Information sheet for environmental audits and preliminary risk screen assessments (PRSAs)

Publication 2009 June 2021

Victoria's audit system

An environmental audit system has operated in Victoria since 1989. The *Environment Protection Act 2017* (the Act) provides for the appointment of environmental auditors. It also provides for Environment Protection Authority (EPA or the Authority) to have a system of preliminary risk screen assessments (PRSAs) and environmental audits. These are used in the planning, approval, regulation and management of activities, and in protection of human health and the environment.

Under the Act, the functions of an environmental auditor include to:

- conduct PRSAs and environmental audits
- prepare and issue PRSA statements and reports, and environmental audit statements and reports.

The purpose of a PRSA is to:

- assess the likelihood of the presence of contaminated land
- determine if an environmental audit is required
- recommend a scope for the environmental audit if an environmental audit is required.

The purpose of an environmental audit is to:

- assess the nature and extent of the risk of harm to human health or the environment from contaminated land, waste, pollution, or any activity
- recommend measures to manage the risk of harm to human health or the environment from contaminated land, waste, pollution, or any activity
- make recommendations to manage any contaminated land, waste, pollution or activity.

Upon completion, all PRSAs and environmental audits require preparation of either a PRSA statement, accompanied by a PRSA report, or an environmental audit statement, accompanied by an environmental audit report.

A person may engage an environmental auditor to conduct a PRSA or an environmental audit.

EPA administers the environmental audit system and ensures an acceptable quality of environmental auditing is maintained. This is achieved by assessing auditor applications and conducting a quality assurance program. These measures ensure that PRSAs and environmental audits that environmental auditors undertake are completed in accordance with the relevant sections of the Act or any other Act, and with the guidelines the Authority or other government agencies have published.

File structures

EPA stores digital statements and reports from PRSAs and environmental audits in three parts:

- Part A, the PRSA or environmental audit report
- Part B, report appendices
- Part C, the PRSA statement and executive summary or environmental audit statement and executive summary.

Report executive summaries, findings and recommendations should be read and relied upon only in the context of the whole document, including any appendices and the PRSA statement or environmental audit statement.

Currency of PRSAs and environmental audits

PRSAs and environmental audits are based on the conditions encountered and information reviewed at the time of preparation. They don't represent any changes that may have occurred since the completion date. As it's not possible for the PRSA or audit report to present all data that could be of interest to all readers, consideration should be made to any appendices or referenced documentation for further information.

When information about the site changes from what was available at the time the PRSA or environmental audit was completed, or where an administrative error is identified, an environmental auditor may amend or withdraw PRSA or environmental audit statements and/or reports. Users are advised to check EPA's website to ensure documents' currency.

PDF searchability and printing

EPA can only provide PRSAs and environmental audit statements, reports and appendices that the environmental auditor provided to EPA via the EPA portal on the EPA website.

All statements and reports should be in a Portable Document Format (PDF) and searchable; however at times some appendices may be provided as image-only PDFs, which can affect searchability.

The PDF is compatible with Adobe Acrobat Reader, which is downloadable free from Adobe's Website (www.adobe.com).

Further information

For more information on Victoria's environmental audit system, visit EPA's website or contact EPA's Environmental Audit Unit.

Web: www.epa.vic.gov.au

Email: environmental.audit@epa.vic.gov.au

EXECUTIVE SUMMARY

This is an environmental audit report for the site at Glen Helen Lodge (8495 Namatjira Drive, Mount Zeil) which has been completed by Mr. Steven Kirsanovs of Kirsa Environmental (the Auditor). The Auditor is an NT EPA approved person within the class of persons suitable to undertake Environmental Audits in the Northern Territory[1]. The audit has been performed in accordance with the relevant provisions of Part 6 of the *Waste Management and Pollution Control Act 1998,* and (as far as applicable to the Northern Territory) with the relevant provisions of the *Environment Protection Act 2017* of Victoria (Mr. Kirsanovs is appointed as an environmental auditor in that jurisdiction). The audit details and outcomes are summarised in the following tables.

Table 1: Summary of Audit Report information

Auditor	Steven Kirsanovs
Auditor account number	EXT001154
Date EPA notified of audit	30/08/2021
Environmental audit reference	NTEPA2021/0004-270
Name of person requesting audit	Cameron Miller, CEO Ngurratjuta/Pmara Ntjarra Aboriginal Corporation PO Box 8573 Alice Springs NT 0871 Phone 08 8951 1911 reception@ngur.com.au
Relationship of person requesting audit to site	Authorised representative of former Site owner
Name of site owner	Beston Parks Land Co Pty Ltd (ACN 111 783 423) (trading as / known as) Discovery Parks who acquired the site in August 2021.
Date of auditor engagement	30/08/2021
Completion date of the audit	30/11/2023
Reason for audit	Requirement of Notice issued under S48(1) of the Waste Management and Pollution Control Act (dated 26 August 2021)
Environmental segments	Air, land, water
Planning permit number or requirement detail if applicable	-
EPA Region	Not applicable
Municipality	MacDonnell Regional Council
Dominant - lot on plan	NT Portion 830 from Plan A 000315 (CUFT Volume 849 Folio 156)
Additional - lot on plan(s)	-
Site/premises name	Glen Helen Lodge
Building/complex sub-unit/lot No.	-
Street/Lot – Lower No.	8495
Street/Lot – Upper No.	-
Street Name	Namatjira
Street type (for example road, court)	Drive

[1] Steven Kirsanovs is an approved person accredited under the South Australian, Victorian and Western Australian Auditor schemes.

Street suffix (for example, North, South	-
Suburb	Mount Zeil
Postcode	0872
GIS Coordinate of Site centroid	E.g., GDA94 – Latitude/Longitude in decimal degrees
Latitude (GDA94)	-23.68516 S
Longitude (GDA94)	132.67346 E
Site area (in square metres)	71,800m^2 (area of Portion 830, noting the actual investigation area is only a small part of this land parcel)
Plan of site/premises/location showing the audit site boundary attached	Included in Appendix A and the annexures to the Audit Statement
Members and categories of support team utilised	-
Further works or requirements	Groundwater Quality Management Plan (GQMP) to be implemented as per Audit Statement recommendations.
Nature and extent of continuing risk	Risk of harm or detriment to land, surface water and groundwater o Land. The information reviewed indicates there has been some degree of harm arising from the activities to the land in the immediate vicinity of the former tanks and bowsers. As noted above, the impacts are relatively localised in the immediate vicinity of the former tanks and bowsers, and are also limited to soils at a depth below approximately 1.5m. o Groundwater. The information reviewed suggests there is unlikely the activities have resulted in any harm to groundwater, although as noted above this will need to be confirmed via some further monitoring. o Surface water. The information reviewed suggests there is unlikely the activities have resulted in any harm to surface water in the Finke River.
Outcome of environmental audit report	The objectives of the audit have been achieved, including assessing the nature and extent of contaminated land, waste, pollution or any activity nature and extent of contamination. This includes impacts at the audit site and also any impacts in adjacent land affected by the audit site. I conclude that the site is suitable for ongoing commercial and recreational open space as currently developed. No further clean up is required for air, land or water at the site, subject to the audit statement recommendations. Recommended have been provided as outlined in the section above to manage:- o Risks of harm to human health and the environment; and o Ccontaminated land, waste, pollution or activity Land use suitability has been confirmed for the proposed for ongoing use (see below).
Land use suitability	Suitable for the ongoing use as proposed subject to compliance with recommendations in the Audit Statement

<table>
<tr><td>Has groundwater cleanup been undertaken as far as reasonably practicable?</td><td>Yes</td></tr>
<tr><td>Does groundwater contamination remain at the site and is the site the source?</td><td>The Site is a source of petroleum hydrocarbon impacts within soils. One round of groundwater monitoring has been undertaken following adequate development of the installed groundwater monitoring wells and does not indicate groundwater petroleum hydrocarbon impacts. As stated within the audit report, additional groundwater monitoring is proposed under a groundwater management plan to confirm the results obtained to date.</td></tr>
<tr><td>If groundwater contamination remains, does it extend off-site?</td><td>No.</td></tr>
<tr><td>Is a GQRUZ recommended?</td><td>Not applicable.</td></tr>
<tr><td>If applicable, please indicate which of the following are threatened environmental values of groundwater</td><td>For example, site-sourced and regional pollution.
<table>
<tr><td>Water dependent ecosystems and species</td><td>No*</td></tr>
<tr><td>Potable water supply (desirable)</td><td>Lead (considered likely to be anomalous and will need to be checked via further monitoring)</td></tr>
<tr><td>Potable water supply (acceptable)</td><td>Lead (considered likely to be anomalous and will need to be checked via further monitoring)</td></tr>
<tr><td>Potable mineral water supply</td><td>NA</td></tr>
<tr><td>Agriculture and irrigation (irrigation)</td><td>NA</td></tr>
<tr><td>Agriculture and irrigation (stock watering)</td><td>No</td></tr>
<tr><td>Industrial and commercial use</td><td>No</td></tr>
<tr><td>Water-based recreation (primary contact recreation)</td><td>No</td></tr>
<tr><td>Traditional Owner cultural values</td><td>NA</td></tr>
<tr><td>Buildings and structures</td><td>No</td></tr>
<tr><td>Geothermal properties</td><td>NA</td></tr>
</table></td></tr>
<tr><td>Is ongoing groundwater monitoring required?</td><td>Yes</td></tr>
<tr><td>Is ongoing vapour/gas monitoring required</td><td>No</td></tr>
<tr><td>Are vapour/gas mitigation measures required</td><td>No</td></tr>
<tr><td>List any other ongoing management requirements if applicable</td><td>No other measures from those listed previously in this summary.</td></tr>
</table>

*threatened on-site only – not threatened off-site at point of nearest surface water receptor

Table 2: Physical Site information

Current EPA permission/s and related permission ID if applicable	Not applicable.
Historical land use	Traditional owners / custodians – Western Arrarnta people Post European history includes pastoral use and since then a tourism / accommodation lodge with fuel station.
Current land use	Accommodation / tourism facility
Proposed land use	Accommodation / tourism facility
Current land use zoning	No Zone
Proposed land use zoning	No Zone
Surrounding land use – north (if applicable)	The Site is surrounded by the Tjoritja / West MacDonnell National Park. The land portions within the National Park surrounding the site are Aboriginal Land (scheduled under ALRA) owned by the Tyurretye aboriginal land trust.
Surrounding land use – south (if applicable)	
Surrounding land use – east (if applicable)	
Surrounding land use – west (if applicable)	
Has EPA been notified about the site under Section 40 of the Environment Protection Act 2017? [2]	Not applicable
Nearest surface water receptor – name	Finke River.
Nearest surface water receptor – direction	south.
Nearest surface water receptor – distance (m)	120m.
Likely point of groundwater discharge	Finke River The Finke River wraps around the western and southern boundary of the site, flowing from north to south, and the Glen Helen Gorge is approximately 450m southeast of where the fuel tanks were formerly located. The Finke River is an ephemeral watercourse which flows for short periods following significant rainfall events, with waterholes adjacent to the site where surface water remains for some time after river flows cease. The Glen Helen Gorge, located downstream from the site, is a permanent waterhole.
Site aquifer formation	Florina Formation: Fractured and karstic limestone, locally cavernous (per NT aquifer map – Appendix J of LES, 8 December 2021).
Groundwater flow direction	South / southwest
Groundwater TDS range (mg/L)	1,220-3,201mg/L (per nearby groundwater bores information in Table 1 of 8 December 2021).
Groundwater Segment	B
Are there multiple aquifers impacted by pollution at the site	No.

[2] Section 40 refers to a duty to notify EPA of notifiable contamination. Further information in relation to this can be found in EPA Publication 2008: Notifiable contamination guideline: Duty to notify of contaminated land.

Perched groundwater depth – upper [metres below ground level (mbgl)]	-
Perched groundwater depth – lower (mbgl)	-
Regional groundwater depth – upper (mbgl)	5.2
Regional groundwater depth – lower (mbgl)	6.1
Number of bores within 2km	2
Closest extractive use (distance in m)	The current groundwater bore used to supply water to the Glen Helen Lodge is bore RN016944, adjacent to Namatjira Drive, about 1,140m northeast of the fuel systems.
Zone of groundwater plume influence (m from site boundary)	Not applicable
Year groundwater last monitored	2023

ENVIRONMENTAL AUDIT STATEMENT

Environmental audit statement

Under Part 8.3 of the *Environment Protection Act 2017*

Publication F1032 published September 2021

The purpose of an environmental audit is:

a) to assess the nature and extent of the risk of harm to human health or the environment from contaminated land, waste, pollution or any activity; and
b) to recommend measures to manage the risk of harm to human health or the environment from contaminated land, waste, pollution or any activity; and
c) to make recommendations to manage the contaminated land, waste, pollution or activity.

This statement is a summary of the findings of an environmental audit conducted under Part 8.3 of the *Environment Protection Act 2017* for:

Glen Helen Lodge, 8495 Namatjira Drive, Mount Zeil, NT

Further details are provided in the environmental audit report that accompanies this statement.

Section 1: Environmental audit overview

Environmental audit ID number:	NTEPA2021/0004-270

Environmental auditor details

Name:	Steven Jon Kirsanovs
Company:	Kirsa Environmental
Address:	PO Box 1243 Unley SA 5061
Phone:	08 8271 9025
Email:	stevek@kirsaenv.com.au

Site owner or occupant

Name:	Discovery Parks
Company:	Beston Parks Land Co Pty Ltd (ACN 111 783 423)

Environmental auditor engaged by

Name:	Cameron Miller
Company:	Ngurratjuta/Pmara Ntjarra Aboriginal Corporation
Relationship to site owner:	Authorised representative of the former site owner

Reason for the environmental audit

☐ Requirement under the *Planning and Environment Act 1987* (e.g. planning permit)
No details of planning permit provided

☐ Requirement under the *Environment Protection Act 2017* (e.g. remedial notice or licence)

☐ Requirement under other legislation

☒ Other

Requirement of Notice issued under S48(1) of the *Waste Management and Pollution Control Act* (NT) 1998 (dated 26 August 2021)

Section 2: Environmental audit scope

Details of the site in respect of which the environmental audit was conducted

Site/premises name:	Glen Helen Lodge
Address:	8495 Namatjira Drive, Mount Zeil 0872
Title details:	NT Portion 830 from Plan A 000315 (CUFT Volume 849 Folio 156)
Area (m^2):	71,800m^2 (area of Portion 830, noting the actual investigation area is only a small part of this land parcel)

☒ a plan of the site is attached

Use or proposed use for which the site is being audited

Sensitive land use categories

Note that sensitive land uses in the *Environment Reference Standard* (ERS 2021) are categorised as lower and high density. Lower density is where there is generally substantial access to soil and high density is restricted to developments that make maximum use of available land space, and there is minimal access to soil. For planning purposes, the *Ministerial Direction No.1* (MD No.1) considers secondary schools and children's playgrounds to be sensitive land uses.

☐ High density

☐ Other (lower density)

☐ Residential land use
☐ Child care centre
☐ Pre-school
☐ Primary school
☐ Secondary school

☐ Children's playground (indoor)
☐ Children's playground (indoor)

Other land use categories

☒ Recreation/open space
☐ Parks and reserves
☐ Agricultural
☒ Commercial
☐ Industrial
☐ Other land uses not captured by the above as described here:

Elements of the environment assessed in the environmental audit

☒ Ambient air
- ☐ all environmental values were considered
- ☒ all environmental values other than the following were considered.
  - Life, health and well-being of other forms of life, including the protection of ecosystems and biodiversity
  - The useful life and aesthetic appearance of buildings, structures, property and materials;

- Climate systems that are consistent with human development, the life, health and well-being of humans, and the protection of ecosystems and biodiversity.

☐ Ambient sound
- ☐ all environmental values were considered
- ☐ all environmental values other than the following were considered:

☒ Land
- ☐ all environmental values that apply to the land use category were considered
- ☒ all environmental values that apply to the land use category, other than the following, were considered:
  - Production of food, flora and fibre.

☒ Water
- ☐ Surface water
  - ☐ all environmental values that apply to the applicable segment were considered OR
  - ☐ all environmental values that apply to the applicable segment, other than the following, were considered:
- ☒ Groundwater
  - ☒ all environmental values that apply to the applicable segment were considered OR
  - ☐ all environmental values that apply to the applicable segment, other than the following, were considered:

Standards and reference documents considered

NT Guidance / references:-

- Waste Management and Pollution Control Act (NT) 1998
- Tjoritja / West MacDonnell National Park Joint Management Plan (NT Parks & Wildlife commission, NT government, March 2018)
- NT EPA, Northern Territory Contaminated Land Guideline, June 2017.

National guidance / references:-

- National Environment Protection (Assessment of Site Contamination) Measure (NEPC 1999, as amended 2013) ("the ASC NEPM")
- Australian Government 2018, *Charter: National Water Quality Management Strategy*, Department of Agriculture and Water Resources, Canberra, March. CC BY 3.0
- The Australian drinking water guidelines (as updated from time to time)
- The Australian and New Zealand Guidelines for Fresh and Marine Water Quality
- The Guidelines for managing risks in recreational water

Victorian guidance / references:-

- Environment Reference Standard 2021 ("the ERS")
- Environmental auditor guidelines for appointment and conduct (EPA publication 865)
- Environmental auditor guidelines – Provision of environmental audit statements and reports for environmental audits and preliminary risk screen assessments (EPA publication 2022)
- Guidelines for conducting environmental audits (EPA publication 2041)
- Guideline on clean up and management of contaminated groundwater (EPA publication 2001)
- Assessing and controlling contaminated land risks: a proposed guide to meeting the duty to manage for those in management or control of land (EPA publication 1977)
- Contaminated land: understanding section 35 of the Environment Protection Act (EPA publication 1940)

Assumptions made during the environmental audit or any limitations

None.

Exclusions from the environmental audit and the rationale for these

The following elements of the environment and environmental values specified in the ERS were excluded:-

Ambient air

- All environmental values excluded.

Rationale / Justification
The only EVs considered relevant for this contaminated land audit were those relating to human health, and 'local amenity and aesthetic enjoyment' and 'visibility'. These were considered in the assessment of the land segment.

Ambient sound

- All environmental values excluded.

Rationale / Justification
All the EVs for this element were excluded as they were not considered relevant for this particular audit (contaminated land and suitability of land).

Water (surface water)

- All environmental values excluded.

Rationale / Justification
All the EVs for this element were excluded as there are no surface water bodies on the audit site. Surface water bodies offsite (Finke River and Glen Helen Gorge) are assessed as a part of groundwater impacts (i.e. impacts arising from groundwater discharge to the nearest surface water).

Water (groundwater)

- No exclusions. All environmental values that apply to the applicable segment were considered.

This statement is accompanied by the following environmental audit report:

Title:	Environmental Audit Report, Glen Helen Lodge 8495 Namatjira Drive, Mount Zeil, NT
Report no:	Audit No.NTEPA2021/0004-270
Date:	30 November 2023

Section 3: Results and recommendations of the environmental audit

Land use suitability

Based on my assessment of the site in relation to the risk of harm to human health or the environment from contaminated land, waste or pollution, I am of the opinion that the site is suitable for the following land uses if the recommendations I have made in this statement are complied with:

Sensitive land use categories

Sensitive land use categories

~~☐ High density~~

~~☐ Other (lower density)~~

~~☐ Residential land use~~
~~☐ Child care centre~~
~~☐ Pre-school~~
~~☐ Primary school~~
~~☐ Secondary school~~

~~☐ Children's playground (indoor)~~
~~☐ Children's playground (indoor)~~

Other land use categories

☒ Recreation/open space
~~☐ Parks and reserves~~
~~☐ Agricultural~~
☒ Commercial

- ☐ ~~Industrial~~
- ☐ ~~Other land uses not captured by the above as described here:~~

Results of the environmental audit

The audit was required to satisfy conditions of a notice to carry out an environmental audit program issued by the NT EPA pursuant to Section 48(1) of the Waste Management and Pollution Control Act 1998) (referred to hereon as "the s48 Notice").

The audit provides an independent review of the information relating to the assessments, remediation and validation works completed and specifically to address the requirements for the audit as specified in the s48 Notice reproduced below:-

a. determine the type, amount and distribution and mobility of contaminants and wastes present in the environment resulting from the activities;

b. determine the risk of any possible harm or detriment to the land, surface water and groundwater environments as a result of identified contamination;

c. where a risk of any possible harm or detriment to a segment of the environment has been determined in requirement b above, recommend any further assessment, risk analysis (human health or ecological) or remedial measures necessary to reduce the risk to an acceptable level; and

d. include an indicative implementation timetable for any recommended clean-up and/or management works referred to in requirement c

It is noted the s48 Notice specifically relates to impacts associated with underground petroleum products storage and dispensing in a specific area of the property, and that is what has been considered as "the activities" referred to in item a. above. Various other potentially contaminating activities have been identified at the Glen Helen Lodge site such as above ground fuel storage / dispensing in other parts of the site, landfilling and wastewater / effluent treatment and disposal but these are specifically excluded from this audit as they were not required to be considered as part of the s48 Notice.

The objectives of the audit have been achieved, including determining the type, amount and distribution and mobility of contaminants and wastes present in the environment resulting from the activities, and associated risks of harm.

I conclude that the site is suitable for ongoing commercial and recreational open space as currently developed.

Further details of the audit outcomes are provided in the following points.

Type amount and distribution of contamination and waste

- The former tanks bowsers and associated pipework relating to "the activities" specified in the s48 Notice were removed in 2021. The information reviewed indicates the contaminants and wastes present in the environment resulting from the activities are limited to residual petroleum hydrocarbon impacts in soils in the vicinity of the former underground fuel storage tanks. The information indicates the impacts are relatively localised, and at a depth below approximately 1.5m.
- There have been no detects of petroleum hydrocarbons reported in groundwater directly beneath the former tanks and bowser area in the latest round of monitoring (May 2023). It is noted there were some trace detects of petroleum hydrocarbon indicators reported in an earlier monitoring phase conducted in late 2021, however those results were not considered reliable due to inadequate development of the monitoring bores and poorly documented records of sampling, as well as the sample handling storage and transport. There has however been some elevated lead detected in groundwater in the latest monitoring, which could be an indicator of fuel related impacts as it was historically

additives to petrol prior to the early 2000s. In our experience it would be unusual for lead to be found at a fuel impacted site without at least some trace of other petroleum indicators, and it is considered likely this might be an anomaly that can be resolved via further monitoring to provide confidence to the NT EPA and other stakeholders that the groundwater has not been impacted by the historical activities.

- There have been no detects of petroleum hydrocarbons reported in the Finke River adjacent to Glen Helen Lodge. Samples have been collected on multiple occasions and there is a high level of confidence in this monitoring.
- There have been petroleum vapour detected in shallow soils in the vicinity of the former tanks and bowsers. A vapour survey has found the impacts dissipate over a relatively short distance from the former tank and bowser area, and does not extend as far as the nearest buildings.

Risk of harm or detriment to land, surface water and groundwater

- Land. The information reviewed indicates there has been some degree of harm arising from the activities to the land in the immediate vicinity of the former tanks and bowsers. As noted above, the impacts are relatively localised in the immediate vicinity of the former tanks and bowsers, and are also limited to soils at a depth below approximately 1.5m.
- Groundwater. The information reviewed suggests there is unlikely the activities have resulted in any harm to groundwater, although as noted above this will need to be confirmed via some further monitoring.
- Surface water. The information reviewed suggests there is unlikely the activities have resulted in any harm to surface water in the Finke River.

Recommendations

a. Building controls. If any buildings (above ground or including basements) are proposed to be constructed either directly above or in the vicinity of the former USTs and bowser area, then this should be subject to further assessment to consider the need (if any) for vapour mitigation measures for those buildings. This requirement should be included in the site's existing management documentation to ensure it is caried forward for future site owners / occupants. Timetable for implementation – to be written into the site's management documentation within 6 months following completion of this audit report.

b. Any subsurface works in the vicinity of the former USTs and bowser area (for example, utility maintenance or installation) should be planned and executed with regard to the possible presence of hydrocarbon impacted soils below approximately 1.5m depth, with an appropriate environmental management plan and health and safety plan in place. This requirement should be included in the site's existing management documentation to ensure it is caried forward for future site owners / occupants. Timetable for implementation – to be written into the site's management documentation within 6 months following completion of this audit report.

c. Groundwater beneath the site is possibly contaminated, based on an evaluation of lead and is potentially not suitable for the environmental value of water-dependant ecosystems and species and potable water. The site is potentially a source of the lead impacts, and the groundwater should not be used without prior testing and review of results by a suitably qualified professional to confirm its suitability for the proposed use. It may be extracted for the purposes of environmental monitoring or remediation.

d. The groundwater management plan (GMP) attached to this audit statement (prepared by Tierra Environment and dated November 2023) should be implemented by the parties listed in that GMP until such time as it determined to no longer be required pursuant to the process outlined in the GMP.

Other related information

e. Some soils at the site may have restrictions in relation to off-site disposal. Any soil proposed to be excavated and disposed off-site after the completion of the audit, should be classified and disposed off-site by the contractor undertaking those works in accordance with relevant NT EPA guidance.

f. Any groundwater monitoring bores installed at the site and offsite should be decommissioned once no longer needed for groundwater assessment and monitoring purposes, in accordance with the requirements of "Minimum Construction Requirements for Water Bores in Australia", published by the Land and Water Biodiversity Committee [most recent version].

Section 4: Environmental auditor's declaration

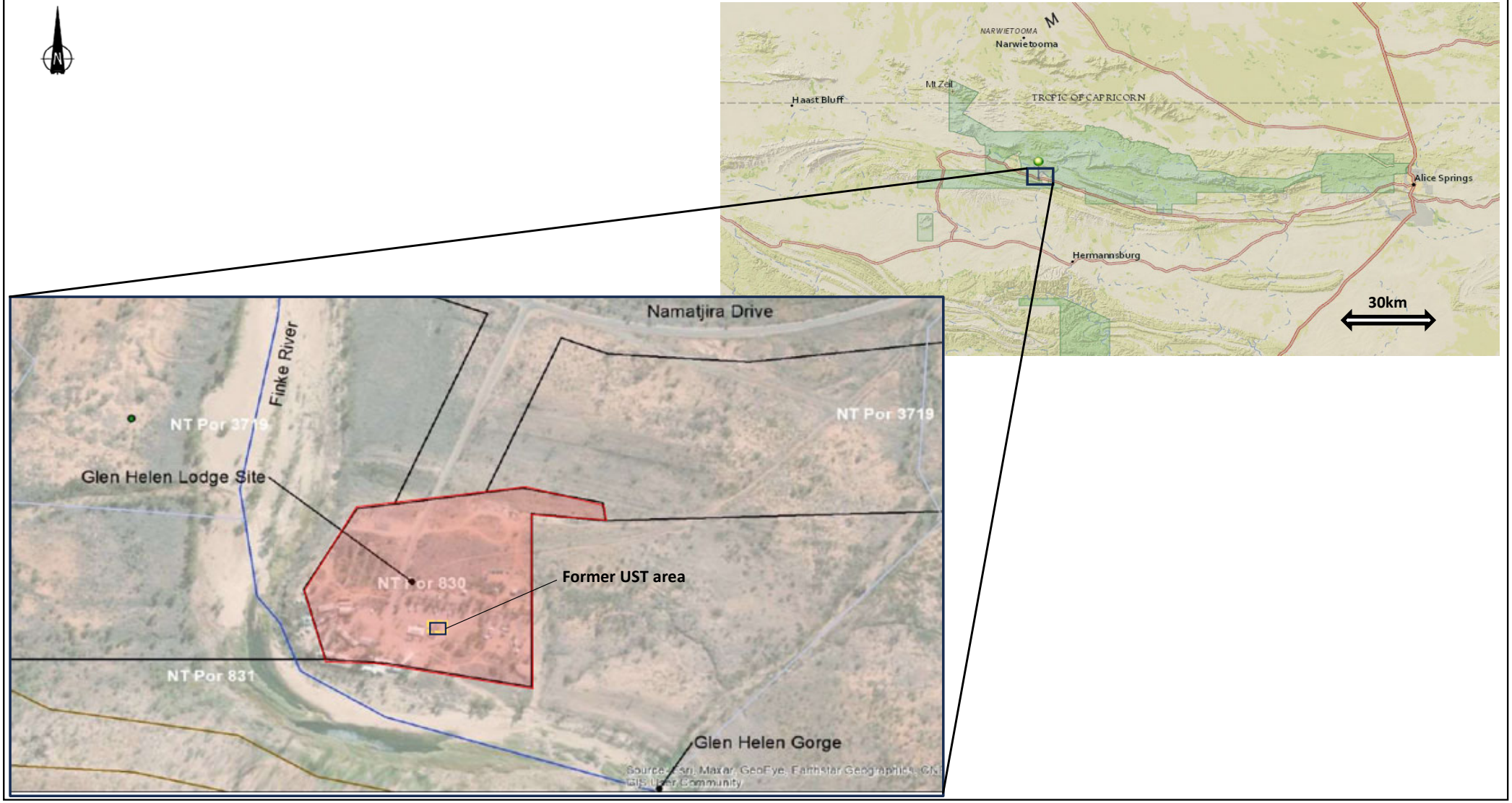
I state that:

- I am appointed as an environmental auditor by the Environment Protection Authority Victoria under the *Environment Protection Act 2017*.
- The information contained in this statement represents a true and accurate summary of the findings of the environmental audit that I have completed.

Date:	30 November 2023
Signed:	
Name:	Steven Jon Kirsanovs
	Environmental Auditor

ANNEXURE 1

AUDIT SITE BOUNDARY



LEGEND

AUDIT SITE BOUNDARY

RKH 30 / 11 / 2023
6179 Rev.01

KIRSA ENVIRONMENTAL

Adapted from:
GeoEye Earthstar Geographic

AUDIT SITE BOUNDARY
8495 Namatjira Drive, Mount Zeil, NT

ANNEXURE 2

GROUNDWATER MANAGEMENT PLAN

Glen Helen Discovery Park

Groundwater Monitoring Plan

Prepared for

Ngurratjuta/Pmara Ntjarra Aboriginal Corporation

28 November 2023

Consulting Engineers and Scientists

Tierra Environment Pty Ltd
ABN 84 111 615 680

PO Box 360
Mitcham SA 5062
08 8373 2512
general@tierra.com.au

Glen Helen Discovery Park
Groundwater Monitoring Plan

Prepared for
Ngurratjuta/Pmara Ntjarra Aboriginal Corporation

28 November 2023

Document Status		Name	Signature	Date
Approved for Issue ✓	Prepared by	Daryl Burrows		28/11/2023
Revision A	Reviewed by	Lauren Harvey		28/11/2023

1 INTRODUCTION

1.1 General

This Groundwater Monitoring Plan (GMP) has been prepared by Tierra Environment (Tierra) on behalf of Ngurratjuta/Pmara Ntjarra Aboriginal Corporation (NPNAC). It provides details of proposed groundwater monitoring events (GMEs) and associated assessments in the vicinity of now removed underground storage tanks (USTs) that were used for fuel storage at a holiday accommodation facility at 8495 Namatjira Drive Mount Zeil, Northern Territory.

A plan showing the location of the site is provided as Figure 1 in Appendix A.

The site subject to monitoring activities is as follows:

Description	Glen Helen Discovery Park
Address	8495 Namatjira Drive Mount Zeil
Area	71,800m^2
Certificate of Title	CUFT Volume 849 Folio 156
Plan Reference	NT POR 830
Council	MacDonnell Regional Council
Zoning	No Zone

The site is subject to an environmental audit undertaken by Steve Kirsonovs who is an accredited Auditor in Victoria. As per Section 11.5 of the NT Contaminated Land Guideline, environmental audits are required to be completed in accordance with the State where the Auditor is accredited, therefore groundwater activities and assessments outlined in this document must be undertaken in accordance with the Environment Protection Act (VIC) 2017.

1.2 Current and Future Land Uses

The site is developed for holiday accommodation and tourism but is currently not in use. If operations resume the use is not anticipated to change.

1.3 Previous Investigations

The Glen Helen Discovery Park is currently owned by the G'DAY Group Holdings, the umbrella company for Discovery Parks. Prior to their ownership the site was owned by NPNAC. Before Discovery Parks purchased the site they undertook due diligence investigations at the site. This initially constituted what was referred to by Low Ecological Services (LES – who undertook the work) as a "high level environmental due diligence inspection of the Glen Helen Lodge". From this, two underground storage tanks were identified and because of their age they were flagged as a risk. To address this Discovery Parks commissioned LES to undertake a preliminary site investigation (PSI) which then triggered further investigations and remedial works as detailed below.

Discovery Parks Glen Helen Lodge Preliminary Site Investigation for Fuel Leakage from UPSSs, 25 February 2021 – Low Ecological Services

The scope of work of this investigation was as follows:

- Desktop review to understand the site environment context and fuel systems history.
- Determine the locations of underground fuel storage tanks and infrastructure on the site.
- Sample soils adjacent and beneath the two underground fuel tanks and collect soil samples at various depths down to below the base of the tanks.
- Test all soil samples on-site for the presence of fuel vapours using a portable photo ionisation detector (PID).

- Select representative soil samples based on location, depth, and PID vapour concentrations and have them laboratory analysed for the presence of hydrocarbons and heavy metals.

LES concluded that there is fuel contamination of soil in the immediate vicinity of both UST's down to a rocky layer at approximately three metres. LES concluded that the results,

"*indicate that fuel in the soil surrounding the tanks is at sufficient concentration to potentially pose an ecological risk in this area of ecological significance. There are minimal risks to human health from the contaminated soils due to the open location."*

From this LES recommended,

"*Additional sampling and testing is required to determine the lateral and vertical extents of contamination from both underground fuel systems to assess the risks that the contamination poses, and develop a remediation or management strategy."*

Glen Helen Lodge Ngurratjuta/Pmara Ntjarra Aboriginal Corporation Underground Petroleum Storage System's Fuel Contamination Detailed Site Investigation (DSI), 8 December 2021 – Low Ecological Services

To resolve the fuel contamination risks prior to settlement of the property sale NPNAC contracted Territory Electrical to remove the UST's and the associated infrastructure and for LES to further delineate the extent and nature of contamination. The following scope of work was undertaken:

- Desktop review to understand the site environment context and fuel systems history.
- Sample soil from the walls and base of each of the fuel tank pits after removal of the fuel systems.
- Sample soil excavated from the pits and stockpiled during tank removal works.
- Sample soils from the greater perimeter of the two (2) underground fuel tanks at various distances and depths to determine the extent of fuel migration from the source.
- Test all soil samples on-site for the presence of fuel vapours using a portable PID.
- Select representative soil samples based on location, depth, and PID vapour concentrations and have them laboratory analysed for the presence of hydrocarbons and heavy metals.
- Remove all contaminated excavated soil from site.
- Sample and analyse excavated soil to determine level of contamination.
- Dispose of excavated soil appropriately (TRH > 1000mg/kg = Adelaide Cleanaway, TRH < 1000mg/kg = Alice Springs Landfill).
- Backfill tank pits with clean imported material and install perforated vent pipes for aeration purposes.
- Deploy 6 passive diffusion samplers in 1.5m deep soil bores in varying locations around the backfilled tank pits and nearby buildings and have the samples analysed by the laboratory to confirm there is not a vapour risk for buildings.
- Sample shallow groundwater adjacent to the Finke River and have the samples analysed by the laboratory to confirm hydrocarbons have not migrated to the Finke River waterhole.
- Assess the risks of identified contamination and consider remediation options.

LES concluded the following:

- Migration of hydrocarbon contamination off site is not occurring.
- There is no evidence of contamination beyond the pits.
- The source of the fuel leak has been removed.
- The consistent layer of bedrock at ~2.7 mbgl and the clay soils will limit further migration of the residual hydrocarbon contamination. Hence the ecological risk is negligible.
- There is no risk to human health from the residual in-situ contaminated soil in the open car park area in which the tank pits are located. This was confirmed in the soil vapour sampler results having low vapour readings that would not pose health risks to persons inside nearby buildings.

- The lateral and vertical extent of the residual localized contamination will not pose a risk to human health, the environment, or management of the site, given that the current and proposed medium-term future use of this area within the site as a carpark and lawn area.

Glen Helen Lodge Discovery Parks Fuel Contamination from Underground Petroleum Storage System: Investigation and Remediation Report, March 2022 – Low Ecological Services

Key findings of this report are as follows:

- Ngurratjuta Aboriginal Corporation commissioned Territory Electrical and Refrigeration (Territory Electrical) to examine the fuel system for leaks in February 2021. This resulted in Low Ecological Services (LES) being engaged by Territory Electrical to undertake a Preliminary Site Investigation (PSI) of fuel contamination in the soil surrounding the UPSS. The PSI showed hydrocarbon contaminated soils by use of minimally invasive hand auguring around the underground tanks.
- Phase 2 of the DSI with the drilling rig, found bedrock was less than 3.5 mbgl, no water table was present, a levy bank (likely based on rock) formed a geological gully around the tank pits, fuel contaminated soil was localized to the diesel and Opal fuel tank pits and immediate surrounds and the contamination did not extend to drill hole sample points, which were drilled down to bedrock, located 6m to 90m downslope of the UST pit area, along the natural drainage line.
- Due to the ecological sensitivity of the area, in July 2021, the NT EPA issued a s48 Notice requiring the investigations, remediation and validation works to be completed under an environmental audit program under the relevant provisions of the Waste Management and Pollution Control Act 1998.
- The WMS soil vapour results indicated that there is no vapour intrusion risk to people occupying the nearby buildings or to invasive maintenance workers and the groundwater sample analysis detected no levels of hydrocarbons above LOR indicating that the hydrocarbon contamination had not migrated into the Finke River.
- The diesel and petrol pits were lined and backfilled with clean imported soil. A perforated vent pipe system, designed by LES and agreed upon by Mr Kirsanovs (Auditor), was installed in both pits to increase aeration and natural remediation of the soil at the bottom of the pits.
- The findings from each phase of this investigation prove that the migration of hydrocarbon contamination off site is not occurring. There is no evidence of contamination beyond the pits, all proximal soil and water samples were uncontaminated. The source of the fuel leak has been removed, pits have been lined, the consistent layer of bedrock at ~2.7 mbgl and the clay soils will limit further migration of the residual hydrocarbon contamination. Hence the ecological risk is negligible. Furthermore, there is no risk to human health from the residual in-situ contaminated soil in the open car park area in which the tank pits are located, given the contaminated soil is deeper than 1.2 m below the ground surface.
- Thus, the findings of this investigation show that the lateral and vertical extent of the residual localized contamination will not pose a risk to human health, the environment, or management of the site, given that the current and proposed medium-term future use of this area within the site as a carpark and lawn area as agreed upon by the new land owners, Discovery Parks.

Glen Helen Lodge Discovery Parks Fuel Contamination from Underground Petroleum Storage System: A Progress Update Report, January 2023 – Low Ecological Services

This report appears to be an uncompleted draft version. A summary of the key points from the draft report is provided below. It should be noted that the final version of this report should be reviewed once its completed.

A review of the draft report found:

- LES installed 4 groundwater monitoring wells in May 2022.
- Soil samples were collected during the drilling of the wells and analysed for TRH, BTEX and metals. Concentrations of TRH were detected in soil sample MW1-6m. TRH was not detected in the lower sample for this well (MW1-10m).

- Groundwater monitoring was undertaken on 11 November 2002 however due to the recent placement of gravel in the area only well MW1 could be found.
- During the site visit on the 11 November sheen was observed on the surface of the Finke River. Black soil in the river was also observed. A sample of the soil was collected and analysed for metals, TRH and BTEX. Results for TRH and BTEX were less than the limits of reporting.
- LES returned to the site on the 15 November and found all four wells. All wells were subsequently sampled and samples analysed for TRH and BTEX. All wells reported concentrations of TRH above the limits of detection with the highest concentrations reported in MW4. BTEX was also detected in MW2 and MW4.
- Another round of monitoring was undertaken in December 2022. Approximately 80L to 100L were bailed from the wells (assuming collectively) before the wells were left to recover and sampled.
- Concentrations of TRH and BTEX were less than the limits of reporting in MW1 and MW3 while concentrations of TRH and BTEX were detected in MW2 and MW4.
- The report concluded that additional development of the wells should be undertaken, sampling should be undertaken using hydra-sleeves and that monitoring should continue biannually (one event in wet season and one in dry season) for the next three years.

Glen Helen Discovery Park, Groundwater Monitoring Event May 2023, July 2023 – Tierra Environment

This report documented the development, sampling and analysis of three existing groundwater wells at the Glen Helen Discovery Park as well as the sampling and analysis of two surface water samples from the nearby Finke River.

As there were some uncertainties whether the wells were adequately developed when originally installed Tierra undertook development prior to purging and sampling activities. Approximately 115L, 80L and 70L of water and sediment were removed from wells MW1, MW3 and MW4 respectively with 6m, 3.1m and 4.3m of sediment removed.

Light non-aqueous liquid (LNAPL) was not identified in any of the wells during gauging and similarly discolouration, sheen or hydrocarbon odours were not observed during purging and sampling activities. From gauging activities groundwater flow was found to be to the south south-west towards the Finke River which is located approximately 100m to the south.

Laboratory analysis of groundwater and surface water samples did not detect TRH, BTEX or MTBE above the laboratory's limits of reporting. Concentrations of lead were detected in the three groundwater wells exceeding ANZG 99% fresh water criteria and the lead concentration in one well also exceeded ADWG criteria. Lead was not detected above the limits of reporting in the surface water samples.

The CSM identified that it is unlikely that a complete exposure pathway exists between the identified potential chemicals of concern and human receptors, assuming that groundwater is not extracted for use.

Risks to the Finke River are expected to be acceptably low as there appears to be only remnant concentrations of lead in the groundwater near the tank locations (now removed). As there has only been one sampling event where lead was analysed it is not clear if it is associated with the tanks or naturally occurring variability.

Recommendations from the report included the development of a groundwater quality monitoring plan and groundwater monitoring over a 12 month period taking into account the climate and expected seasonal variation.

1.4 Objectives

The objectives of the monitoring programs detailed in this report are as follows:

- To assess if petroleum hydrocarbons associated with a leak from a former UST are present in the groundwater.
- To assess if seasonal variability impacts on concentrations of contaminants in the groundwater.
- To assess whether lead concentrations are attributable to the USTs or is naturally occurring.

- To assess if the groundwater poses a risk to human or environmental health.

The GMP also establishes a means for administering and managing groundwater related risks and providing mechanisms whereby additional management measures or remedial action could be implemented, in the event of unacceptable risks to human health and the environment in the future.

1.5 Roles and Responsibilities

Current site owner	Beston Parks Land Co Pty Ltd (ACN 111 783 423), trading as Discovery Parks Responsibilities – to allow access for monitoring activities under this GMP and to ensure the monitoring bores are maintained in suitable working condition.
Former owners	Ngurratjuta/Pmara Ntjarra Aboriginal Corporation Responsibilities – implementation of the monitoring program outlined in the GMP.
Environmental consultant	Tierra Environment – Daryl Burrows Responsibilities - undertaking and reporting on groundwater monitoring activities, making amendments to the GMP as necessary, and making recommendations at the appropriate time when it is considered monitoring under the GMP should cease.
Auditor	Kirsa Environmental – Steven Kirsanovs Responsibilities - review of environmental investigations, preparation of Audit Report, reporting to the NT EPA, review of reporting under this GMP, review and approve amendments to the GMP as may be required and recommendations to the NT EPA whether or not the monitoring program should cease.
NT EPA	-

1.6 Changes to the GMP and Review

This Groundwater Monitoring Plan applies for 12 months. After 12 months this plan will be reviewed and subject to confirmation from the Auditor monitoring at the site can be ceased. Changes to the plan can be made prior to the 12 months subject to Auditors input.

1.7 Content

This GMP provides the following information:

- locations proposed to be used for monitoring
- monitoring scopes and frequencies
- sampling and reporting protocols
- triggers which would determine the need for further investigations, risk assessments and remediation activities
- an outline of additional measures (included in a contingency plan) to be implemented if risks to public health and the environment were to exist

2 GROUNDWATER MONITORING PROGRAM

2.1 Well Locations

The locations of groundwater wells to be used for the monitoring activities are shown on Figure 2 in Appendix A.

The monitoring bores shall be provided with surface completions/covers in accordance with relative state and national guidelines. Ideally these should be metal and flush mounted to enable protection of the monitoring bores, and easy location of monitoring bores for future GMEs. This should be a priority item to be addressed as part of the first GME scheduled under this GMP.

These wells shall be maintained throughout the duration of required groundwater monitoring, unless it is determined in the course of future monitoring that select wells may no longer be required. In the event of a well becoming damaged an attempt to repair should be made. If a damaged well or other requires removal, the well shall be decommissioned and a replacement monitoring well shall be installed within 2m of the original well location.

Wells proposed to be used for groundwater sampling are as follows:

Well No	Rationale for use
MW1	The well is located in the potential source area between the two former tank pits.
MW3	The well is likely a background well located up hydraulic gradient from the former tank pits. TRH was also previously detected in this well in November 2022.
MW4	The well is likely a background well located up hydraulic gradient from the former tank pits. Elevated concentrations of TRH and BTEX were also reported in this well in November and December 2022.

2.2 Monitoring Frequencies

The following shall be undertaken:

- commencement in 2024
- biannual GMEs over a 12 month period (ideally in February/March and August/September)

Well/sampling location No	Frequency of use
MW1, MW3 and MW4	All monitoring events
MW2	Attempt to locate, redevelop and monitor during all monitoring events
FR1 and FR2	All monitoring events

2.3 Standards and Guidelines

All groundwater monitoring shall be undertaken in accordance with the following documents:

- Northern Territory of Australia Water Act 1992
- Northern Territory of Australia Water Regulations 1992
- Northern Territory of Australia Waste Management and Pollution Control Act 1998
- Environment Protection Act 2017 (Vic)
- Environment Reference Standard, Victoria Government Gazette No. S 245 (26 May 2021)
- Environment Protection Authority Victoria, Groundwater Sampling Guidelines, Publication 669.1, February 2022
- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018 (ANZG)
- Australian Drinking Water Guidelines 2011 (ADWG)

- Amended National Environment Protection (Assessment of Site Contamination) Measure 1999
- AS5667.1-1998: Water quality – Sampling, Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples
- AS5667.11-1998: Water quality – Sampling, Guidance on sampling of groundwaters

Groundwater monitoring will be undertaken as per the Sampling and Analysis Quality Plan presented in Appendix B which meets the requirements of the ASC NEPM 1999, Schedule B2 Section 5.

2.4 Field Parameters

During each monitoring round the following field information shall be reported:

- presence/absence of phase separate petroleum hydrocarbons
- depth to groundwater level and depth to the base of well, measured from a designated point in each well; groundwater levels shall be gauged in one dedicated event
- groundwater purging records such as purging duration, purging rate, and groundwater quality records (observations such as water colour, odour, turbidity and sheen)
- groundwater field parameters during purging (pH, electrical conductivity, redox, dissolved oxygen and temperature)

2.5 Contaminants of Concern

The analytical program shall include the following parameters: TRH, BTEXN, MTBE and Pb

These have been selected as the appropriate indicators of fuel related impacts to be included in this monitoring program.

2.6 Sampling and Laboratory QA/QC

The procedures for field sampling undertaken at the site shall be in compliance with ASC NEPM 1999 guidelines and AS5667.1 – 1998.

The following quality control sampling and analytical analysis shall be undertaken per monitoring event:

- one intra-laboratory and one inter-laboratory duplicate for each round of monitoring shall be collected and analysed; duplicates shall be analysed for the same range of analytes as the primary sample
- one equipment rinsate and one field blank shall be collected and analysed for each day of monitoring; rinsate and field blank samples shall be analysed for the same range of analytes as the primary sample
- one trip blank shall be utilised and analysed for BTEXN and TRH C_6 - C_9

2.7 Analytical Procedures

The analytical methods shall comply with industry standards such as USEPA, APHA, or equivalent methods. These shall be stated by the laboratories as part of their reporting procedures. All laboratories must be NATA endorsed for the analyses undertaken.

The laboratories shall implement quality assurance programs including the analyses of internal spikes duplicates and method blanks. Certificates of analysis received from the primary and secondary laboratories shall be provided for each round of monitoring.

Laboratory limits of reporting shall be at or below the values provided below:

Parameter	Limits of Reporting (mg/L)
TRH	0.02 (C_6-C_{10}), 0.05 (>C_{10}-C_{16}), 0.1 (>C_{16}-C_{34}/>C_{34}-C_{40})
BTEXN	0.001 (BTE), 0.003 (X), 0.01 (N)
MTBE	0.001
Pb	0.001

3 PERFORMANCE EVALUATION

3.1 Required evidence

The 2023 monitoring event did not identify TRH, BTEX or MTBE in the groundwater. Lead was detected however above ANZG 99% freshwater criteria of 0.001mg/L in all wells and above ADWG criteria of 0.01mg/L in MW3.

The objective of proposed monitoring activities is to demonstrate a continuation of no detectable TRH, BTEXN or MTBE and consistent lead concentrations. For this purpose the following lines of evidence will be used:

Line of evidence	Associated monitoring activities
There is no TRH, BTEXN or MTBE	Monitoring of groundwater wells to demonstrate TRH, BTEXN and MTBE are not present in any well or the Finke River
Pb is consistent with previous rounds	As lead can be naturally occurring lead should be consistent with previous rounds of investigation

3.2 Response to monitoring results

In the event of reported concentrations of tested analytes not confirming to the lines of evidence listed above, contingency measures outlined in Section 4 shall be implemented and the Site Contamination Auditor notified.

In the event of reported concentrations of tested analytes exceeding ASC NEPM groundwater HSLs for vapour intrusion provided in ASC NEPM Schedule B1 Table 1A(4), contingency measures outlined in Section 4 shall be implemented and the Site Contamination Auditor notified.

In the event of evidence of changes in land uses or groundwater uses occurring and adversely affecting the monitoring approach (e.g. groundwater extraction altering the direction of groundwater flow), contingency measures outlined in Section 4 shall be implemented and the Site Contamination Auditor notified.

3.3 Reporting

Groundwater monitoring data shall be reported 4 weeks after the second biannual monitoring event unless triggers are exceeded in the first biannual event. A report shall be provided to NPNAC and the Auditor. The report shall provide the following:

- the scope of monitoring works
- sampling and analytical procedures
- collected field data and field logs
- chain-of-custody forms
- certificates of laboratory analyses
- tabulated data of groundwater depths and levels
- tabulated results of measured field parameters
- tabulated analytical results
- an assessment of data quality using the data quality objectives set contained in AS4482.1-2005
- a plan showing potentiometric groundwater contours
- an evaluation of the direction of groundwater movement
- a plan showing wells with TRH and BTEX concentrations exceeding laboratory reporting limits and a time series comparison with previous rounds of monitoring
- an evaluation of the spatial and temporal distribution of contaminants of concern
- an assessment of generated data against ASC NEPM groundwater HSLs and ANZG 99% freshwater criteria
- recommendations for future actions, e.g. implementation of contingency measures

4 CONTINGENCY MEASURES

4.1 General

As identified in Section 3.2 contingency processes may need to be implemented. This typically includes increased monitoring, additional assessments and possibly active remediation to protect receptors if necessary. Contingency measures should be flexible enough to allow for the incorporation of new information about site risks and technologies as these become available over time.

A contingency plan provides a set of measures to be applied to protect human health and the environment. A five stage approach for contingency measures is proposed in the event of reported concentrations of tested analytes not confirming the lines of evidence listed in Section 3.1, or exceeding ASC NEPM groundwater HSLs for vapour intrusion or ANZG 99% freshwater criteria or in the event of known changes to land or groundwater uses affecting the natural attenuation approach.

Activities associated with contingency measures shall be undertaken by a suitably qualified and experienced environmental consultant with input from the Site Contamination Auditor (refer also to Section 1.5).

4.2 Stage 1 Contingency Measures – Repeat Measurements

As the initial response to the need for contingency measures the most recent groundwater monitoring event should be repeated as soon as practicable. If the measurements which triggered a Stage 1 response are confirmed, Stage 2 of the contingency measures shall be implemented. Otherwise at least one more monitoring event should be undertaken.

4.3 Stage 2 Contingency Measures – Increase Monitoring Frequency

The sampling frequencies listed in Sections 2.2 shall be increased to add one additional round of sampling 3 months after the round which triggered the Stage 2 response. If the measurements which triggered a Stage 2 response are confirmed, Stage 3 of the contingency measures shall be implemented. Otherwise at least one more monitoring event shall be undertaken.

4.4 Stage 3 Contingency Measures – Data Review

A detailed review of available groundwater data shall be undertaken. This review shall involve:

- historic and current monitoring results
- known aquifer and soil characteristics including soil types, groundwater levels, groundwater movement direction and groundwater movement velocity
- changes in the risk profile to receptors including occupants at the accommodation facility or the Finke River, or uncertainties in the level of risk to these receptors that warrant further consideration

The review shall identify whether observed concentrations are reliable and acceptable, or whether additional information on groundwater will be required.

In the event it is deemed the circumstances have changed sufficiently or there is inadequate information for such decision making, then Stage 4 of the contingency measures shall be implemented.

4.5 Stage 4 Contingency Measures – Additional Assessments

A program of additional investigations and/or monitoring shall be determined in consultation with the Auditor. A scope will take into account the specific uncertainties and information gaps that might have become apparent over the source of the previous monitoring. The scope must consider what if any additional information is required to assess the nature and extent of impacts and associated risks to occupants of the accommodation facility, and to the Finke River.

4.6 Stage 5 Contingency Measures – Remediation

In the event of assessments undertaken during Stage 4 indicating that risks to public health and the environment exist and active remediation is required, a groundwater remediation plan shall be prepared. The remediation options described in the remediation plan(s) will be dependent on the nature and levels of

contaminants reported in groundwater / soil vapour / indoor air, aquifer conditions encountered, environmental receptors to be protected and available technologies.

APPENDIX A
FIGURES

MW1 Groundwater Well - In Service

MW1 Groundwater Well - Out of Service

623 Groundwater level contour (m AHD)

Scale (m)
0 3 6

Notes:

1. The extent of the former tank pits are approximate based on a plan provided by Low Ecological Services.
2. The positon of MW1, MW3 and MW4 is based on a survey. The position of MW2 is approximate and based on a plan provided by Low Ecological Services.
3. Groundwater contours generated by Surfer software with a grid generated using triangulation with linear interpolation.

C:\Users\laurenh\Tierra Environment\Shared - Projects\23\ARZ 23 069\01\Surfer\Fig 1 - Well Locations.srf

Figure 1 - Groundwater Well Locations
Glen Helen Discovery Park
Groundwater Monitoring Plan

Rev A, 24 November 2023

APPENDIX B
SAMPLING AND ANALYSIS QUALITY PLAN

Glen Helen Discovery Park

Groundwater Monitoring Plan

Sampling and Analysis Quality Plan

Prepared for

Ngurratjuta/Pmara Ntjarra Aboriginal Corporation

24 November 2023

Environmental Consultants

Consulting Engineers and Scientists

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Glen Helen Discovery Park
Groundwater Monitoring Plan
Sampling and Analysis Quality Plan

Prepared for

Ngurratjuta/Pmara Ntjarra Aboriginal Corporation

24 November 2023

Document Status		Name	Signature	Date
Approved for Issue	✓	Prepared by: Daryl Burrows		24/11/2023
Revision: A		Reviewed by: Lauren Harvey		24/11/2023

1 INTRODUCTION

1.1 General

This Sampling and Analysis Quality Plan (SAQP) has been prepared by Tierra Environment on behalf of Ngurratjuta/Pmara Ntjarra Aboriginal Corporation ICN for groundwater investigations in the vicinity of former and current underground storage tanks (UST). The aim of these investigations is to further assess the contamination status of the groundwater including any seasonal variability to identify any possible risk to human or environmental health.

1.2 Site Definition

The site subject to investigation comprises of the following:

Description	Glen Helen Discovery Park
Address	8495 Namatjira Drive, Mount Zeil
Area	71,800m^2
Certificate of Title	CUFT 849 Folio 156
Plan Reference	Survey Plan A 000315 NT Por 830
Council	MacDonnell Regional Council
Zoning	No Zone
Owners	G'day Group Pty Ltd

A plan of the site is provided in Appendix A.

General site information is presented in Section 2.1.

1.3 Background

The following assessment reports for the site are available:

- Glen Helen Groundwater Investigation West MacDonnells National Park 1991-1995 – Power and Water, Water Resources Branch May 1996.
- Discovery Parks Glen Helen Lodge Preliminary Site Investigation for Fuel Leakage from UPSSs Low Ecological Services February 2021.
- Glen Helen Lodge Ngurratjuta/Pmara Ntjarra Aboriginal Corporation Underground Petroleum Storage System's Fuel Contamination Detailed Site Investigation (DSI) – Low Ecological Services December 2021. Note this seems to be an uncompleted draft version of the March 2022 report.
- Glen Helen Discovery Parks Fuel Contamination from Underground Petroleum Storage System: Investigation and Remediation Report Low Ecological Services March 2022.
- Glen Helen Lodge Discovery Parks Fuel Contamination from Underground Petroleum Storage System: A Progress Update Report January 2023 – Low Ecological Services.

Steve Kirsanovs of Kirsa Environmental has been engaged as the site contamination auditor. The scope of work and this SAQP will be submitted to the Auditor for review and comment and if required revision prior to commencing works.

1.4 Objectives

This SAQP has been prepared for the implementation of groundwater well development and an additional groundwater monitoring event.

The SAQP is prepared to ensure that the groundwater investigation works for the site are undertaken in accordance with the Amended National Environment Protection (Assessment of Site Contamination) Measure 1999, Schedule B2, Section 5 ("Systematic planning for collection of environmental data").

The SAQP specifies the proposed sampling and analytical testing program and nominates Data Quality Objectives (DQO) and Indicators (DQI) to quantify the precision, accuracy, representativeness, completeness and comparability of the analytical results. The SAQP has been developed with reference to the "7-Step" process outlined in Amended ASC NEPM Schedule B2, Appendix B.

1.5 Dissemination of Information

The following will be implemented to ensure that the content of this SAQP will be available to all relevant staff and stakeholders:

- Endorsement for this SAQP will be sought from the site contamination auditor.
- This SAQP will be read and understood by all field staff prior to works commencing on-site.
- A copy of the document will be retained on site by Tierra staff throughout the field investigations.

1.6 Communications and Workers Health and Safety

The following will be implemented:

- Field staff will carry a mobile phone for communication.
- The field team will carry a first aid kit.
- A Safe Work Method Statement will be prepared for use by site staff.
- Any accident or incident involving or observed by project staff during the course of the investigation will be reported immediately to the site owner or its representative.

1.7 Limitations Applying to the Proposed Investigations

The following limitations may apply:

- Access to wells
- Access to groundwater – Fluctuations of groundwater level in wells may inhibit the purging and sampling activities.

2 STATUS AND BACKGROUND INFORMATION

2.1 Current Site Conditions

Based on a review of available aerial photography and provided information the following can be noted about the site.

- The site is located on the inner bend of the Finke River with gently rolling hills to the north and steeper ridge lines to the south across the Finke River.
- The site is used for park style accommodation (Discovery Park) with bar and restaurant, motel and hostel style rooms and camp sites.
- Where the tank sites and groundwater wells are located is unsealed carpark and access road which has been recently improved (earthworks undertaken).
- 150m to the north is water treatment ponds.

2.2 Previous Environmental Investigations

2.2.1 Power and Water, Water Resources Branch 1996 Groundwater Report

This report was commissioned to assess water quality and aquifer yields in the vicinity of the park prior to its construction. The assessed water would ultimately be used as a supply to the park. Key findings are as follows:

- Shallow groundwater and surface water supplies associated with the Finke River in this area are invariably non-potable and are not considered a viable resource.
- From the drilling at the Living Area approximately 8 km east of Glen Helen and the results from bores RN 6146 and RN 12021, it was hypothesised that no potable groundwater was present north of the ridgeline which runs in an east-west direction immediately south of the resort.
- It can be seen that, in the Goyder Formation at least, the groundwater gradients slope towards the waterhole, from both the west and east. The siting and design of the resort infrastructure should recognise that the Finke River is the lowest point in the system, is a discharge zone and acts as a sink in the local area.
- From the hydrochemistry of the different waterholes and from the water levels of the Goyder Formation (Figure 5) it appears that the surface water in the Glen Helen area is, to some degree at least dependent on, and connected with the groundwater contained in the aquifers of the different formations. It is beyond the scope of this report to undertake further comment on the relationship between the groundwater and surface water apart from stating that there is a connection.

2.2.2 Low Ecological Services 2021 PSI

A Preliminary Site Investigation for the site was prepared in February 2021.

A summary of key findings of the PSI are as follows:

- Contamination Extent – There is fuel contamination of soil immediately surrounding both underground systems down to a rocky layer or bedrock at approximately 3m. Lab results indicate that fuel in the soil surrounding the tanks is at sufficient concentration to potentially pose an ecological risk in this area of ecological significance.
- Vapour intrusion – Vapour intrusion risk is not of concern in public open spaces such as the area around the fuel systems, carpark and lawns.
- Direct contact – Surface contamination was only observed in the immediate vicinity of the bowsers so there is limited opportunity for direct contact with contaminated soil in this case.
- Groundwater – Local groundwater was not encountered in any of the hand auger sample holes at the site. More investigation is required to understand if local groundwater has been contaminated.

Groundwater extraction for drinking water is from bores approximately 1070m northeast upgradient of the fuel systems.

- Ecological Considerations – The site is surrounded by the West MacDonnell National Park and adjacent to the Finke River and Glen Helen Gorge and waterhole. The site is in an area of ecological significance with sensitive ecological receptors nearby. Given the setting, the potential ecological risks are perhaps of most concern.
- Ecological Screening Levels (ESLs) for contaminated soil are generally applicable to the top 2m of soil profile, however greater depths should be considered in arid areas such as Glen Helen (NEPM 2013). Hydrocarbon concentrations in all soil samples analysed by the laboratory were such that NEPM ESLs were exceeded for all samples.
- Conclusion – There is fuel contamination of soil immediately surrounding both underground fuel tank systems down to a rocky layer or bedrock at approximately 3m. Lab results indicate that fuel in the soil surrounding the tanks is at sufficient concentration to potentially pose an ecological risk in this area of ecological significance. There are minimal risks to human health from the contaminated soils due to the open location.

2.2.3 Low Ecological Services December 2021 DSI Report

This report appears to be an uncompleted draft version of the March 2022 report, refer Section 2.2.4.

2.2.4 Low Ecological Services March 2022 Investigation and Remediation Report

Key findings of this report are as follows:

- Ngurratjuta Aboriginal Corporation commissioned Territory Electrical and Refrigeration (Territory Electrical) to examine the fuel system for leaks in February 2021. This resulted in Low Ecological Services (LES) being engaged by Territory Electrical to undertake a Preliminary Site Investigation (PSI) of fuel contamination in the soil surrounding the UPSS. The PSI showed hydrocarbon contaminated soils by use of minimally invasive hand auguring around the underground tanks.
- Phase 2 of the DSI with the drilling rig, found bedrock was less than 3.5 mbgl, no water table was present, a levy bank (likely based on rock) formed a geological gully around the tank pits, fuel contaminated soil was localized to the diesel and Opal fuel tank pits and immediate surrounds and the contamination did not extend to drill hole sample points, which were drilled down to bedrock, located 6 m to 90 m downslope of the UST pit area, along the natural drainage line.
- Due to the ecological sensitivity of the area, in July 2021, the NT EPA issued a s48 Notice requiring the investigations, remediation and validation works to be completed under an environmental audit program under the relevant provisions of the Waste Management and Pollution Control Act 1998.
- The WMS soil vapour results indicated that there is no vapour intrusion risk to people occupying the nearby buildings or to invasive maintenance workers and the groundwater sample analysis detected no levels of hydrocarbons above LOR indicating that the hydrocarbon contamination had not migrated into the Finke River.
- The diesel and petrol pits were lined and backfilled with clean imported soil. A perforated vent pipe system, designed by LES and agreed upon by Mr Kirsanovs (Auditor), was installed in both pits to increase aeration and natural remediation of the soil at the bottom of the pits.
- The findings from each phase of this investigation prove that the migration of hydrocarbon contamination off site is not occurring. There is no evidence of contamination beyond the pits, all proximal soil and water samples were uncontaminated. The source of the fuel leak has been removed, pits have been lined, the consistent layer of bedrock at ~2.7 mbgl and the clay soils will limit further migration of the residual hydrocarbon contamination. Hence the ecological risk is negligible. Furthermore, there is no risk to human health from the residual in-situ contaminated soil in the open car park area in which the tank pits are located, given the contaminated soil is deeper than 1.2 m below the ground surface.

- Thus, the findings of this investigation show that the lateral and vertical extent of the residual localized contamination will not pose a risk to human health, the environment, or management of the site, given that the current and proposed medium-term future use of this area within the site as a carpark and lawn area as agreed upon by the new land owners, Discovery Parks.

2.2.5 Low Ecological Services January 2023 Update Report

This report appears to be an uncompleted draft version. A summary of the key points from the draft report is provided below. It should be noted that the final version of this report should be reviewed once its completed.

A review of the draft report found:

- LES installed 4 groundwater monitoring wells in May 2022.
- Soil samples were collected during the drilling of the wells and analysed for TRH, BTEX and metals. Concentrations of TRH were detected in soil sample MW1-6m. TRH was not detected in the lower sample for this well (MW1-10m).
- Groundwater monitoring was undertaken on 11 November 2002 however due to the recent placement of gravel in the area only well MW1 could be found.
- During the site visit on the 11 November sheen was observed on the surface of the Finke River. Black soil in the river was also observed. A sample of the soil was collected and analysed for metals, TRH and BTEX. Results for TRH and BTEX were less than the limits of reporting.
- LES returned to the site on the 15 November and found all four wells. All wells were subsequently sampled and samples analysed for TRH and BTEX. All wells reported concentrations of TRH above the limits of detection with the highest concentrations reported in MW4. BTEX was also detected in MW2 and MW4.
- Another round of monitoring was undertaken in December 2022. Approximately 80L to 100L were bailed from the wells (assuming collectively) before the wells were left to recover and sampled.
- Concentrations of TRH and BTEX were less than the limits of reporting in MW1 and MW3 while concentrations of TRH and BTEX were detected in MW2 and MW4.
- The report concluded that additional development of the wells should be undertaken, sampling should be undertaken using hydra-sleeves and that monitoring should continue biannually (one event in wet season and one in dry season) for the next three years.

2.2.6 Tierra Environment 2023 GME

This report documented the development, sampling and analytical analyses of three existing groundwater wells at the Glen Helen Discovery Park as well as the sampling and analysis of two surface water samples from the nearby Finke River.

As the wells were not developed when originally installed Tierra undertook development prior to purging and sampling activities. Approximately 115L, 80L and 70L of water and sediment were removed from wells MW1, MW3 and MW4 respectively with 6m, 3.1m and 4.3m of sediment removed.

LNAPL was identified in any of the wells during gauging and similarly discolouration, sheen or hydrocarbon odours were not observed during purging and sampling activities. From gauging activities groundwater flow was found to be to the south south-west towards the Finke River which is located approximately 100m to the south.

Laboratory analysis of groundwater and surface water samples did not detect TRH, BTEX or MTBE above the laboratory's limits of reporting. Concentrations of lead were detected in the three groundwater wells exceeding ANZG 99% fresh water criteria and the lead concentration in one well also exceeded ADWG criteria. Lead was not detected above the limits of reporting in the surface water samples.

The CSM identified that it is unlikely that a complete exposure pathway exists between the identified potential chemicals of concern and human receptors, assuming that groundwater is not extracted for use.

Risks to the Finke River are expected to be unlikely as there appears to be only remnant concentrations of lead in the groundwater near the tank locations (now removed). As there has only been one sampling event where lead was analysed it is not clear if it is associated with the tanks or naturally occurring variability.

Recommendations from the report included the development of a groundwater quality monitoring plan and groundwater monitoring over a 12 month period taking into account the climate and expected seasonal variation.

3 SAMPLING, ANALYSIS AND DATA QUALITY OBJECTIVES

3.1 General

The DQO process is used to define the type, quantity and quality of data needed to support decisions relating to the environmental condition of a site. It provides a systematic approach for defining the criteria that a data collection design should satisfy, including when, where and how to collect samples or measurements; determination of tolerable decision error rates; and the number of samples or measurements that should be collected.

This plan has been prepared to clearly document the requirements of the assessment program including:

- quantitative DQOs - including sample location numbers, sample collection frequency, sample analysis frequencies and QA/QC requirements
- a plan to achieve pre-determined DQOs - through describing the site sampling program and procedures, nominated investigation criteria and screening levels
- procedures to be undertaken if the data does not meet the expected DQOs to still achieve the project outcomes

The objective of the investigation for the site is to provide information to allow:

- a comparison to ANZG and ADWG criteria based selected environmental values as per the method detailed in Part 5 Division 2 of the Victorian Government Gazette No S245 dated May 2021
- a comparison to NEPM HSLs to assess the risk of vapour intrusion
- a comparison to previous results and assessment of seasonal variation

The objectives of this SAQP are to provide a detailed description of the key site investigation requirements to be undertaken in order to meet the overall project objective, in accordance with Northern Territory legislative and Amended ASC NEPM guideline requirements, the latter specifically relating to the preparation and implementation of a SAQP.

3.2 Step 1 – State the Problem

As part of a due diligence assessment two underground fuel tanks were identified as having potentially leaked. Previous investigations undertaken by Low Ecological (soil, soil vapour and groundwater) identified TRH and BTEX in the soil in the vicinity of the fuel tanks in groundwater wells MW2 and MW4. Tierra undertook the development of the wells in 2023 and subsequent sampling. Local groundwater flow was identified to be generally to the south, south-west towards the Finke River approximately 100m to the south. TRH and BTEX were not identified in the wells above the limits of reporting however lead was detected and exceeded ANZG and ADWG criteria. Recommendations from the report were to develop a groundwater monitoring plan and undertake additional rounds of monitoring to confirm that chemical concentrations remain low.

3.3 Step 2 – Identify the Decision

The decision will be to assess whether the known hydrocarbon soil contamination in the vicinity of the fuel tanks has resulted in impacts to groundwater. The comparison of results against the screening criteria will form part of that decision process.

Groundwater investigation results are considered required to allow a comparison against, ANZG and ADWG criteria for protected environmental values as specified in Section 3.4.5.

Relevant guidelines to be used as part of the assessment will include:

- Northern Territory of Australia Water Act 1992
- Northern Territory of Australia Water Regulations 1992
- Northern Territory of Australia Waste Management and Pollution Control Act 1998
- Victoria Government Gazette No. S 245

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2018 (ANZG)
- Australian Drinking Water Guidelines 2011 (ADWG)
- Amended National Environment Protection (Assessment of Site Contamination) Measure 1999
- AS5667.1-1998: Water quality – Sampling, Guidance on the design of sampling programs, sampling techniques and the preservation and handling of samples
- AS5667.11-1998: Water quality – Sampling, Guidance on sampling of groundwaters

3.4 Step 3 – Identify Inputs into the Decision

The inputs required to make the decision stated in Step 2 are identified in the DQO process and include:

- Consideration of the site's history
- Consideration of the results of previous site investigations
- Collection of groundwater samples and lab analyses
- Consideration of the site's current condition
- Consideration of the site's future use

3.4.1 Investigation scope considerations

The following considerations apply:

- The scope of investigations is limited to the uppermost groundwater aquifer in the vicinity of the UST's.
- The monitoring event will be limited to existing groundwater wells at the site in the vicinity of the UST's.
- All operational wells will be gauged prior to purging and sampling.
- All operational wells will be purged until field parameters become stable or a well runs dry (although the latter is not desirable).
- All operational wells will be assessed for groundwater sheen, odours and free product (the latter by using an interface probe).
- All operational wells will be sampled for laboratory analysis (refer to Section 3.8.2 for the laboratory program).

3.4.2 Laboratory analysis methodology

Analysis of primary samples, intra-laboratory samples, rinsate, field blank and trip blank samples will be conducted by Eurofins. Analyses of inter-laboratory samples will be undertaken by Envirolab Services. The laboratories hold National Association of Testing Authorities (NATA) registration for the parameters listed in the following table:

Parameter	Analytical Method	Limits of Reporting (mg/L unless otherwise stated)
Metals (Pb)	Eurofins: USEPA 6020A	0.001
	Envirolab: APHA 3120 USEPA 200.8, USEPA 3005A (prep), USEPA 6020A)	0.001
TRH	Eurofins: LTM-ORG-2010 TRH C6-C40	0.02-0.1
	Envirolab: USEPA 8020A, 8260, 8000	0.05-0.1
BTEXN	Eurofins: USEPA 8260	0.001
	Envirolab: USEPA 8260	0.001

Parameter	Analytical Method	Limits of Reporting (mg/L unless otherwise stated)
MTBE	Eurofins: USEPA 8260	0.001
	Envirolab: USEPA 8260	0.001

3.4.3 Internal laboratory quality control

Internal laboratory quality control will include the following: reagent blanks, method blanks, matrix spikes, matrix spike duplicates, surrogate spikes, reference materials and laboratory control samples (refer also to the Amended ASC NEPM, Schedule B3).

3.4.4 Quality assurance/quality control

- Analysis of 1 intra laboratory and 1 inter laboratory duplicate and 1 rinsate for TPH, BTEXN, MTBE and lead.
- Analysis of 1 trip blank sample for BTEXN and TRH C_6 - C_9.

3.4.5 Assessment criteria

Acceptance criteria will be selected based on the environmental values (EVs) applicable to the site.

The NT contaminated Land Guideline (section 11.5) requires that environmental audits be completed in accordance with the State where the Auditor is accredited, in this case Victoria. On this basis the selection of the EVs was undertaken as per the method detailed in Part 5 Division 2 of the Victorian Government Gazette No S245 dated May 2021. The document specifies that EVs should be based on the TDS (Table 5.3) and then indicators and objectives are based on selected EVs (Table 5.4).

Therefore for the Glen Helen site TDS was based on the TDS level in one of the wells on site and reported TDS levels of nearby production wells which ranged from 1,220ppm to 3,200ppm. Based on this Groundwater Segment B with a TDS range of 1,201mg/L – 3,100mg/L was selected as the most representative. For Segment B the following environmental values apply:

- Water dependent ecosystems and species
- Potable mineral water supply
- Irrigation
- Stock Watering
- Industrial and commercial use
- Primary contact recreation
- Traditional Owner cultural values
- Buildings and structures
- Geothermal properties

Based on the selected environmental values and in consideration of the limited scope of analysis (analysing for lead, TRH, BTEXN, MTBE), groundwater results will be compared to the following indicators as specified in Table 5.4:

- Aquatic ecosystems default guideline values for 99% species protection for freshwater from the 2018 Australian and New Zealand Guidelines for Fresh & Marine Water Quality (ANZG)
- Health and aesthetic guideline values provided in Table 10.6 of the 2011 Australian Drinking Water Guidelines (ADWG)

Results will be compared to the lowest recognised criterion for each analyte (shown in bold in the results summary table).

For a Tier 1 risk assessment of vapour intrusion, health screening levels are provided in Schedule B1 of the ASC NEPM. The health screening levels (HSLs) considered most appropriate is "Groundwater HSL for

Vapour Intrusion, HSL A/B, 8m+, Clay Soils", on the basis of the most conservative soil type, the land use scenario and the depth to groundwater.

3.4.6 Presence of LNAPL

During well gauging a Solinst 122 Interface Meter will be used to check for the presence of LNAPL in each well. Where LNAPL is detected the thickness will be determined and the well will not be sampled. In addition during purging and sampling recovered water will be inspected for the presence of LNAPL.

3.4.7 Presence of odour and sheen

During purging and sampling activities the purged water will be observed for the presence of odour and sheen.

3.5 Step 4 – Define the Study Boundaries

The site is defined on the plan provided in Appendix A.

3.6 Step 5 – Develop a Decision Rule

The results of the groundwater analytical testing will be compared to adopted assessment criteria.

Data Quality Objectives (DQOs) for the site will be in accordance with the Amended ASC NEPM.

Data Quality Indicators (DQIs) to be adopted to assess the precision, accuracy, documentation, completeness, representativeness and comparability of the data are summarised in Appendix B.

3.7 Step 6 – Specify Limits on Decision Errors

3.7.1 General

To validate the quality and quantity of both the field and laboratory data being used in the decision making process, Quality Assurance/Quality Control (QA/QC) objectives have been developed. QA/QC procedures will be implemented in accordance with Australian Standard AS4482.1.

The accepted probability of making a Type II error (false negative) for this investigation has been set at 5%.

3.7.2 Decision error protocol

The decision error protocols adopted for the QA/QC program are as identified in Appendix B.

3.7.3 Rectifying non-conformances

Where non-conformances in the decision error protocols are identified the reason for the non-conformance will be investigated and clearly identified within the assessment report. The discussion will also state whether the identified non-conformance is likely to impact the quality of the data obtained for the investigation of the site.

Where a non-conformance is reported by the analytical laboratories, the laboratory will be contacted to identify the reason for the non-conformance and affected samples may be re-analysed to ensure the representativeness of the results.

In the event that the stated level of confidence in the decision cannot be achieved (in this case 95%) during the hypothesis testing approach, additional collection of samples and/or analysis of additional samples may be required. Any recommended additional works would be outlined in a proposal to be considered for approval by the Client.

3.7.4 Laboratory analytical procedures

Laboratories used for the investigation will be NATA accredited and will use NATA endorsed analytical methods (where available).

3.8 Step 7 – Optimise the Design for Obtaining Data

The condition of the wells and the site will be reviewed prior to sampling and during gauging to ensure the most appropriate sampling technique is used and to identify sampling constraints (if any) posed by site

conditions. At this stage the proposed method is using a low follow bladder pump with dedicated twin tubing and dedicated disposal bladder for each well.

3.8.1 Sampling methodology

The sampling methodology to be adopted for the investigation will be undertaken in accordance with the Amended ASC NEPM. A brief description of the proposed methodology is provided in Section 3.8.6 of this report.

3.8.2 Sampling pattern, frequency and analysis

Samples will be collected from the 4 groundwater wells MW1, MW2 (if able to be located), MW3 and MW4. A plan showing the locations of the groundwater wells is presented in Appendix A.

Field parameters will be measures as follows:

- pH, conductivity, redox, temperature, dissolved oxygen

The proposed laboratory scope is as follows:

- Analysis of samples from MW1 to MW4 for TRH, BTEXN, MTBE, lead

3.8.3 Sampling team

The Project Team will include the following members and responsibilities as outlined below.

Role	Team Member	Contact Details
Client Contact	Amy Driver	08 8951 1911 amyd@ngur.com.au
Reporting Manager	Daryl Burrows	0402 097 295 daryl@tierra.com.au
Project Manager and Client Liaison	Daryl Burrows	0402 097 295 daryl@tierra.com.au
Peer Review	Tom Dolling	08 8373 2512 tom@tierra.com.au
Field Program Manager and OH&S Manager	Daryl Burrows	0402 097 295 daryl@tierra.com.au
Field Team	Daryl Burrows/ Lauren Harvey (if Daryl is unavailable)	08 8373 2512
Reporting	Daryl Burrows/ Lauren Harvey	08 8373 2512

3.8.4 Field instrument calibration and maintenance

The water quality meter used during purging activities will be sourced from Kennards. The unit will be calibrated by Kennards prior to issue.

3.8.5 Field data and record keeping

Sampling sheets will be completed in the field and contain information regarding the depth to groundwater, weather, purging method and equipment, litres purged, temperature, dissolved oxygen concentration, conductivity, pH, redox, appearance of the water and other information or observations made.

Groundwater well locations will be placed on a plan and contours from groundwater gauging data will be generated.

3.8.6 Sample collection and preservation

Sampling will be undertaken in accordance with Schedule B2 of the ASC NEPM.

The primary laboratory will supply appropriate sample bottles for the type of analysis that is to be undertaken. Bottles will be labelled prior to going on site. Sample bottles for individual wells will be removed from the site vehicle immediately after purging and prior to sampling. Bottles will be labelled with the appropriate location designation.

It has been assumed that laminar flow and therefore low flow is able to be achieved in the wells during the monitoring event. If this is not the case in any particular well the well will be purged with drawdown until either the field readings are stable or the well runs dry. In the event the well runs dry the well will be left until the water level has recovered to at least 75% of its original level and then sampled.

During this event groundwater wells are to be purged and sampled using a low flow bladder pump.

All wells will be purged prior to sampling until dissolved oxygen, redox potential, conductivity, pH and temperature readings, measured in the field using a multi parameter water quality meter, have stabilised. Purged water will be stored in 200L drums and disposed of at a licenced liquid waste facility.

3.8.7 Sample preservation and transport

Samples will be stored in an esky with ice prior to transportation to the laboratory to ensure that acceptable storage conditions are achieved as relevant to the type of analyses to be undertaken. Samples will be shipped to the laboratory within 48 hours of sampling under Chain of Custody documentation.

3.8.8 Decontamination

Disposable gloves will be worn during all sampling activities to prevent contact with potentially toxic compounds and changed between samples to prevent cross contamination.

A new disposable bladder pump and dedicated twin tubing will be used for each well to minimise the potential for cross contamination.

The Solinst Interface meter used during groundwater gauging and the body of the bladder pump will be decontaminated by washing in detergent (e.g. Decon 90) and water and subsequent rinsing with water prior to the commencement of field work, between each groundwater well and at the completion of field work. This will be undertaken to minimise the potential for cross contamination of samples. The water quality meter will not be decontaminated as it will be located after the sampling position and as such sampled water will not come in contact with the meter.

3.8.9 Reporting

A report will be prepared based on reporting guidelines in the Amended ASC NEPM.

APPENDIX A
SITE PLAN

MW1 Groundwater Well - In Service

MW1 Groundwater Well - Out of Service

623 Groundwater level contour (m AHD)

Scale (m)
0 3 6

Notes:

1. The extent of the former tank pits are approximate based on a plan provided by Low Ecological Services.
2. The positon of MW1, MW3 and MW4 is based on a survey. The position of MW2 is approximate and based on a plan provided by Low Ecological Services.
3. Groundwater contours generated by Surfer software with a grid generated using triangulation with linear interpolation.

C:\Users\laurenh\Tierra Environment\Shared - Projects\23\ARZ 23 069\01\Surfer\Fig 2 - Well Locations.srf

Figure 1 - Groundwater Well Locations
Glen Helen Discovery Park
Groundwater Monitoring Event - May 2023

Rev A, 6 July 2023

APPENDIX B
DATA QUALITY INDICATORS

DQI - Completeness *A measure of the amount of useable data (expressed as %) from a data collection activity*			
Field considerations	*Laboratory considerations*	*Comments*	*Completeness DQIs adopted for this program*
All critical locations sampled *All samples collected* *SOPs appropriate and complied with* *Experienced sampler* *Documentation correct*	*All critical samples analysed according to SAQP* *All analytes analysed according to SAQP* *Appropriate methods and PQLs* *Sample documentation complete* *Sample holding times complied with*	*The required percentage completeness should be specified in the SAQP.* *All required data must be obtained for critical samples and chemicals of concern.* *Incompleteness is influenced by:* *• field performance problems (access problems, difficulties on site, damage)* *• laboratory performance problems (matrix interference, invalid holding times)* *• matrix problems*	▪ *All field work to be completed in accordance with the SAQP. Where this cannot be achieved, alternative sampling approaches / locations will be undertaken where possible. An acceptance level of 95% has been considered appropriate.* ▪ *Samples to be collected from each well* ▪ *Field engineer / scientist to be adequately experienced/trained in each task to be undertaken or supervised by an adequately experienced/trained person* ▪ *Field sampling sheets to be completed* ▪ *Samples to be analysed within laboratory specified holding times* ▪ *Primary and secondary laboratory methods are as listed in the SAQP*
DQI - Comparability *The confidence (expressed qualitatively) that data may be considered to be equivalent for each sampling and analytical event*			
Field considerations	*Laboratory considerations*	*Comments*	*Comparability DQIs adopted for this program*
Same SOPs used on each occasion *Experienced sampler* *Climatic conditions (temperature, rainfall, wind, …)*	*Sample analytical methods used (including clean-up)* *Sample PQLs (justify/quantify if different)* *Same laboratories (justify/quantify if different)* *Same units (justify/quantify if different)*	*Same approach to sampling (SOPs, holding times…)* *Quantify influence from climatic or physical conditions* *Samples collected, preserved, handled in same manner (filtered, same containers)*	▪ *Field work to be completed in accordance with the SAQP* ▪ *Field engineer / scientist to be adequately experienced/trained in each task to be undertaken or supervised by an adequately experienced/trained person* ▪ *Groundwater samples to be collected using the same method, i.e. low flow bladder pump* ▪ *Refer SAQP for primary laboratory methods* ▪ *Same media to be reported with same units (mg/L or ug/L for water)* ▪ *Samples to be stored in laboratory supplied containers, in a chilled cool box and transported to laboratory under chain of custody documentation*

DQI - Representativeness *The confidence (expressed qualitatively) that data are representative of each media present on the site*			
Field considerations	*Laboratory considerations*	*Comments*	*Representativeness DQIs adopted for this program*
Appropriate media sampled according to SAQP *All media identified in SAQP sampled*	*All samples analysed according to SAQP*	*Samples must be collected to reflect the characteristics of each media* *Sample analyses must reflect properties of field samples* *Homogeneity of the samples* *Appropriate collection, handling, storage and preservation* *Detection of laboratory artefacts, e.g. contamination blanks*	▪ *Groundwater only to be sampled as specified in the SAQP* ▪ *Groundwater samples to be collected in accordance with AS4482.1 in appropriately preserved bottles and stored in chilled cool box for transport to the laboratory to minimise volatile losses* ▪ *Refer accuracy (bias) for laboratory blank info*
DQI - Precision *A quantitative measure of the variability (or reproducibility) of data*			
Field considerations	*Laboratory considerations*	*Comments*	*Precision DQI's adopted for this program*
SOPs appropriate and complied with	*Analysis of:* *• laboratory and interlaboratory duplicates* *• field duplicates* *• laboratory-prepared volatile trip spikes*	*Measured by the coefficient of variance or standard deviation of the mean or by RPDs* *Field duplicates measure field and laboratory precision* *Laboratory duplicates measure analytical precision*	▪ *All field work to be completed in accordance with the SAQP.* ▪ *Field duplicates (inter and intra laboratory) to be collected and analysed as indicated in the SAQP.* *RPDs to be calculated for inter and intra laboratory duplicates, with the objective of all RPDs calculated being 0% to 50% for concentrations 10 to 30 times the limits of reporting and 0% to 30% for concentrations 30 times greater than the limits of reporting.* *Where exceedances greater than these tolerances occur, the reason for the high RPD value will be investigated and further action will be taken if necessary. These reasons may be related to low sample concentrations where a small actual difference in concentration results in a large RPD value, in which case no further action will be required.* ▪ *Laboratory internal QC to include duplicate samples for each analyte and will conform with the following:* o *Surrogate spike recoveries to be between the laboratories stated criteria (varies per analytes);* o *Matrix spike recoveries to be between the laboratories stated criteria (varies per analytes);* o *Contaminants below detection limits for field blank samples and rinsate and trip blank samples;* o *Matrix duplicate/laboratory duplicate RPDs to be less than 30%.*

DQI - Accuracy (bias) *A quantitative measure of the closeness of reported data to the true value*			
Field considerations	*Laboratory considerations*	*Comments*	*Accuracy (bias) DQIs adopted for this program*
SOPs appropriate and complied with	*Analysis of:* *• field blanks* *• rinsate blanks* *• reagent blanks* *• method blanks* *• matrix spikes* *• matrix spike duplicates* *• surrogate spikes* *• reference materials* *• laboratory control samples*	*Bias introduced:* *• by chemicals during handling or transport* *• from contaminated equipment* *• from contaminated reagents* *• during laboratory analysis* *• during laboratory preparation and analysis (may be high or low)* *• precision of preparation and analytical method*	▪ *All field work to be completed in accordance with this SAQP.* ▪ *Laboratories to be National Association of Testing Authorities (NATA) accredited for the analyses performed (where available)* ▪ *The frequency of duplicate, trip blank, and rinsate sampling and testing will be as listed in the SAQP.* ▪ *Laboratory internal QC to include as outlined in NEPM Schedule B(3):* o *reagent blanks* o *method blanks* o *matrix spikes* o *matrix spike duplicates* o *surrogate spikes* o *reference materials* o *laboratory control samples*