of the incident	
(d) how the pollution has occurred, is occurring or may occur	
(e) the attempts made to prevent, reduce, control, rectify or clean up the pollution or resultant environmental harm caused or threatening to be caused by the incident	
(f) the identity of the person notifying the NT EPA	



Appendix C Stormwater Management Plan

Environmental Management Plan

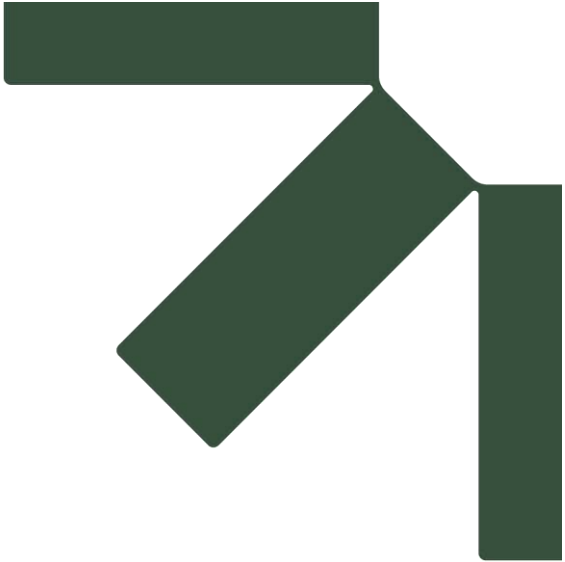
Howard Springs Waste Transfer Station

Litchfield Council

SLR Project No.: 680.V30105.00102

20 December 2024





Appendix D Conceptual Site Model

Environmental Management Plan

Howard Springs Waste Transfer Station

Litchfield Council

SLR Project No.: 680.V30105.00102

20 December 2024



Revision Record

Revision	Date	Prepared By	Checked By	Authorised By
1.0	19 December 2024	E. Aliotti	G. Coles	F. Jones
	Click to enter a date.			

Basis of Report

This report has been prepared by SLR Consulting Australia (SLR) with all reasonable skill, care and diligence, and taking account of the timescale and resources allocated to it by agreement with Litchfield Council (the Client). Information reported herein is based on the interpretation of data collected, which has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of the Client. No warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from SLR.

SLR disclaims any responsibility to the Client and others in respect of any matters outside the agreed scope of the work.



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Acronyms and Abbreviations

CSM	Conceptual Site Model
C&D	Construction & Demolition
EPL	Environment Protection Licence
SLR	SLR Consulting Australia Pty Ltd
ULABs	Used lead acid batteries
WTS	Waste Transfer Station



1.0 Conceptual Site Model

1.1 Introduction

A conceptual site model (CSM) is a representation of the nature, fate and transport of discharges, wastes or contaminants that allows assessment of potential and/or actual exposure to contaminants.

SLR Consulting Australia Pty Ltd (SLR) has developed this CSM for Howard Springs Waste Transfer Station (WTS) to characterise potential plausible processes of transport and impacts of contamination to sensitive receptors, including human and ecological receptors. This CSM has been prepared in consideration of the *Guidelines on Conceptual Site Models* (NT EPA, 2013) and the ASC NEPM, which draws upon ASTM E1689-20 (2020) Standard Guide for Developing Conceptual Site Models for Contaminated Sites (ASTM, 2020). The CSM identifies:

- Primary sources of waste.
- Any potential discharges from the waste at the point of release.
- How these discharges may enter and move through the environment.
- The different potential receptors that might come in contact with contaminated media (e.g. Birds, mammals, fish, plants, humans).
- Lists the ways different receptors may come into contact with the discharge or contaminants.

1.2 Definitions

As per ASTM E1689, definitions of the key elements of the complete exposure pathways are as follows:

- **Contaminant:** a substance that is potentially hazardous to human health and/or the environment and is present in the environment at concentrations above background levels.
- **Source:** the location from which a contaminant has entered a system, including primary and secondary origins.
- **Environmental receptors:** humans and other living organisms potentially exposed to and adversely affected by contaminants because they are present at the source(s) or along contamination migration pathways.
- **Transport pathways:** routes contaminants take from the source(s) to potential environmental receptors.
- **Exposure pathways:** process by which a contaminant or physical agent in the environment comes into direct contact with the body, tissues, or exchange boundaries of an environmental receptor or organism (**Table 1-1**). Where both the route of a contaminant to the sensitive receptor and an exposure route is identified, this condition is described as a complete exposure pathway.



Table 1-1: Exposure Pathway

Symbol	Pathway	Definition
✓	Pathway Potentially Complete	A migration pathway and exposure route exist from the source to the potential receptor.
×	Pathway Insignificant	A migration pathway potentially exists however the exposure is considered unlikely to present an unacceptable risk to the potential receptor.
××	Pathway Incomplete	No transport mechanism or exposure route exists to the potential receptor.

1.3 Site Inspection

A site inspection was conducted on 7 November 2024, which verified the current waste streams and management practices observed at the Howard Springs WTS.

Litchfield Council currently holds Environment Protection Licence (EPL) 278 for Howard Springs WTS, which allows the storage of the following listed wastes:

- Used lead acid batteries (ULABs); and
- Waste mineral oils unfit for their original intended use.

It was notified by Litchfield Council that tyres observed on site will be transferred to the Humpty Doo WTS.

Historical mixed Construction & Demolition (C&D) waste with asbestos contamination was observed on site. Litchfield Council is currently working with Stantec to consider remedial options.

White goods such as air conditioner and fridges are temporary stored on site. External contractors come to Howard Springs WTS to remove the gas from the white goods prior transfer off-site.

The CSM for Howard Springs WTS is provided in a tabular format as **Table 1-2**.



Table 1-2: Howard Springs WTS Conceptual Site Model

Source	Contaminants	Characteristics of contaminant	Exposure route	Transport pathway	Environmental receptor	Complete exposure pathway
Batteries 	Heavy metals (Pb, Ni, Cd, Cu) and acid	Toxic, carcinogenic, dermal impact (e.g. metal toxicity, acid burns and skin irritation). Respiratory impacts (e.g. acid vapour)	Dermal, respiratory and ingestion	Gaseous emission	Fauna	✗
					Flora	✗
				Ingestion	Fauna	✓
					Humans (bioaccumulation through eating contaminated material) – employees and visitors at site	✓
				Wind transport or gaseous emission	Fauna	✗
					Flora	✗
					Surface water bodies	✗
					Humans (employees and visitors at site, people passing nearby to site)	✗
				Surface water (adsorption)	Fauna	✓
					Flora	✓
					Surface water bodies	✓
				Surface water (ingestion)	Fauna	✓
					Flora	✓
					Humans (employees and visitors at site, people passing nearby to site)	✓
				Direct contact	Fauna	✓
					Flora	✓
					Humans (employees and visitors at site, people passing nearby to site)	✓
				Groundwater	Fauna (if drinking from affected discharged groundwater)	✗
					Flora	✗
					Humans (via ingestion of contaminated groundwater)	✗✗
					Groundwater quality	✓
Tyres	PAH, TRH (if burned)	Toxic, carcinogenic and respiratory impacts. Flammable	Respiratory and ingestion of burned.	Gaseous emission (if burned)	Fauna	✓
					Humans (employees and people at or near site)	✓
				Wind transport of gaseous emission	Fauna	✗
					Flora	✗
					Surface water bodies	✗
					Humans (employees and people at or near site)	✗
				Surface water (adsorption)	Fauna	✓
					Flora	✓
					Surface water bodies	✓
				Surface water (ingestion)	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Direct contact	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✗✗
				Groundwater	Fauna (if drinking affected discharged groundwater)	✗✗
					Flora	✗✗



Source	Contaminants	Characteristics of contaminant	Exposure route	Transport pathway	Environmental receptor	Complete exposure pathway
	Disease	Aquatic insect breeding habitat	Biohazard	Biting insects breeding in retained water	Humans (via ingestion of contaminated groundwater)	xx
					Groundwater quality	✓
					Fauna	✓
					Humans (employees and people at or near site)	✓
Mechanical oil waste 	Oils and fuels (PAH, TRH, BTEX), heavy metals, coolants, acid in batteries	Toxic, carcinogenic, dermal impacts, respiratory impacts, flammability.	Dermal, respiratory, ingestion	Gaseous emission	Fauna	xx
					Flora	xx
				Ingestion	Fauna	x
					Humans (employees and people at or near site)	x
				Wind transport of gaseous emission	Fauna	xx
					Flora	xx
					Surface water bodies	xx
					Humans (employees and people at or near site)	xx
				Surface water (adsorption)	Fauna	xx
					Flora	xx
					Surface water bodies	xx
				Surface water (ingestion)	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
				Direct contact	Fauna	x
					Flora	x
					Humans (employees and people at or near site)	x
				Groundwater	Fauna if drinking affected discharged groundwater	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
					Groundwater quality	x
Gas bottles 	Propane, butane or a propane-butane blend	Toxic, carcinogenic, dermal impacts, respiratory impacts, flammability.	Dermal, respiratory, ingestion	Gaseous emission	Fauna	x
					Flora	x
				Ingestion	Fauna	xx
					Humans (employees and people at or near site)	xx
				Wind transport of gaseous emission	Fauna	x
					Flora	x
					Surface water bodies	x
					Humans (employees and people at or near site)	x
				Surface water (adsorption)	Fauna	xx
					Flora	xx
					Surface water bodies	xx
				Surface water (ingestion)	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
				Direct contact	Fauna	xx



Source	Contaminants	Characteristics of contaminant	Exposure route	Transport pathway	Environmental receptor	Complete exposure pathway
					Flora	xx
					Humans (employees and people at or near site)	x
				Groundwater	Fauna if drinking affected discharged groundwater	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
					Groundwater quality	xx
Asbestos containing material 	Mixed Construction & Demolition waste. Fibrous asbestos or asbestos fines	Toxic, carcinogenic, dermal impact	Respiratory, ingestion and dermal	Gaseous emission	Fauna	✓
					Flora	✓
				Ingestion	Fauna	✓
					Humans (employees and people at or near site)	✓
				Wind transport of particulates	Fauna	✓
					Flora	✓
					Surface water bodies	✓
					Humans (employees and people at or near site)	✓
				Surface water (fibres/fines liberated by evaporation, minor risk of ingestion)	Fauna	✓
					Flora	✓
					Surface water bodies	✓
					Humans (employees and people at or near site)	✓
				Direct contact	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Groundwater (fibres, fines liberated by evaporation, minor risk of ingestion)	Humans (employees and people at or near site)	x
Domestic putrescibles 	H ₂ S, SO ₂ , CH ₄ , CO, CO ₂	Toxic, respiratory, asphyxia (from acids in water), dermal, flammable, explosive	Respiratory	Gaseous emission	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
				Wind transport of gaseous emission	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
	Leachate: acidic liquids, ammonia, nitrates, phenols	Toxic, dermal impacts	Dermal, ingestion	Surface water	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
				Groundwater	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
	Bacteria	Biohazard	Dermal, ingestion	Surface water	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx



Source	Contaminants	Characteristics of contaminant	Exposure route	Transport pathway	Environmental receptor	Complete exposure pathway
				Groundwater	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
					Groundwater quality	xx
Green waste 	Residual herbicides and pesticides Mulching process	Toxic, carcinogenic, dermal	Dermal, ingestion	Gaseous emission	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Wind transport of gaseous emission	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Direct contact	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Surface water (adsorption)	Fauna	✓
					Flora	✓
					Surface water bodies	✓
				Surface water (ingestion)	Fauna	✓
					Humans (employees and people at or near site)	✓
	Weed seed	Environmental impacts	Exposure of fertile weed material to soil	Direct contact	Flora (competition)	x
				Wind dispersal of weed seeds	Flora (competition)	✓
White goods	Heavy metal, plastic, chemicals and gases	Toxic, carcinogenic, dermal	Dermal, ingestion	Gaseous emission	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Wind transport of gaseous emission	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Ingestion	Fauna	✓
					Humans (employees and people at or near site)	✓
				Surface water (adsorption)	Fauna	✓
					Humans (employees and people at or near site)	✓
				Surface water (ingestion)	Fauna	✓
					Humans (employees and people at or near site)	✓
				Groundwater	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
					Groundwater quality	✓
Metals/Steel	Iron, chemicals from paints	Toxic, carcinogenic, dermal	Ingestion and dermal	Ingestion	Fauna	✓
					Humans (employees and people at or near site)	✓



Source	Contaminants	Characteristics of contaminant	Exposure route	Transport pathway	Environmental receptor	Complete exposure pathway
				Surface water (adsorption)	Fauna	✓
					Flora	✓
					Surface water bodies	✓
				Surface water (ingestion)	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Direct contact	Fauna	✓
					Flora	✓
					Humans (employees and people at or near site)	✓
				Groundwater	Fauna if drinking affected discharged groundwater	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
					Groundwater quality	xx
Commingled and cardboards 	Dioxins, furans, heavy metals (if burnt)	Toxic, carcinogenic, dermal	Ingestion and dermal	Gaseous emission	Fauna	xx
					Flora	xx
				Ingestion	Fauna	xx
					Humans (employees and people at or near site)	xx
				Wind transport of gaseous emission	Fauna	xx
					Flora	xx
					Surface water bodies	xx
					Humans (employees and people at or near site)	xx
				Surface water (adsorption)	Fauna	xx
					Flora	xx
					Surface water bodies	xx
				Surface water (ingestion)	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
				Direct contact	Fauna	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
				Groundwater	Fauna if drinking affected discharged groundwater	xx
					Flora	xx
					Humans (employees and people at or near site)	xx
					Groundwater quality	xx



2.0 References

ASTM (2020) “*Standard Guide for Developing Conceptual Site Models for Contaminated Sites*”. ASTM E1689-20. American Society for Testing and Materials. ASTM International.

NT Environment Protection Authority (NT EPA) (May 2013) *Guidelines on Conceptual Site Models, Version 1.2*.



