Perdaman Lateral Project

Referral Supporting Document

Environmental Protection Act 1986 Part IV Section 38 Referral

Australian Gas Infrastructure Group

Date: 30 August 2024

Document Revision History

Rev	Date	Reviewer	Approver	Revision Description
1	7/08/2024	M. Kenny	T. Rakai	Initial Draft
2	15/08/2024	M. Kenny	T. Rakai	Revised Draft
3	30/0/2024	M. Kenny	T. Rakai	Final for Submission

EXECUTIVE SUMMARY

DBNGP (WA) Nominees Pty Ltd (ABN 54 871 588 515, the Proponent) is proposing to develop the Perdaman Lateral Project, on the Burrup Peninsula, approximately 20 km north of Karratha on the northern coastline of Western Australia. The Proposal includes a 550 m long pipeline and associated infrastructure, designed to transport natural gas from the Dampier to Bunbury Natural Gas Pipeline (DBNGP) to the proposed Perdaman Urea Plant development (Project Ceres). Additional onsite infrastructure includes the Perdaman Inlet Station and Perdaman Meter Station. The Proposal also includes supporting infrastructure to facilitate construction of the Proposal and the expansion of the existing rock causeway which runs parallel to the proposed pipeline.

A general description of the Proposal and its physical, construction and operational elements are provided in Table ES-1 and Table ES-2.

Table ES-1: General Description of the Proposal

General Proposal Description	
Proposal Title	Perdaman Lateral Project
Proponent Name	DBNGP (WA) Nominees Pty Ltd
Short Description	The Perdaman Lateral Project (the Proposal) is located within the Burrup Peninsula, approximately 20 km north of Karratha. The Project involves the construction of a 550 m pipeline and associated supporting infrastructure to transport a maximum of 150 TJ of natural gas per day from the Dampier to Bunbury Natural Gas Pipeline to the proposed Perdaman Urea Plant development.

Table ES-2: Proposal Content elements

Proposal element	Location / description	Maximum extent, capacity, or range
Physical elements		
DN400 lateral pipeline	Figure 2-1 and Figure 2-2	2.05 ha of disturbance including 0.21 ha of vegetation, within a 2.05 ha Development Envelope
Hot tap connection to the DBNGP		
Pig Launcher Compound		
Pig Receiver Compound and Custody Transfer Meter Station		
Material storage/laydown areas		
Temporary offices, workshops, cribs and ablution buildings		
Rock causeway		

Proposal element	Location / description	Maximum extent, capacity, or range
Operational elements		
Transfer natural gas from DBNGP to Perdaman Urea Plant development	N/A	150 TJ/Day (Maximum)
Proposal elements with greenhouse gas emissions		
Construction elements:		
Scope 1	1,362 t CO_2-e	
Scope 2	N/A	
Scope 3	N/A	
Operation elements:		
Scope 1	8 t CO_2-e / year	
Scope 2	N/A	
Scope 3	820,000 t CO_2-e / year	
Rehabilitation		
The Development Envelope contains only minor areas (0.21 ha) of native vegetation in Poor condition and 1.22 ha of mudflat habitat (which does not contain any vegetation). The Proposal includes backfilling of the proposed pipeline with trench spoil and topsoil following construction. Revegetation of native vegetation prior to decommissioning is therefore not relevant to this Proposal.		
Commissioning		
Following the completion of the construction phase, the Proponent will undertake the environmental commissioning of the Proposal in accordance with the DBNGP Environment Plan (EP) approved by the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS). This will consist of final leak tests, confirmation of the functionality (including set point confirmation for all safety critical elements) and remote visibility of all installations/devices.		
Decommissioning		
All operational infrastructure located in the surface of the Development Envelope will be removed. Pipelines and subsurface infrastructure will also be removed where practicable (no additional environmental impacts are likely), otherwise, it will be appropriately decommissioned and buried at an appropriate level below the surface. A decommissioning and final rehabilitation plan will be prepared prior to commencing any decommissioning activities.		
Other elements which affect extent of effects on the environment		
Proposal time	Maximum project life	28 years
	Construction phase	4-6 months
	Operations phase	25 years
	Decommissioning and rehabilitation phase	2 years

This document supports referral of the Proposal under section 38 of the *Environmental Protection Act 1986*. It describes and assesses the existing environmental values present within and immediately surrounding the Proposal and the environmental impacts that have the potential to occur from its implementation.

The Proponent has consulted with key stakeholders and is committed to ongoing stakeholder engagement throughout the approval process, construction, operation and closure stages of the Proposal. Key stakeholders identified include regulatory agencies, local government, landowners, corporations, community groups and the Murujuga Aboriginal Corporation (MAC).

The Proponent has assessed the potential impacts (direct, indirect and cumulative) associated with the Proposal against all Environmental Protection Authority (EPA) environmental factors that may be considered relevant. The environmental factors that may be considered relevant to the Proposal are:

- Flora and Vegetation
- Terrestrial Fauna
- Inland Waters
- Social Surroundings
- Greenhouse Gas Emissions
- Marine Environmental Quality
- Benthic Communities and Habitats.

Overall, the residual impacts of the Proposal are low due to its small scale nature, short construction phase and the avoidance and mitigation measures proposed. The Proposal is located within an industrial area and as such is separated from sensitive receptors and largely devoid of significant environmental values, with a negligible amount of native vegetation present within the Development Envelope. Any potential impacts are expected to be effectively mitigated and managed with measures outlined in the Construction Environmental Management Plan (CEMP), the existing DBNGP Construction Environment Plan (EP) and the Oil Spill Contingency Plan (OSCP).

A summary of potential impacts, proposed mitigation strategies and proposed environmental outcomes for each of the relevant environmental factors is provided in Table ES-3.

Table ES-3: Summary of Potential Impacts, Proposed Mitigation and Proposed Environmental Outcomes

Environmental Factors	
Factor 1: Flora and Vegetation	
Potential Impacts	**Direct Impacts:** • Clearing of native vegetation. **Indirect Impacts:** • Degradation of vegetation from increased dust deposition • Increased fragmentation of native vegetation • Introduction and/or spread of weed species • Altered fire regimes as a result of construction activities.
Avoidance and Mitigation	Potential impacts have primarily been avoided or minimised through the design of the Proposal during the planning phase, including: • The Development Envelope has been reduced to minimise the amount of native vegetation to be cleared • The existing rock causeway will be used to avoid clearing of native vegetation • The proposed pipeline will be underground, therefore the majority of surface disturbance will be temporary, with reinstatement work to be carried out following construction to promote the regeneration of native vegetation. Potential impacts during clearing, construction and operation will be minimised through measures outlined in a CEMP and the DBNGP EP.
Residual Impacts and Environmental Outcomes	No significant residual impacts to flora and vegetation associated with the Proposal are anticipated due to the following: • The Proposal will result in the clearing of 0.21 ha of native vegetation in Poor condition • The absence of any conservation significant flora species or ecological communities within or immediately adjacent to the Development Envelope • The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the native vegetation surrounding the Development Envelope • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with the natural topography and landforms to be reinstated post-construction • Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised through the implementation of the mitigation measures outlined in the CEMP (Appendix C) and DBNGP EP. **The Proponent considers that through the avoidance and proposed management measures described, biological diversity and ecological integrity will be maintained such that the EPA's objective for the Flora and Vegetation factor can be met.**
Factor 2: Terrestrial Fauna	
Potential Impacts	**Direct Impacts:** • Loss of fauna habitat • Injury, mortality or displacement of native fauna. **Indirect Impacts:** • Increased fragmentation of fauna habitat • Disturbance to native fauna from increased light, dust, noise and/or vibration • Habitat degradation as a result of introduction and/or spread of weed species, increased predation by feral fauna or altered fire regimes due to construction activities.

Avoidance and Mitigation	Potential impacts have primarily been avoided or minimised through the design of the Proposal during the planning phase, including: • The Development Envelope has been reduced to minimise the amount of fauna habitat to be cleared • The existing rock causeway will be used to avoid clearing of fauna habitat • The proposed pipeline will be underground; therefore the majority of surface disturbance will be temporary, with reinstatement work to be carried out following construction to restore the natural fauna habitat • The construction phase of the Proposal will be short and avoid the wet season and king tides when the area is more likely to be used by conservation significant fauna • Night works will be avoided to mitigate disturbance to native fauna from increased light • Trenching will not occur during the wet season or during king tides • Increase habitat fragmentation has been avoid to as far as practicable by positioning the Proposal adjacent to existing infrastructure (i.e. the existing causeway and PL62). Potential impacts during clearing, construction and operation will be minimised through measures outlined in a CEMP and the DBNGP EP.
Residual Impacts and Environmental Outcomes	No significant impacts to terrestrial fauna associated with the Proposal are anticipated due to the following: • The Proposal will result in the clearing of 1.22 ha of Mudflats fauna habitat and 0.21 ha of Low Chenopod Shrubland habitat • Direct impacts to terrestrial fauna are unlikely to be significant given foraging habitat is widespread in the region, the construction timeframe will be short (4 - 6 months) and will avoid and will avoid the wet season and king tides, when the conservation significant species may be utilising the Development Envelope • The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the fauna habitat surrounding the Development Envelope • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with the natural topography and landforms to be reinstated post-construction • Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised through the implementation of the mitigation measures outlined in the CEMP (Appendix C) and DBNGP EP. **The Proponent considers that through the avoidance and proposed management measures described, biological diversity and ecological integrity will be maintained such that the EPA's objective for the Terrestrial Fauna factor can be met.**
Factor 3: Inland Waters	
Potential Impacts	**Direct Impacts:** • Alteration of surface water drainage and waterflow pathways. **Indirect Impacts:** • Contamination of surface water or groundwater from the excavation/exposure of contaminated groundwater or Acid Sulphate Soils (ASS) • Contamination of surface water or groundwater from the accidental spilling of hazardous materials • Reduction of quality of surface water due to site construction works and earthworks exposing underlying soil followed by increased erosion and sediment load.

Avoidance and Mitigation	Potential impacts to inland waters have primarily been avoided or minimised through the design of the Proposal during the planning phase, including: • The Development Envelope has been designed to avoid significant surface water bodies • No dewatering or discharge will be required as part of the Proposal • Vehicles and machinery will be refueled offsite avoiding the storage of large quantities of hazardous materials within the Development Envelope. • Construction activities have been designed to avoid the wet season and king tides. Potential impacts during clearing, construction and operation will be minimised through measures outlined in a CEMP, DBNGP EP and OSCP.
Residual Impacts and Environmental Outcomes	No significant impacts to inland waters associated with the Proposal are anticipated due to the following: • The Proposal is located away from major surface waterways or wetlands and does not intersect any drainage lines • The majority of the natural surface of the Development Envelope will be reinstated following pipeline burial; hence the Proposal is unlikely to permanently alter surface water flows • Construction activities have been designed to avoid periods of inundation as much as possible, and occur over a short time period (4-6 months), hence, the Proposal is unlikely to significantly alter surface water flows or result in reduced quality of inland waters • No dewatering is required for the Proposal, further minimising contamination risks associated with discharging groundwater to the environment • Contamination of surface or groundwater from the Proposal will be minimised through the implementation of the mitigation measures outlined in the CEMP (Appendix C) and DBNGP EP • An ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015). **The Proponent considers that through the avoidance and proposed management measures described, the Proposal can be implemented to ensure that the hydrological regimes and quality of groundwater and surface water will be maintained such that the EPA's objective for the Inland Waters factor can be met.**
Factor 4: Social Surroundings	
Potential Impacts	**Impacts:** • Reduced amenity to the surrounding landscape through the placement of infrastructure • Reduced amenity to the surrounding landscape during construction from dust, noise and light • Impacts to the integrity of Aboriginal rock art resulting from air emissions.
Avoidance and Mitigation	Potential impacts to social surrounds have primarily been avoided or minimised through the design of the Proposal during the planning phase, including: • The Development Envelope has been reduced as far as practicable • A known midden site (WC-2023-M001-01 and WC-2023-M001-02; Scarp Archaeology 2024) has been avoided through the reduction of the Development Envelope • Night construction activities will be avoided to mitigate the disturbance to amenity from increased light • The Development Envelope has been reduced to minimise the amount of native vegetation to be cleared, avoiding significant impacts on amenity of the surrounding landscape. Potential impacts during clearing, construction and operation will be minimised through measures outlined in a CEMP and the DBNGP EP.
Residual Impacts and Environmental Outcomes	No significant impacts to social surroundings associated with the Proposal are anticipated due to the following:

	• No Aboriginal Cultural Heritage sites of significance intersect the Development Envelope according to the archaeological and ethnographic heritage surveys • The Proposal has been sited within an industrial area, therefore sensitive receptors are limited • Reduced amenity to the surrounding landscape from dust, noise and vibration will be minimised through the implementation of the mitigation measures outlined in the CEMP (Appendix C) and DBNGP EP • The Proposal is not expected to impact the integrity of Aboriginal rock art within the Murujuga National Park given the small scale nature of the Proposal, short timeframe of construction and as low sulfur diesel will be used to reduce air emissions. **The Proponent considers that due to the avoidance and proposed management measures described, the Proposal can be implemented to ensure that social surrounds are protected from significant harm such that the EPA's objective for the Social Surroundings factor can be met.**
Factor 5: Greenhouse Gas Emissions	
Potential Impacts	**Direct Impacts:** • Scope 1 emissions derived from the combustion of hydrocarbons by machinery, generators and other vehicles during construction and clearing, Gas venting during commissioning and methane leakage from the pipeline during operations. **Indirect Impacts:** • Scope 3 emissions derived from upstream and downstream emissions.
Avoidance and Mitigation	Excessive greenhouse gas emissions associated with the Proposal have been avoided or minimised through the design of the Proposal during the planning phase, including: • The Proposal has been designed to avoid the use of diesel-powered machinery to as low as practicable • The pipeline has been designed to avoid methane leakage to as far as practicable. Potential impacts during clearing, construction and operation will be minimised through measures outlined in a CEMP and the DBNGP EP.
Residual Impacts and Environmental Outcomes	The emissions from the Proposal are estimated to total 1,362 t CO_2-e during construction and 8 t CO_2-e per annum during operation. This is below the EPA assessment threshold of 100,000 t CO_2-e per year (EPA 2023b) and impacts associated with GHG emissions from the Proposal are therefore not considered to be significant. **The proponent considers that through the implementation of mitigation measures, GHG emissions have been reduced to as low as is reasonably practicable to minimise the risk of environmental harm associated with climate change and the Proponent considers that the EPA's objective for Greenhouse Gas Emissions will be met.**
Factor 6: Marine Factors	
Potential Impacts	**Impacts:** • Elevated turbidity from fugitive dust emissions resulting in reduced marine environmental quality and impacts to the King Bay mangrove community • Elevated turbidity resulting in reduced marine environmental quality and impacts to the King Bay mangrove community due to site construction works and earthworks exposing underlying soil followed by increased sediment load • Reduced marine environmental quality and associated impacts to the King Bay mangrove community from accidental spills of hazardous materials • Reduced marine environmental quality and associated impacts to the King Bay mangrove community from excavation/exposure of contaminated groundwater or ASS.
Avoidance and Mitigation	Potential impacts to marine environmental quality and benthic communities have primarily been avoided or minimised through the design of the Proposal during the planning phase, including: • The Proposal has been designed to avoid clearing vegetation as far as practicable, avoiding increased dust emissions

	• The Development Envelope has been sited to avoid significant water bodies • Construction will be avoided during the wet season and king tides, when risks associated with stormwater runoff and accidental spills are highest • Vehicles and machinery will be refueled offsite avoiding the storage of large quantities of hazardous materials within the Development Envelope. Potential impacts during clearing, construction and operation will be minimised through measures outlined in a CEMP, DBNGP EP and OSCP.
Residual Impacts and Environmental Outcomes	The Proposal is not anticipated to have any significant residual impacts on marine environmental quality or benthic communities due to the following: • Impacts to marine environmental quality and the King Bay mangrove community are unlikely to be significant given the small scale nature of the Proposal and that the construction timeframe will be short and will avoid the wet season and key tides, when marine waters are most at risk of being impacted • No dewatering is required for the Proposal, further minimising contamination risks associated with discharging groundwater to the marine environment • Impacts to the marine environment will be further managed through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP • An ASS Management plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015). **The Proponent considers that due to the avoidance and proposed management measures described, the Proposal can be implemented to ensure that the EPA's objectives for the Marine Environmental Quality and Benthic Communities and Habitats factors can be met.**

Environmental impacts of the Proposal have been considered both holistically and cumulatively. Each of the environmental factors relevant to the Proposal are associated with at least one other factor in some way. Given the small scale nature of the Proposal, the short construction period, and the absence of key environmental values within the Development Envelope and surrounds, the combined effects on the terrestrial environment as a whole are unlikely to be greater than the Proposal's effect on individual factors. The cumulative effects of the Proposal have been assessed by considering the successive incremental and interactive impacts of the Proposal with past, present and reasonably foreseeable future activities on the Burrup Peninsula. From a cumulative impact perspective, the Proposal will only result in negligible to minor cumulative impacts on the environment and as such the EPA's objective for all environmental factors can be met.

The Proponent considers the avoidance and mitigation proposed in this Referral Supporting Document, as well as the ability of other statutory decision-making processes to mitigate potential impacts to the environment, are sufficient to meet both the principles contained in the EP Act, and the EPA's environmental objectives.

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ABBREVIATIONS

Abbreviation	Definition
ACV	Authorisation to Clear Vegetation
AH Act	*Aboriginal Heritage Act 1972*
APM	Animal Plant Mineral Pty Ltd
ASS	Acid Sulphate Soils
BAM Act	*Biosecurity and Agricultural Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016*
BESS	Battery Energy Storage Systems
BMIEA	Burrup and Maitland Industrial Estates Agreement
BoM	Bureau of Meteorology
BSIA	Burrup Strategic Industrial Area
CEMP	Construction Environmental Management Plan
tCO_2-e	Tonnes of CO_2 equivalent
DAFWA	Department of Agriculture and Food
DBCA	Department of Biodiversity, Conservation and Attractions
DBP	DBNGP (WA) Nominees Pty Ltd
DBNGP	Dampier to Bunbury Natural Gas Pipeline
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEMIRS	Department of Energy, Mines, Industry, Regulation and Safety
DGS Act	*Dangerous Goods Safety Act 2004*
DMA	Decision-making Authority
DPIRD	Department of Primary Industries and Regional Development

Abbreviation	Definition
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
ELA	Eco Logical Australia
EPA	Environmental Protection Authority
EP	Environment Plan
EP Act	*Environmental Protection Act 1986*
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESG	Environmental, Social and Governance
GHG	Greenhouse Gas
IBRA	Interim Biogeographic Regionalisation for Australia
LEP	Levels of Ecological Protection
LoS	Line of Sight
MAC	Murujuga Aboriginal Corporation
MNES	Matters of National Environmental Significance
NGER ACT	*National Greenhouse and Energy Reporting Act 2007*
NVCP	Native Vegetation Clearing Permit
OSCP	Oil Spill Contingency Plan
PECs	Priority Ecological Communities
PFAS	Polyfluoroalkyl Substances
PL40	Pipeline Licence 40
PL62	Pipeline Licence 62

Abbreviation	Definition
PP Act	*Petroleum Pipelines Act 1969*
PP regulation	Petroleum Pipelines (Environment) Regulation 2012
Project Ceres	Perdaman Urea Plant development
RiWI Act	*Rights in Water and Irrigation Act 1914*
RSD	Referral Supporting Document
SCADA	Supervisory Control and Data Acquisition
TAN	Technical Ammonium Nitrate

1. INTRODUCTION

1.1 Overview

The Perdaman Lateral Project (the Proposal) is located within the Burrup Peninsula of the Pilbara region of Western Australia, approximately 20 km north of Karratha and 8 km north of Dampier (Figure 1-1). The Proposal will consist of a 550 m long pipeline, and supporting infrastructure, to transport natural gas from the existing Dampier to Bunbury Natural Gas Pipeline (DBNGP) to the proposed Perdaman Urea Plant development (Project Ceres). The supporting infrastructure includes:

- Perdaman Inlet Station
- Perdaman Meter Station
- Material storage/laydown areas
- Rock causeway.

1.2 Purpose and Scope

The purpose of this Referral Supporting Document (RSD) is to provide additional supporting information for the assessment of the Proposal as proposed by DBNGP (WA) Nominees Pty Ltd (DBP; the Proponent). Collectively these documents describe and assess the existing environmental values present within and immediately surrounding the Proposal and the environmental impacts that have the potential to occur from its implementation. This information will enable the Environmental Protection Authority (EPA) to assess the Proposal in accordance with the *Environmental Protection Act 1986* (EP Act).

1.3 Proponent

DBNGP (WA) Nominees Pty Ltd is the Proponent for this Proposal. The relevant Proponent details are presented in Table 1-1.

Table 1-1: Proponent Details

Proponent Details	
ABN	54 871 588 515
Address	Level 22 140 St Georges Terrace PERTH WA 6000
Contacts	Melanie Kenny Environmental Manager Melanie.Kenny@agig.com.au T +61 8 9223 4907

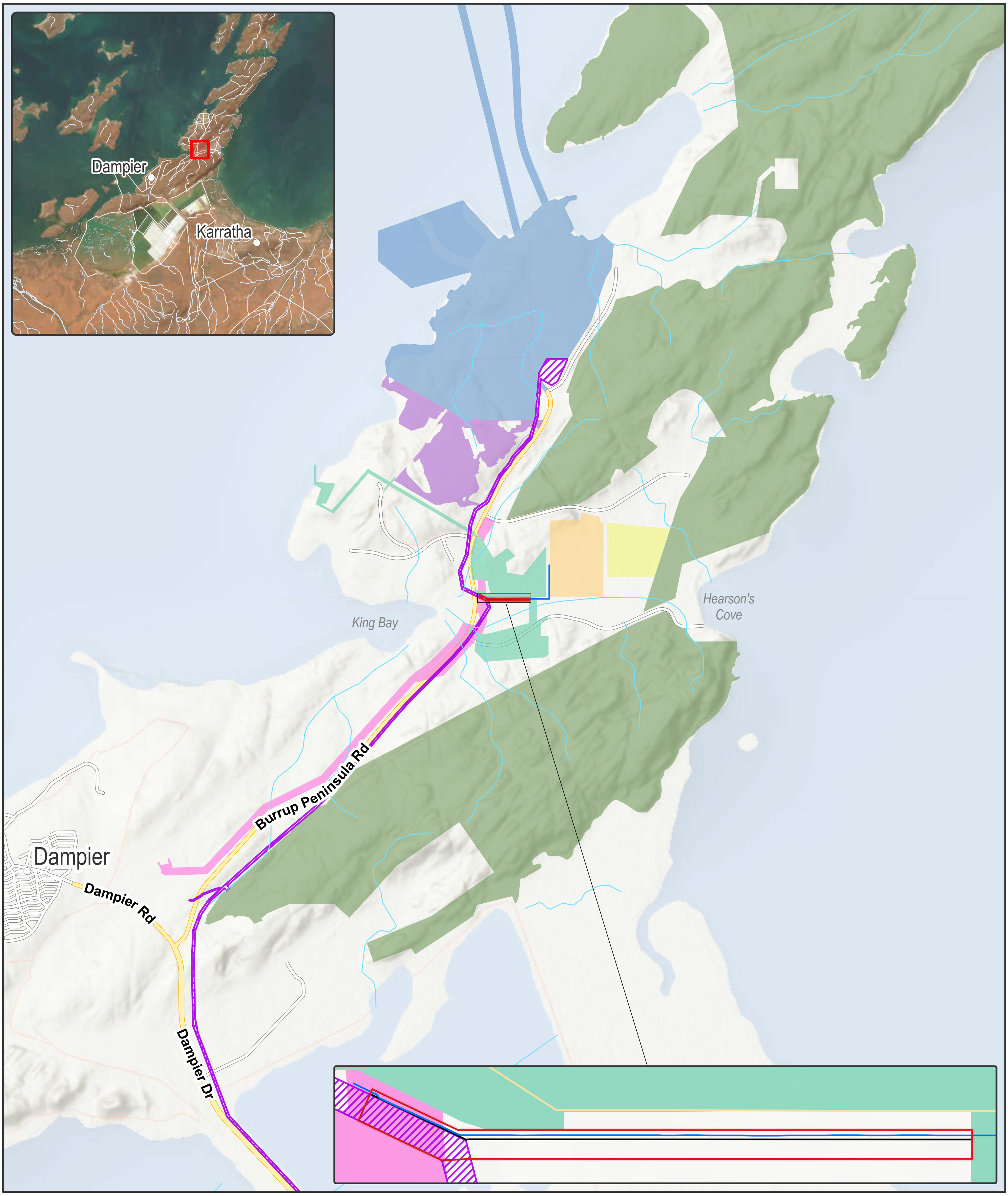


Figure 1-1: Regional Context of the Proposal

- 🟥 Development Envelope
- 🟩 Murujuga National Park
- — Watercourses
- — Distributor Road
- — Access Road
- — Burrup Fertilisers Lateral (PL62)
- — Existing Rock Causeway
- ▨ Dampier to Bunbury Natural Gas Pipeline (DBNGP)
- 🟩 Project Ceres
- 🟧 Yara Pilbara Fertilisers Plant
- 🟦 North West Shelf Project Extension
- 🟪 Burrup Common User Transmission Infrastructure
- 🟪 Pluto LNG Development
- 🟨 Technical Ammonium Nitrate Production Facility

0 0.5 1 2
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER7890-JP Date: 9/07/2024

N

2. PROPOSAL

2.1 Background

The Proponent is proposing to construct and operate a 550 m pipeline and associated infrastructure to connect the proposed Project Ceres to the DBNGP network.

Perdaman Industries is currently in the process of constructing the Project Ceres urea plant on the Burrup Peninsula, located directly adjacent to the north, east and south of the Proposal. The plant will convert natural gas into ammonia and subsequently into urea using a single synthesis reactor to produce fertiliser. The Proposal will provide the primary natural gas source from the DBNGP to Project Ceres.

The Proposal intersects two existing pipeline licences – the Burrup Fertilisers Lateral (Pipeline Licence 62 [PL62]) and the DBNGP (Pipeline Licence 40 [PL40]) (Figure 1-1). The DBNGP was constructed and commissioned in 1984 to transport natural gas from Dampier to commercial, industrial and domestic markets in south-west WA, finishing near Bunbury. PL62 is a 1.4 km pipeline which connects the Yara Pilbara Fertilisers plant to the DBNGP network. PL62 is maintained cleared to enable Line of Sight (LoS) (PL62 LoS; Figure 2-2).

2.2 Proposal Elements

All activities associated with the Proposal will be contained within a 2.05 ha Development Envelope (Figure 2-1). The entire Development Envelope is proposed to be disturbed as part of this Proposal.

Table 2-1 presents a general description of the Proposal, whilst Table 2-2 identifies the Proposal's key elements. Figure 2-1 presents a schematic of the Proposal elements.

Table 2-1: General Proposal Content Description

General Proposal Content Description	
Proposal Title	Perdaman Lateral Project
Proponent Name	DBNGP (WA) Nominees Pty Ltd
Short Description	The Perdaman Lateral Project (the Proposal) is located within the Burrup Peninsula, approximately 20 km north of Karratha. The Project involves the construction of a 550 m pipeline and associated supporting infrastructure to transport a maximum of 150 TJ of natural gas per day from the Dampier to Bunbury Natural Gas Pipeline to the proposed Perdaman Urea Plant development.

Table 2-2: Proposal Content Elements

Proposal Element	Location / Description	Maximum Extent, Capacity or Range
Physical Elements		
DN400 lateral pipeline	Figure 2-1 and Figure 2-2	2.05 ha of disturbance including 0.21 ha of native vegetation, within a 2.05 ha Development Envelope
Hot tap connection to the DBNGP		
Pig Launcher Compound		
Pig Receiver Compound and Custody Transfer Meter Station		
Material storage/laydown areas		
Rock causeway		
Operational Elements		
Transfer natural gas from DBNGP to Perdaman Urea Plant development	N/A	150 TJ/Day (Maximum)
Proposal Elements with Greenhouse Gas Emissions		
Construction Elements:		
Scope 1	1,362 t CO_2-e	
Scope 2	N/A	
Scope 3	N/A	
Operation elements:		
Scope 1	8 t CO_2-e / year	
Scope 2	N/A	
Scope 3	820,000 t CO_2-e / year	
Rehabilitation		
The Development Envelope contains only minor areas (0.21 ha) of native vegetation in Poor condition and 1.22 ha of mudflat habitat (which does not contain any vegetation). The Proposal includes backfilling of the proposed pipeline with trench spoil and topsoil following construction. Revegetation of native vegetation prior to decommissioning is therefore not relevant to this Proposal.		

Proposal Element	Location / Description	Maximum Extent, Capacity or Range
Commissioning		
Following the completion of the construction phase, the Proponent will undertake the environmental commissioning of the Proposal in accordance with the DBNGP Environment Plan (EP) approved by the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS). This will consist of final leak tests, confirmation of the functionality (including set point confirmation for all safety critical elements) and remote visibility of all installations/devices.		
Decommissioning		
All operational infrastructure located in the surface of the Development Envelope will be removed. Pipelines and subsurface infrastructure will also be removed where practicable (no additional environmental impacts are likely), otherwise, it will be appropriately decommissioned and buried at an appropriate level below the surface. A decommissioning and final rehabilitation plan will be prepared prior to commencing any decommissioning activities.		
Other elements which affect extent of effects on the environment		
Proposal time	Maximum project life	28 years
	Construction phase	4-6 months
	Operations phase	25 years
	Decommissioning and rehabilitation phase	2 years

2.2.1 DN400 Lateral Pipeline

A DN400 (16-inch), approximately 550 m pipeline from the Perdaman Inlet Station to the Perdaman Meter Station. The installation of the pipeline will involve the construction of a 550 m underground concrete-coated pipeline with pipeline pigging facilities at either end to tie into the DBNGP and meter station. Construction of the pipeline will involve trenching, stringing, welding, lower-in, backfilling, hydrostatic pressure testings and final tie-ins. The trench will be open for a maximum of three weeks. Concrete-coated pipe will be utilised to eliminate the need for dewatering.

Trench spoil will be stored to the south of the trench and re-used for backfilling, and excess spoil will be spread over the pipeline centreline and battered against the rock causeway.

2.2.2 Perdaman Inlet Station

The Perdaman Inlet Station consists of the following components:

- Connection to DBNGP at new hot tap point
- Remote operable shutdown valve
- Pipework and valving provision for pig launcher
- Field Marshalling Box for control, power supply and communications cables run from the Perdaman Meter Station.

The hot tap connection to the DBNGP involves making a connection to existing piping or pressure vessels without interrupting or emptying that section of pipe or vessel. This method allows for modifications or expansions to the pipeline network without shutting down operations.

A remote operable isolating valve will be installed to isolate systems in case of a loss of primary containment. This valve helps prevent further leakage and ensures that the affected area can be safely addressed without compromising the entire system.

A pig launcher is used to facilitate intelligent pigging of the pipeline for maintenance, cleaning, and inspection purposes, allowing for the detection and mitigation of defects and corrosion within the pipeline infrastructure.

2.2.3 Perdaman Meter Station

The Perdaman Meter Station consists of the following components:

- Pipework and valving provision for pig receiver
- Remote operable shutdown valve skid
- Filtration skid
- Duty/standby custody transfer Ultrasonic flow skid
- Duty/standby pressure control skid
- 2 x Gas Chromatograph
- A Remote Terminal Unit Control shelter
- Solar panel and battery storage for power supply.

A pig receiver will be installed to retrieve the intelligent pig from pigging, ensuring that any pig sent through the system for cleaning or diagnostic purposes is safely and effectively recovered.

A custody transfer meter station will be installed to allow accurate measurement and accounting of the gas flow, facilitating proper management and billing between the DBNGP and Project Ceres.

2.2.4 Supporting Infrastructure

Supporting infrastructure to facilitate construction of the Proposal will include material storage/laydown areas. There will be no storage of dangerous or hazardous goods within the site in quantities required to be licenced.

2.2.5 Rock Causeway

In order to facilitate construction access along the pipeline easement, the width of the existing rock causeway is to be expanded. The existing causeway runs parallel to the proposed pipeline. This causeway will be expanded from 3 m in width to 8 m and raised to provide 400 mm clearance from the natural surface level. The length of the causeway is approximately 550 m. Pipeline construction will proceed following completion of the causeway expansion.

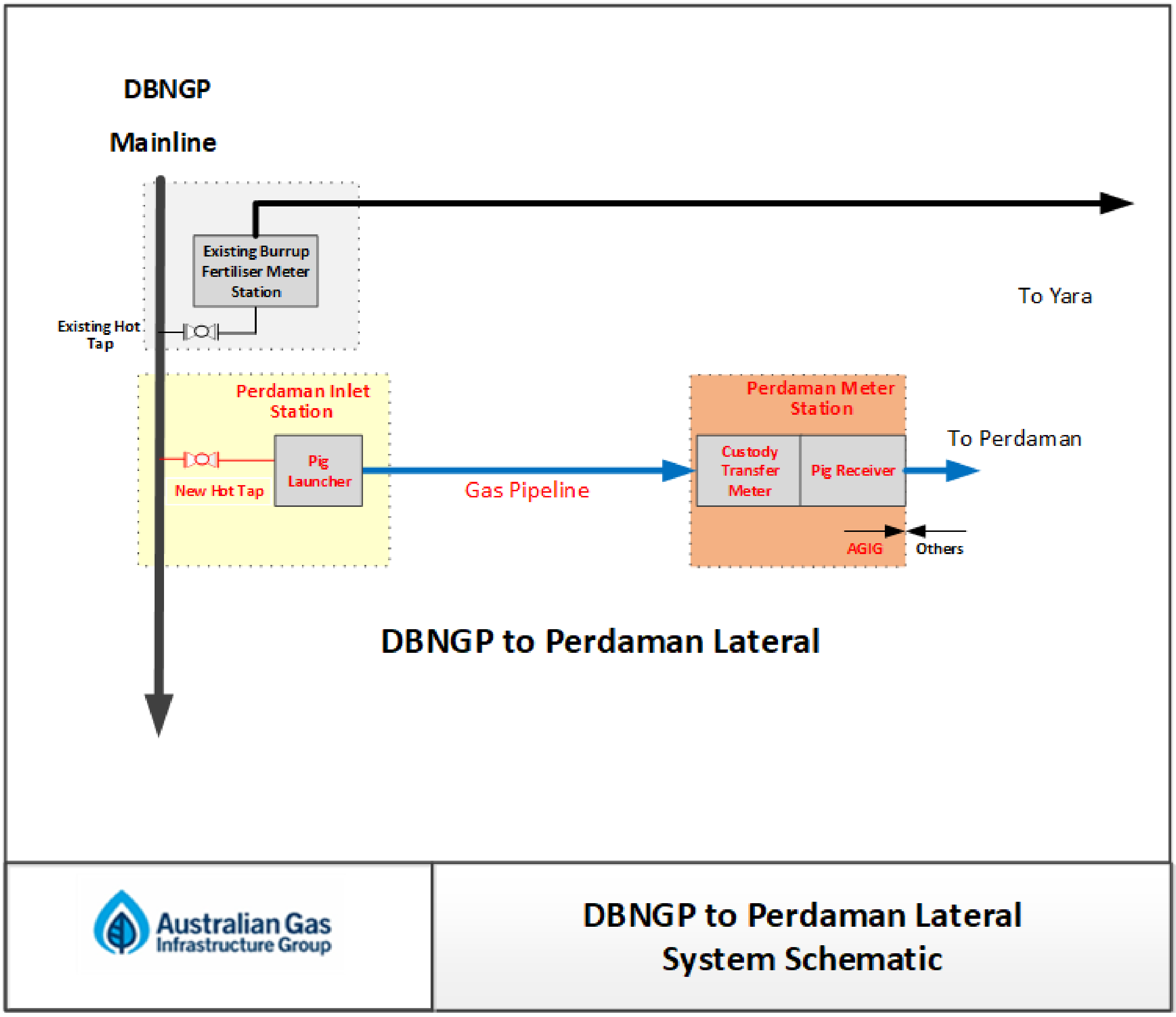


Figure 2-1: DBNGP to Perdaman Lateral Pipeline Schematic

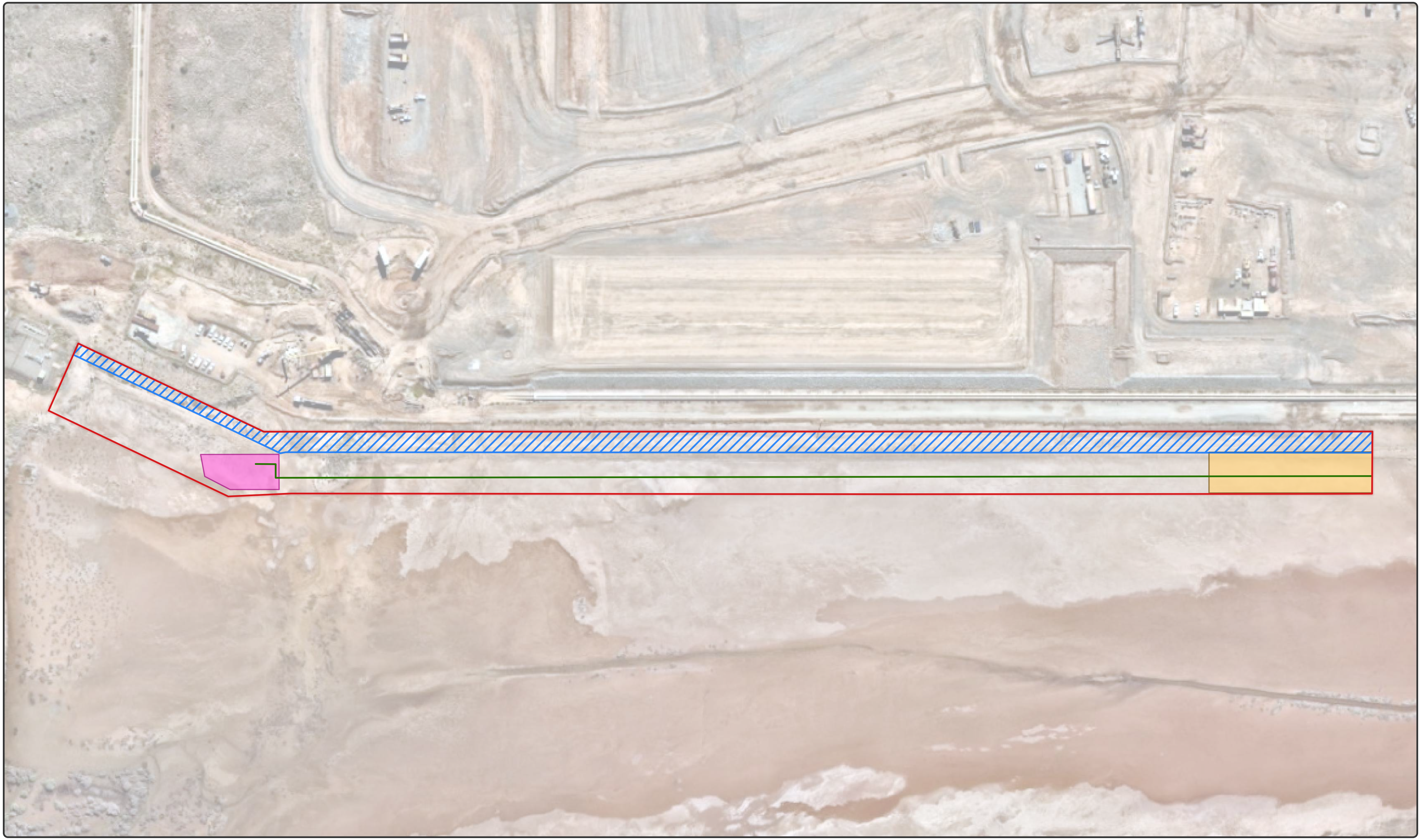


Figure 2-2: Development Envelope and Proposal Elements

Datum/Projection:
GDA 1994 MGA Zone 50

24PER7890-JP Date: 9/07/2024

2.3 Proposal Alternatives

The location of the existing DBNGP pipeline and Project Ceres urea plant defines the location of the Proposal, and therefore no alternative or more suitable locations have been identified. However, the Proposal design has been optimised to minimise environmental and social impacts, including the following design, layout and mitigation considerations:

- Re-designing the Development Envelope to avoid a midden site identified by Traditional Owners
- Utilising the existing access way for construction of the Proposal
- Re-designing construction methods to remove the requirement for dewatering and discharge.

2.4 Local and Regional Context

The Proposal is located within the Burrup Peninsula of the Pilbara region of Western Australia, approximately 20 km north-west of Karratha and 8 km north of Dampier. The Development Envelope is located within the City of Karratha Local Government Area and is zoned Strategic Industry under the City of Karratha Local Planning Scheme 8. The Development Envelope is also located within the Burrup Strategic Industrial Area (BSIA), an area designated and managed by DevelopmentWA under the Burrup and Maitland Industrial Estates Agreement (BMIEA). The Development Envelope in particular is in an area set aside as a service corridor within the BSIA.

The Development Envelope occurs within the Ngarluma/Yindjibarndi Native Title Determination Area (WAD6017/1996), which is held jointly by the Ngarluma Aboriginal Corporation and the Yindjibarndi Aboriginal Corporation.

The land surrounding the Development Envelope primarily consists of industrial developments related to the oil and gas sector and the Murujuga National Park, located approximately 1 km to the north and south of the Development Envelope (Figure 1-1).

3. LEGISLATIVE CONTEXT

3.1 Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) and its associated regulations is the primary environmental protection legislation within Western Australia.

Part IV of the EP Act provides the legislative framework for the Minister of the Environment (Western Australia) and their delegates to conduct environmental impact assessments (EIA) on proposals that have or are likely to significantly impact the environment. The EIA process is administered by the Environmental Protection Authority (EPA) division within the Department of Water and Environmental Regulation (DWER).

This document and the associated referral application form have been developed to meet the legislative requirements outlined in s.38 of the EP Act for the 'referral of proposals' to the EPA.

3.2 Petroleum Pipelines Act 1969 and Associated Environment Regulations

The *Petroleum Pipelines Act 1969* (PP Act) applies to construction, operation and maintenance of petroleum flowlines/trunklines gas transmission pipelines on land within WA. All infrastructure and activities relevant to the Proposal will be authorised under the PP Act.

The objectives of the environment regulations associated with the PP Act are to ensure that any petroleum activities are carried out in a manner consistent with the principles of ecologically sustainable development. The regulations also ensure that the activities are being carried out in accordance with an EP and an Oil Spill Contingency Plan (OSCP). All petroleum activities within WA are to be undertaken in accordance with these plans, which include appropriate risk-based environmental performance objectives and standards and provide criteria for determining whether these are met.

The management measures outlined within this document are reflected in the DBNGP EP and OSCP, which will be updated to include the Proposal.

3.3 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) is the primary environmental protection legislation at the federal level and provides a legal framework for the protection of Matters of National Environmental Significance (MNES). Under this act all activities that will or has the potential to have a significant impact on an MNES need to be referred to the Australian Minister for the Environment. The proposal is then assessed by the minister's delegates within the Department of Climate Change, Energy, the Environment and Water (DCCEEW). As part of the planning process for the Proposal, DBP have considered its requirements under the EPBC Act.

3.4 Other Environmental Approvals and Regulations

The other environmental approval decision-making authorities (DMAs) and regulating legislations relevant to the Proposal are outlined in Table 3-1. Additional detail of how these decision-making authorities will assist in mitigating the Proposal's potential impacts and ensure it is implemented in accordance with the EPA's objectives is outlined in Table 3-2.

Table 3-1: Decision-making Authorities and Processes

Decision Making Authority	Legislation or Agreement Regulating the Activity	Approval Required
Department of Energy, Mines, Industry, Regulation and Safety (DEMIRS)	*Petroleum Pipelines Act 1969* (PP Act) and Petroleum Pipelines (Environment) Regulations 2012 (PP [Environment] Regulations)	License to construct and operate petroleum pipelines.
	EP Act, Part V Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Native Vegetation Clearing Permit (NVCP)
Department of Biodiversity, Conservation and Attractions (DBCA)	*Biodiversity Conservation Act 2016* (BC Act)	Licensing associated with fauna and flora surveys and research, including fauna handling licenses

Table 3-2: Other Decision-making Processes to Mitigate Potential Environmental Impacts

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
Flora and Vegetation • Clearing 0.21 ha of native vegetation in Poor condition.	EP Act, Part V: NVCP	Limits of the DMA to regulate an impact: • Exemptions apply for certain activities up to 5 ha per financial year (excludes environmentally sensitive areas) • Clearing is restricted to 2-5 years depending on the type of the NVCP • Applies to 'native vegetation' only. The above limitations do not apply to the Proposal and as such, the NVCP process can adequately regulate the potential impacts of clearing 0.21 ha of native vegetation for the Proposal.	The NVCP process is governed by the guiding principles for the clearing of native vegetation, as stipulated in Schedule 5(1) of the EP Act, stating that native vegetation should not be cleared if: • it comprises a high level of biodiversity; or • it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna; or • it includes, or is necessary for the continued existence of, threatened flora; or • it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community; or • it is significant as a remnant of native vegetation in an area that has been extensively cleared; or • it is growing in, or in association with, an environment associated with a watercourse or wetland; or • the clearing of the vegetation is likely to cause appreciable land degradation; or • the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area; or • the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or • the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding. To obtain a NVCP for the Proposal the impacts to native vegetation must be consistent with these clearing principles. This will ensure that any potential impacts to flora and vegetation are mitigated. The Proposal is not expected to have any significant residual impacts on flora and vegetation due to the following: • The Proposal will result in the clearing of 0.21 ha of native vegetation in Poor condition • The absence of any conservation significant flora species or ecological communities within or immediately adjacent to the Development Envelope • The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the native vegetation surrounding the Development Envelope • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction • Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised	**Conditions** In accordance with ss 51G, 51H and 51I of the EP Act, DWER is empowered to attach conditions to the NVCP that are proportionate to the assessed potential impacts on the environment. **Enforcement** Under s 51J of the EP Act the NVCP may include conditions requiring the permit holder to report on various aspects of the clearing activities approved under the permit. It may also contain conditions allowing DWER to undertake compliance inspections. If through the reporting and inspection processes, it is identified that a law has been breached, DWER is empowered under s 70 of the EP Act to undertake 'enforcement actions' to either remedy the situation or sanction the permit holder. **Review Process** Under ss 101A (1), 101A(3) and 101A(4) of the EP Act any permit applicants or a third party, including the general public, have the opportunity to appeal against DWER's determination or any conditions attached to an approved permit, within the legislated timeframe. These appeals will be considered by the Minister of the day, who is empowered under ss 51K(1)(h), 51K(2), 105(aa), 107, 109, 110 of the EP Act to make a final determination to uphold or dismiss the appeal.	Applications for an NVCP are advertised for public comment in accordance with s51E (4B) of the EP Act. DWER is also required to consult with other relevant agencies on the content of the application and conditions that may be required, including DBCA, under s51E (4A) of the EP Act. The Proponent will engage with DEMIRS prior to submission of the NVCP application.

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
			through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP. Based on the above, the environmental outcomes for the Proposal will be consistent with the EPA's Flora and Vegetation Factor Objective '*To protect flora and vegetation so that biological diversity and ecological integrity are maintained.*'		
	PP Act: Environment Plan and OSCP The Proponent will update the DBNGP Environment Plan to include the Proposal, which will be required to be approved by DEMIRS.	Limits of the DMA to regulate an impact: - Restricted to the assessment and management of impacts to the environment that are related to the construction and operation of the Petroleum Pipeline. As the Proposal is for the construction and operation of a petroleum pipeline, the above limit does not apply and as such, the Environment Plan can regulate the potential impacts of clearing 0.21 ha of native vegetation.	The development and approval of an Environment Plan are guided by the overarching objectives (s 3) of the PP (Environment) Regulations. The objective of the regulations is to ensure that any pipeline activity is: *(a) Carried out in a manner consistent with the principles of ecologically sustainable development* *(b)* Carried out in accordance with an environment plan that: (i) *Demonstrates that the environmental impacts and environmental risks of the pipeline activity will be reduced to as low as is reasonably practicable* (ii) *Has appropriate environmental performance objectives and environmental performance standards* (iii) *Has appropriate measurement criteria for determining whether those objectives and standards have been met.* The DBNGP Environment Plan includes measures to minimise potential impacts to flora and vegetation, and as per s7 of the PP (Environment) Regulations an activity must comply with an approved environment plan. The Proposal is not expected to have any significant residual impacts on flora and vegetation due to the following: - The Proposal will result in the clearing of 0.21 ha of native vegetation in Poor condition - The absence of any conservation significant flora species or ecological communities within or immediately adjacent to the Development Envelope - The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the native vegetation surrounding the Development Envelope - The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction - Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP. Based on the above, the outcomes of the Proposal are expected to align with the EPA's Flora and Vegetation	**Conditions** In accordance with s11 of the PP (Environment) Regulations, the Minister of the day may approve an Environment Plan subject to the imposition of limitations or conditions. **Enforcement** Under the PP (Environment) Regulations, the Minister of the day is empowered to administer penalties and/or the withdraw approval of a plan if the applicant is not adhering to specific approval conditions and/or provisions within the regulation. **Review Process** There are no provisions within the PP Act or the PP (Environment) Regulations for the public to review the Environment Plan. However, there are mechanisms within the regulations for the Minister or their delegate to review and ensure the appropriateness/effectiveness of the plan in achieving environmental protection. In addition, as per s20 of the PP (Environment) Regulations the operator of a pipeline activity must submit to the Minister a proposed revision of the environment plan every five years.	As part of the approval process for an Environment Plan, the Minister of the day is not required under the PP Act to undertake stakeholder consultation. However, once approved, a summary of the plan must be made publicly available. In addition, the PP (Environment) Regulations require that adequate consultation must be undertaken with relevant stakeholders and a report on this consultation included in the EP. The Proponent has consulted with DEMIRS regarding the update of the DBNGP EP to include this Proposal. DEMIRS agreed to the update of the DBNGP EP

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
			Factor Objective *'To protect flora and vegetation so that biological diversity and ecological integrity are maintained.'*		

Terrestrial Fauna
- Clearing of 1.43 ha of native fauna habitat, including:
  ○ 0.21 ha of Low Chenopod Shrubland
  ○ 1.22 ha of Mudflats
- Loss of or injury to native fauna
- Degradation of native fauna habitat.
	EP Act, Part V: NVCP	Limits of the DMA to regulate an impact:
		- Exemptions apply for certain activities up to 5 ha per financial year (excludes environmentally sensitive areas)
		- Clearing is restricted to 2-5 years depending on the type of the NVCP
		- Applies to 'native vegetation' only.
		The above limitations do not apply to the Proposal and as such, the NVCP process can regulate the potential impacts of clearing 0.21 ha of native vegetation comprising fauna habitat for the Proposal.
			The guiding principles for the clearing of native vegetation, as stipulated in Schedule 5(1) of the EP Act, states that native vegetation should not be cleared if:
			- it comprises a high level of biodiversity; or
			- it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna; or
			- it includes, or is necessary for the continued existence of, threatened flora; or
			- it comprises the whole or a part of, or is necessary for the maintenance of, a threatened ecological community; or
			- it is significant as a remnant of native vegetation in an area that has been extensively cleared; or
			- it is growing in, or in association with, an environment associated with a watercourse or wetland; or
			- the clearing of the vegetation is likely to cause appreciable land degradation; or
			- the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area; or
			- the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water; or
			- the clearing of the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding.
			To obtain a NVCP for the Proposal, the impacts to native vegetation must be consistent with these clearing principles. This will ensure that any potential impacts to native fauna are mitigated.
			The Proposal is not anticipated to have any significant residual impact on terrestrial fauna, due to the following:
			- The Proposal will result in the clearing of 1.22 ha of Mudflats fauna habitat and 0.21 ha of Low Chenopod Shrubland habitat
			- Direct impacts to terrestrial fauna are unlikely to be significant given foraging habitat is widespread in the region, the construction timeframe will be short (4-6 months) and will avoid periods of inundation where possible, when the conservation significant species may be utilising the Development Envelope. Trenching will occur for a maximum of three weeks and will not occur during the wet season or during king tides
			- The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the fauna habitat surrounding the Development Envelope
				As described above	As described above

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
			- The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction - Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP. Based on the above, the environmental outcomes for the Proposal will be consistent with the EPA's Terrestrial Fauna Factor Objective which is '*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.*'		
	PP Act: Environment Plan and OSCP	Limits of the DMA to regulate an impact: - Restricted to the assessment and management of impacts to the environment that are related to the construction and operation of the Petroleum Pipeline. As the Proposal is for the construction and operation of a petroleum pipeline, the above limit does not apply and as such, the Environment Plan can regulate the potential impacts to native fauna.	All provisions, including the development and approval of an Environment Plan are guided by the overarching objectives (s 3) of the PP (Environment) Regulations. The objective of the regulations is to ensure that any pipeline activity is: *(a) Carried out in a manner consistent with the principles of ecologically sustainable development* *(b)* Carried out in accordance with an environment plan that: (i) *Demonstrates that the environmental impacts and environmental risks of the pipeline activity will be reduced to as low as is reasonably practicable* (ii) *Has appropriate environmental performance objectives and environmental performance standards*	As described above	As described above

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
			(iii) *Has appropriate measurement criteria for determining whether those objectives and standards have been met.* The DBNGP Environment Plan includes measures to minimise potential impacts to terrestrial fauna, and as per s7 of the PP (Environment) Regulations, an activity must comply with an approved environment plan. The Proposal is not anticipated to have any significant residual impact on terrestrial fauna, due to the following: • The Proposal will result in the clearing of 1.22 ha of Mudflats fauna habitat and 0.21 ha of Low Chenopod Shrubland habitat • Direct impacts to terrestrial fauna are unlikely to be significant given foraging habitat is widespread in the region, the construction timeframe will be short (4-6 months) and will avoid periods of inundation where possible, when the conservation significant species may be utilising the Development Envelope. Trenching will occur for a maximum of three weeks and will not occur during the wet season or during king tides • The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the fauna habitat surrounding the Development Envelope • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction • Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP. Based on the above, the outcomes of the Proposal are expected to align with the EPA's Terrestrial Fauna Factor Objective which is '*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.'*		
Social Surroundings • Dust, noise and vibration emissions • Impacts to potential unidentified heritage values.	PP Act: Environment Plan and OSCP	Limits of the DMA to regulate an impact: • Restricted to the assessment and management of impacts to the environment that are related to the construction and operation of the Petroleum Pipeline. As the Proposal is for the construction and operation of a petroleum pipeline, the above limit does not apply and as such, the Environment Plan can regulate the potential impacts to social surroundings values.	All provisions, including the development and approval of an Environment Plan are guided by the overarching objectives (s 3) of the PP (Environment) Regulations. The objective of the regulations is to ensure that any pipeline activity is: *(a) Carried out in a manner consistent with the principles of ecologically sustainable development* *(b)* Carried out in accordance with an environment plan that: (i) *Demonstrates that the environmental impacts and environmental risks of the pipeline activity will be reduced to as low as is reasonably practicable*	As described above	As described above

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
			(ii) *Has appropriate environmental performance objectives and environmental performance standards* (iii) *Has appropriate measurement criteria for determining whether those objectives and standards have been met.* The Proposal will be conducted in accordance with the DBNGP Environment Plan, which includes management measures for potential impacts associated with the Social Surroundings. As per s7 of the PP (Environment) Regulations, an activity must comply with an approved environment plan. In addition, heritage surveys have been undertaken for the Proposal and have confirmed that no Aboriginal heritage sites of significance occur within the Development Envelope. An endorsement of the findings of the survey reports was received from MAC on 28 March 2024. The Proposal is not expected to have any significant residual impact on social surroundings due to the following: • No Aboriginal Cultural Heritage sites of significance intersect the Development Envelope according to archaeological and ethnographic heritage surveys • The Proposal has been sited within an industrial area, therefore sensitive receptors are limited • Reduced amenity to the surrounding landscape from dust, noise and vibration will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP • The Proposal is not expected to impact the integrity of Aboriginal rock art within the Murujuga National Park given the small scale nature of the project, short timeframe of construction and as low sulfur diesel will be used to reduce air emissions. Based on the above, the outcomes of the Proposal through this regulatory process are expected to align with the EPA's Social Surroundings Factor Objective which is '*To project social surroundings from significant harm.'*		
Inland Waters • Alteration of surface water flows • Contamination and/or water quality reduction of surface water and groundwater	PP Act: Environment Plan and OSCP The Proponent will update the DBNGP Environment Plan to include the Proposal, which will be required to be approved by DEMIRS. The DBNGP Environment Plan also includes an approved OSCP to provide a practical reference tool	Limits of the DMA to regulate an impact: • Restricted to the assessment and management of impacts to the environment that are related to the construction and operation of the Petroleum Pipeline. As the Proposal is for the construction and operation of a petroleum pipeline, the above limit does not apply and as such, the Environment Plan can regulate the potential impacts to inland waters.	All provisions, including the development and approval of an Environment Plan are guided by the overarching objectives (s 3) of the PP (Environment) Regulations. The objective of the regulations is to ensure that any pipeline activity is: *(a) Carried out in a manner consistent with the principles of ecologically sustainable development* *(b)* Carried out in accordance with an environment plan that: (i) *Demonstrates that the environmental impacts and environmental risks of the pipeline activity will be reduced to as low as is reasonably practicable*	As described above	As described above

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
	for personnel responding to a spill incident.		(ii) *Has appropriate environmental performance objectives and environmental performance standards* (iii) *Has appropriate measurement criteria for determining whether those objectives and standards have been met.* Three lots within the Development Envelope have been classified by DWER as 'Possibly Contaminated – Investigation Required', with restrictions on groundwater abstraction requiring testing prior to its use. Because of this, the Proponent commissioned a Baseline Environmental Site Assessment (ESA) of the Development Envelope to assess the potential contamination to inform management. The soils within the Development Envelope were not found to contain evidence of anthropogenic contaminants, including hydrocarbons, PFAS and metals. However, the ESA did identify the potential for ASS occurring if soils were oxidised. The groundwater did have elevated nutrients (ammonia, total nitrogen and phosphorus) that were considered consistent with the nutrient seepage from the TAN plant. Based on the results of this assessment no dewatering or discharge of groundwater is proposed as part of this Proposal. The Proposal is not expected to have any significant residual impact on inland waters, due to the following: • The Proposal is located away from major surface waterways or wetlands and does not intersect any drainage lines • The majority of the natural surface of the Development Envelope will be reinstated following pipeline burial; hence the Proposal is unlikely to permanently alter surface water flows • Construction activities have been designed to avoid periods of inundation as much as possible and occur over a short time period (4-6 months). Trenching will not occur during the wet season or during king tides. Hence, the Proposal is unlikely to significantly alter surface water flows or result in reduced quality of inland waters • No dewatering is required for the Proposal, further minimising contamination risks associated with discharging groundwater to the environment • Contamination of surface water from the Proposal will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP. • An ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015). The DBNGP Environment Plan includes measures to minimise potential impacts to inland waters including an OSCP and the requirement to prepare an ASS		

Potential Environmental Impact	How is the Impact Regulated by Other Decision-Making Processes	Limits of the Decision-Making Processes to Regulate the Impact	Likely Environmental Outcomes	Conditions, Enforcement, and Review Process Required by Decision Making Processes	Stakeholder Engagement in Decision-Making Processes
			Management Plan in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015). Based on the above, the outcomes of the Environment Plan are expected to align with the EPA's Inland Waters Factor Objective which is '*To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are projected.'*		
Marine Environmental Quality and Benthic Communities and Habitats - Contamination and/or reduced marine environmental quality	PP Act: Environment Plan and OSCP	Limits of the DMA to regulate an impact: - Restricted to the assessment and management of impacts to the environment that are related to the construction and operation of the Petroleum Pipeline. As the Proposal is for the construction and operation of a petroleum pipeline, the above limit does not apply and as such, the Environment Plan can regulate the potential impacts to marine values.	All provisions, including the development and approval of an Environment Plan are guided by the overarching objectives (s 3) of the PP (Environment) Regulations. The objective of the regulations is to ensure that any pipeline activity is: *(a) Carried out in a manner consistent with the principles of ecologically sustainable development* *(b)* Carried out in accordance with an environment plan that: (i) *Demonstrates that the environmental impacts and environmental risks of the pipeline activity will be reduced to as low as is reasonably practicable* (ii) *Has appropriate environmental performance objectives and environmental performance standards* (iii) *Has appropriate measurement criteria for determining whether those objectives and standards have been met.* Based on the ESA, the soils within the Development Envelope were not found to contain evidence of anthropogenic contaminants, including hydrocarbons, PFAS and metals. However, the ESA did identify the potential for ASS occurring if soils were oxidised. The groundwater did have elevated nutrients (ammonia, total nitrogen and phosphorus) were considered consistent with the nutrient seepage from the TAN plant. Based on the results of this assessment no dewatering or discharge of groundwater is proposed as part of this Proposal. The DBNGP Environment Plan includes measures to minimise the potential impacts to the marine environment, including an OSCP and the requirement to prepare an ASS Management Plan in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015). The Proposal is not expected to have any significant residual impacts on marine environmental quality or benthic communities due to the following: - Impacts to marine environmental quality and the King Bay mangrove community are unlikely to be significant given the small scale nature of the Proposal and that the construction timeframe will be short and will avoid the wet season and king tides, when marine waters are most at risk of being impacted	As described above	As described above

<table>
<tr><th>Potential Environmental Impact</th><th>How is the Impact Regulated by Other Decision-Making Processes</th><th>Limits of the Decision-Making Processes to Regulate the Impact</th><th>Likely Environmental Outcomes</th><th>Conditions, Enforcement, and Review Process Required by Decision Making Processes</th><th>Stakeholder Engagement in Decision-Making Processes</th></tr>
<tr><td></td><td></td><td></td><td>• No dewatering is required for the Proposal, further minimising contamination risks associated with discharging groundwater to the marine environment
• Impacts to the marine environment will be further managed through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP
• An ASS Management Plan will be developed and implemented in accordance with the DWER Guideline <i>Treatment and Management of Soil and Water in ASS Landscapes</i> (2015).
Based on the above, the outcomes of the Environment Plan are expected to align with the EPA's Marine Environmental Quality and Benthic Communities and Habitats Factor Objectives, which are:
• <i>To maintain the quality of marine water, sediment and biota so that environmental values are protected</i>
• <i>To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained</i></td><td></td><td></td></tr>
<tr><td>Terrestrial Environmental Quality
• Excavation/exposure of potential ASS</td><td colspan="5">The impacts associated with the exposure of ASS has been assessed within the Inland Waters and Marine Environmental Quality environmental factors. As such, this factor is not relevant to the Proposal.</td></tr>
</table>

3.5 Land Tenure

The Development Envelope intersects three land tenements, all of which occur within the City of Karratha local government area and have been zoned Strategic Industry in the city's Local Planning Scheme 8. All three tenements are currently listed as Crown land, which is administered by DPLH. Additional information on the land tenements related to the Proposal are outlined in Table 3-3.

Table 3-3: Land Tenements within the Development Envelope

Lot Number	Volume/Folio	Land Type
Lot 704 on Deposit Plan 411759	LR 3174/529	Service Corridor
Lot 540 on Deposit Plan 221364	LR 3122/50	Service Corridor
Lot 3013 on Deposit Plan 042282	LR 3139/36	Infrastructure Corridor

4. STAKEHOLDER CONSULTATION

4.1 Key Stakeholders

The key stakeholders identified in relation to the environmental aspects of the Proposal are listed in Table 4-1. A summary of consultation and engagement activities undertaken by the Proponent to date with the key stakeholders listed, along with the issues and topics raised and any Proponent response or related actions is provided in Table 4-2.

Table 4-1:Key stakeholders for the Proposal

Stakeholder Sector	Organisation
Regulatory Agencies	Department of Energy, Mines, Industry Regulation and Safety (DEMIRS)
	Department of Planning Lands and Heritage (DPLH)
	Department of Water and Environmental Regulation (DWER)
	Environmental Protection Authority (EPA)
Local Government	City of Karratha
Traditional Owners	Murujuga Aboriginal Corporation (MAC)
Landowners	DevelopmentWA
Other	Perdaman Chemicals and Fertilisers Pty Ltd
	Woodside Energy Ltd
Community Groups	Dampier Community Association
	Pilbara Wildlife Carers Association

4.2 Ongoing Engagement

The Proponent will continue to undertake stakeholder consultation throughout the Proposal's approval process, construction, operation and closure stages.

Table 4-2:Stakeholder Consultation

Stakeholder	Date	Issues / Topics Raised	Proponent Response / Outcome
DEMIRS	Ongoing engagement has occurred with DEMIRS in relation to the Proposal. Types of engagement have comprised of meetings and emails.	Discussion regarding the update of the DBNGP EP to include the Proposal.	DEMIRS agreed to the update of the DBNGP EP.
DPLH	The Proponent engaged with DLPH in June 2024 in relation to the Proposal. This included one meeting and emails.	Discussion regarding site access rights and the submission of an Access Right application.	Draft Access Right provided for review. Final grant will be post pipeline licence grant.
DWER	DWER were engaged in May 2024 in relation to the Proposal.	Licensing and permitting requirements under the *Rights in Water and Irrigation Act 1914* (RiWI Act) RiWI Act.	No concerns were raised.
DWER – EPA Services	The Proponent met with the EPA in June 2024 for a pre-referral meeting and had further correspondence with the EPA in relation to the referral process in July 2024.	Discussion of the assessment process including the appropriate approval pathway, key environmental factors, and referral documentation requirements. The Proponent informed the EPA that it proposed to refer the project under Part IV of the EP Act.	No concerns were raised.
MAC	Ongoing engagement has occurred between the Proponent and MAC since August 2023 in relation to the Proposal. Types of engagement have comprised of heritage surveys, meetings and regular emails.	Topics of consultation have included: • Heritage survey coordination and discussions • Heritage and project agreement discussion • Project support decision from MAC.	No concerns were raised. Heritage surveys have been completed and endorsed by MAC.
DevelopmentWA	Ongoing engagement has occurred between the Proponent and Development WA since November 2023 in relation to the Proposal. Types of engagement have comprised of meetings and regular emails.	DevelopmentWA were involved in initial project discussions. Additional topics of consultation have included: • Tenure discussions • Concerns regarding site contamination • Telstra cable discussions • Discussions regarding drainage issues.	The Proponent will discuss contamination and drainage concerns within the referral documentation.
Perdaman	The Proponent met with Perdaman in March 2024 in relation to the Proposal.	Discussion regarding the battery limits of the land tenure.	Project battery limits agreed.

Stakeholder	Date	Issues / Topics Raised	Proponent Response / Outcome
Woodside	The Proponent met with Woodside on a weekly and fortnightly basis since December 2023 in relation to the Proposal.	Discussion regarding the project parameters	No concerns were raised.

5. OBJECTIVES AND PRINCIPLES OF THE ENVIRONMENTAL PROTECTION ACT 1986

5.1 Principles

Table 5-1: Principles of the *Environmental Protection Act 1986*

Principle	Considerations
1. The Precautionary Principle Where there are threats of serious or irreversible damage, a lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In application of this precautionary principle, decisions should be guided by: (a) Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment. (b) An assessment of the risk-weighted consequences of various options.	The Proposal has been developed and refined to ensure that significant environmental values are avoided as far as practicable. The suitability of the mitigation actions outlined in this document are suitably informed by local environmental values and the potential impacts associated with the Proposal, through the extensive and accurate environmental studies undertaken within the Development Envelope and surrounding area.
2. The Principle of Intergenerational Equity The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	The mitigation measures outlined within this document demonstrate that this Proposal complies with all of EPA's environmental factor objectives and have been developed to ensure the environment is maintained and enhanced in accordance with the principle of intergenerational equity. This Proposal has been developed in response to the Project Ceres urea plant's need for natural gas, which will be used to create fertilisers to meet the growing global demand in the agricultural sector. The Proposal has been designed to meet the plant's needs whilst mitigating any potential significant health, diversity, and productivity impacts to the local environment for future generations.
3. Principles Relating to Improved Valuation, Pricing and Incentive Mechanisms (a) Environmental factors should be included in the valuation of assets and services. (b) The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. (c) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	It is acknowledged that the Proponent is responsible for providing the resources to fund all the mitigation measures implemented for the Proposal. The potential costs associated with these management measures have been taken into consideration when determining the feasibility of this Proposal, during the initial planning phase.

Principle	Considerations
4. The Principle of the Conservation of Biological Diversity and Ecological Integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The Proponent commissioned several biological surveys to ensure that the biological and ecological values within the Development Envelope were comprehensively understood during the Proposal's planning phase. This ensured that the potential impacts of the Proposal on the biological values present, particularly those of conservation significance, were understood and thus could be avoided or minimised as far as practicable through the implementation of the mitigation measures outlined in this document.
5. The Principle of Waste Minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	The Proposal's waste generation will primarily be restricted to the construction and decommissioning phases. However, the Proponent is committed to the implementation of the hierarchy of waste controls throughout the life of the Proposal to minimise waste generation as far as practicable.

5.2 Identification of Environmental Factors

The EPA considers 14 environmental factors which may be impacted by an aspect of a proposal. Table 5-2 outlines the 14 environmental factors and how they relate to the Proposal.

Based on an assessment of the potential impacts associated with the Proposal, the following environmental factors have been identified as relevant to the Proposal:

- Flora and Vegetation (Section 6)
- Terrestrial Fauna (Section 7)
- Inland Waters (Section 8)
- Social Surroundings (Section 9)
- Greenhouse Gas Emissions (Section 10)
- Marine Environmental Quality and Benthic Communities and Habitats (Section 11).

Table 5-2: Environmental Factors

Factor	Objective	Consideration
Sea		
Benthic Communities and Habitats	To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained	The Proposal has been designed to avoid impacts to the mangrove communities of King Bay. However, with regard for the Precautionary Principle, this factor may be considered **relevant** to the Proposal.
Coastal Processes	To maintain the geophysical processes that shape coastal morphology so that the environmental values of the coast are protected.	The Coastal Processes environmental factor is generally restricted to the coastal strip from the near shore subtidal area to coastal dune systems. The Proposal does not occur within, and will not impact, such a system. As such, this factor is **not relevant** to the Proposal.
Marine Environmental Quality	To maintain the quality of water, sediment, and biota so that environmental values are protected.	The Proposal has been designed to avoid impacts to the quality of the marine environment adjacent to the Proposal. However, with regard for the Precautionary Principle, this factor may be considered **relevant** to the Proposal.
Marine Fauna	To protect marine fauna so that biological diversity and ecological integrity are maintained.	The only Marine Fauna identified as relevant to the Proposal are Migratory birds, which are considered under the Terrestrial Fauna environmental factor. As such, this factor is **not relevant** to the Proposal.
Land		
Flora and Vegetation	To protect flora and vegetation so that biological diversity and ecological integrity are maintained.	The Proposal will result in the clearing of a small area of native vegetation. As such, this factor is **relevant** to the Proposal.
Landforms	To maintain the variety and integrity of distinctive physical landforms so that environmental values are protected.	No distinctive landforms occur within the Development Envelope. As such, this factor is **not relevant** to the Proposal.
Subterranean Fauna	To protect subterranean fauna so that biological diversity and ecological integrity are maintained.	The types of geology known to support stygofauna (including calcretes, alluvial formations, karst limestone and fractured rock aquifers) are not present within the Development Envelope. The Proposal has been designed to avoid a requirement to dewater during construction. It is considered highly unlikely that any significant subterranean fauna habitat will be disturbed. As such, this factor is **not relevant** to the Proposal.

Factor	Objective	Consideration
Terrestrial Environmental Quality	To maintain the quality of land and soils so that environmental values are protected.	The Development Envelope has been classified as 'Possibly Contaminated – Investigation Required' on its Certificate of Title. The Proponent commissioned Senversa to undertake a contamination survey of the Development Envelope (Appendix A). The survey found no contamination or Polyfluoroalkyl Substances (PFAS) within the soil. The survey did identify potential Acid Sulfate Soils (ASS). The Proposal has the potential to expose ASS during trenching. The impacts associated with the exposure of ASS has been assessed within the Inland Waters and Marine Environmental Quality environmental factors. As such, this factor is **not relevant** to the Proposal.
Terrestrial Fauna	To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.	The Proposal will result in the clearing of a small area of potential fauna habitat. The Proponent has made a concerted effort to avoid impacts to fauna, through the design of the Proposal with a short construction timeframe and avoiding of the wet season when the site is more likely to be used by migratory birds. However, with regard for the Precautionary Principle, this factor may be considered **relevant** to the Proposal.
Water		
Inland Waters	To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected	The Proponent has designed the Proposal to avoid any requirement for dewatering or discharge. However, with regard for the Precautionary Principle, this factor may be considered **relevant** to the Proposal.
Air		
Air Quality	To maintain air quality and minimise emissions so that environmental values are protected.	The Proposal may result in an increase in dust emissions, which has potential to impact flora and vegetation and fauna habitat. These impacts will be assessed within those environmental factors. As such, this factor is **not relevant** to the Proposal.
Greenhouse Gas Emissions	To minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable.	The Proposal is estimated to generate 1,362 t CO_2-e of greenhouse gas emissions during the 4-6 month construction phase. Methane leakage during operations is estimated to equal 8.2 t CO_2-e per annum. As such, this factor is **relevant** to the Proposal.
People		
Social Surroundings	To protect social surroundings from significant harm.	The Proposal has been designed to avoid impacts to heritage values. However, with

Factor	Objective	Consideration
		regard for the Precautionary Principle, this factor may be considered relevant to the Proposal.
Human Health	To protect human health from significant harm.	The Proposal does not include radiation emissions or other risks to human health that are not considered under other factors. As such, this factor is not relevant to the Proposal

6. FLORA AND VEGETATION

6.1 EPA Environmental Factor

The EPA's objective for the Flora and Vegetation Environmental Factor is '*to protect flora and vegetation so that biological diversity and ecological integrity are maintained*' (EPA 2016a).

The EPA defines 'flora' as native vascular plants and 'vegetation' as groupings of different flora patterned across the landscape that occur in response to environmental conditions (EPA 2016a).

6.2 Relevant Policy and Guidance

The relevant policy and guidance documents for Flora and Vegetation and how they have been considered for this Proposal are presented in Table 6-1.

Table 6-1: Flora and Vegetation Relevant Policy and Guidance Documents

Policy/Guidance	Consideration
Environmental Factor Guideline: Flora and Vegetation (EPA 2016a)	The information provided in this section of the document has been tailored to address the 'considerations for environmental impact assessment' outlined within these guidelines
Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b)	The technical guidance outlines the methodologies and techniques required to obtain appropriate flora and vegetation data for this document. All surveys/studies related to the Proposal have been undertaken in accordance with this document.

6.3 Receiving Environment

6.3.1 Studies and Survey Effort

A Detailed and Targeted (conservation significant) flora and vegetation survey has been undertaken within the Development Envelope (ELA 2024). The survey covered 1.43 ha of the Development Envelope (herein referred to as the Survey Area). The survey excluded 0.62 ha of the Development Envelope which is associated with the existing rock causeway and PL62 (Section 2.1). The details and spatial extent of the survey is presented in Table 6-2 and Figure 6-1 respectively.

In addition to the above, the Development Envelope is also within a larger area surveyed as part of Project Ceres. A Pre- and Post-Wet Season Biological Survey was conducted for this project in late 2018 and early 2019 and included flora and vegetation survey effort (APM 2019). The findings of this survey were reviewed by Eco Logical Australia (ELA) and have been referenced where appropriate to provide greater local context of the flora and vegetation values present within the Survey Area and wider Development Envelope (ELA 2024).

Table 6-2: Flora and Vegetation Studies

Survey	Area (ha)	Scope &Timing	Study/Survey Effort	Consistency with Guidance and Limitations
Perdaman Pipeline Flora and Fauna Survey (ELA 2024) (Appendix B)	1.43	The field survey was conducted on 26 March 2024. The scope of the survey included: • Desktop assessment of available literature and databases to identify potential values • Field survey to establish quadrats, map and describe vegetation types and compile a species inventory • Identification of conservation significant flora and vegetation communities.	The field survey included the establishment of one quadrat (20 x 125 m) and the systematic traversing of vegetation within the Survey Area	This survey was conducted in accordance with appropriate technical guidance including: • Environmental Factor Guideline: Flora and Vegetation (EPA 2016a) • Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (EPA 2016b) No limitations or constraints were identified for the survey

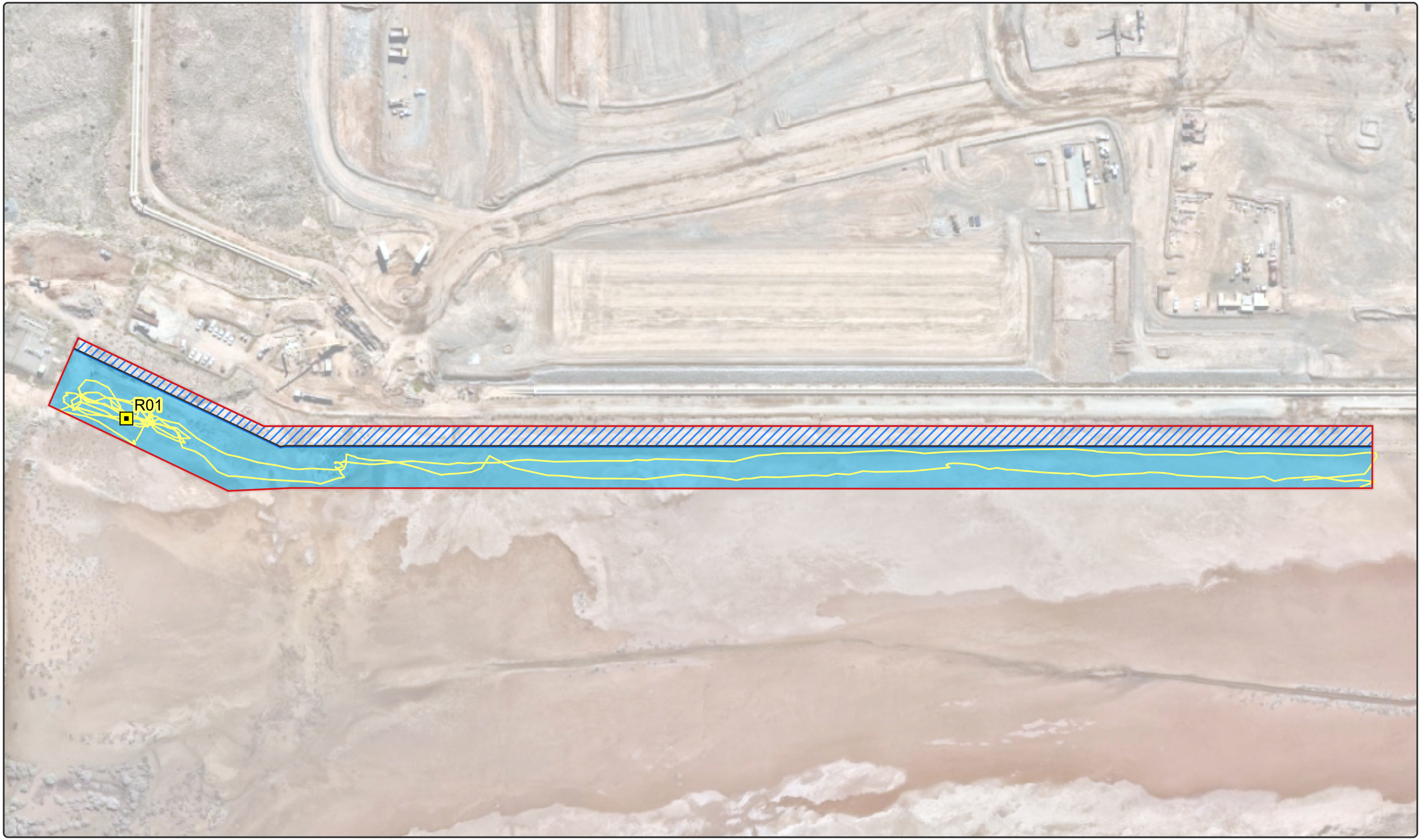


Figure 6-1: Flora and Vegetation Survey Effort

🟥 Development Envelope

▨ PL62 LoS

🟦 Survey Area

■ Quadrat

— Existing Rock Causeway

— Traverse

Datum/Projection:
GDA 1994 MGA Zone 50

24PER7890-JP Date: 11/07/2024

6.3.2 Vegetation

6.3.2.1 Interim Biogeographic Regionalisation of Australia

The Interim Biogeographic Regionalisation for Australia (IBRA) currently classifies 89 bioregions across Australia, based on a range of biotic and abiotic factors such as climate, vegetation, fauna, geology and landform (Thackway and Cresswell 1995; DCCEEW 2024a). These bioregions are further refined into 419 subregions representing more localised and homogenous geomorphological units in each bioregion (DCCEEW 2024a). IBRA divides WA into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation.

The Development Envelope is located in the Pilbara bioregion, and the Roebourne subregion. The Roebourne subregion is described as *Quaternary alluvial and older colluvial coastal and sub-coastal plains with vegetation described as grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of Acacia species and ephemeral drainage lines support Eucalyptus victrix or Corymbia hamersleyana woodlands. Samphire, Sporobolus and mangal occur on marine alluvial flats and river deltas* (Kendrick and Stanley 2001).

6.3.2.2 Land Systems

Land Systems mapping, prepared by the Department of Primary Industries and Regional Development (DPIRD), provides a comprehensive and standardised description of landscapes, soils and vegetation of the Pilbara region of Western Australia at a regional scale (Payne and Schoknecht 2011; DPIRD 2024). These surveys describe the biophysical characteristics of each region and subsequently divide each region into land systems; land systems being defined as repeating patterns of topography, soils and vegetation.

Two Land Systems have been mapped across the Development Envelope: the Granitic Land System and the Littoral Land System (Table 6-3; Figure 6-2).

Table 6-3: Land Systems within the Development Envelope

Land System	Description	State Land Type	Extent in Roebourne Subregion (ha)	Extent within the Development Envelope (ha)	Proportion of Extent within the Development Envelope (%)
Granitic Land System	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.	Hills and ranges; Spinifex grasslands	7,794.7	0.01	Negligible
Littoral Land System	Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests.	Coastal plains, beaches, dunes, mudflats and cliffs; Various coastal vegetation	212,304.9	2.04	Negligible

Figure 6-2: Land Systems

▭ Development Envelope

Land Systems

🟧 Granitic Land System

🟨 Littoral Land System

N

0 1.5 3

Kilometres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 9/07/2024

6.3.2.3 *Pre-European* Vegetation *Associations*

The Pre-European vegetation of Western Australia was mapped, at a 1:1,000,000,000 scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping, DPIRD (DAFWA) compiled a list of vegetation extent and types across WA (Shepherd et al. 2002).

One pre-European vegetation association has been mapped across the Development Envelope, namely Abydos Plain – Roebourne 117 (Figure 6-3). Table 6-4 summarises the current and pre-European extent of this vegetation association within the Roebourne subregion.

Table 6-4: Pre-European Vegetation Associations

Vegetation Association	Pre-European Extent (ha)*	Current Extent (ha)	Proportion (%) of pre-European extent remaining	Extent in Development Envelope (ha)	Proportion (%) of Current Extent within the Development Envelope
Abydos Plain – Roebourne 117 – Hummock grasslands, grass steppe, soft spinifex	50,962.9	46,901.6	92.0	2.05	<0.01%

*within the Roebourne subregion

Figure 6-3: Pre-European Vegetation Association

🟥 Development Envelope

Beard's (1979) vegetation association

🟪 Abydos Plain - Roebourne 117

Datum/Projection:
GDA 1994 MGA Zone 50

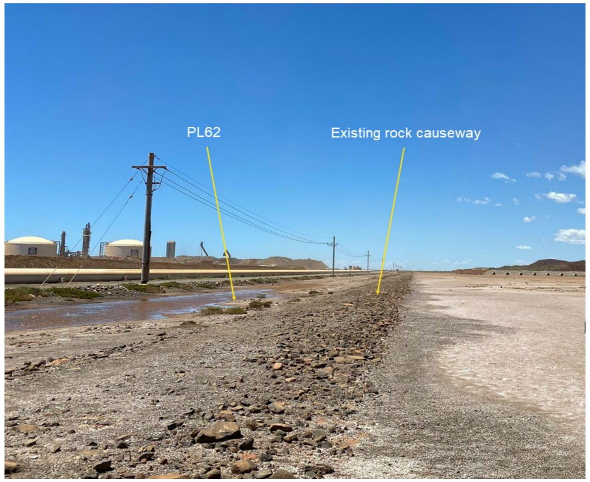
24PER7890-JP Date: 7/08/2024

6.3.2.4 Vegetation Types

One broad vegetation type (VT01) was identified within the Survey Area, covering 0.21 ha. The rest of the Survey Area (1.22 ha) was identified as Mudflats, which are naturally devoid of vegetation (ELA 2024). The remaining 0.62 ha of the Development Envelope is associated with existing rock causeway and PL62. The description and spatial extent of VT01 is presented in Table 6-5 and Figure 6-4.

Table 6-5: Vegetation Types

Vegetation Types	Description	Extent (ha) in Development Envelope	Proportion (%) of Development Envelope	Representative Photo
VT01	*Tecticornia halocnemoides, Tecticornia indica* subsp. *leiostachya, Trianthema turgidifolium* low sparse chenopod shrubland	0.21	10.24	
Mudflats	Naturally devoid of vegetation	1.22	59.52	

Vegetation Types	Description	Extent (ha) in Development Envelope	Proportion (%) of Development Envelope	Representative Photo
Existing rock causeway and PL62 (not surveyed)	-	0.62	30.24	
Total		**2.05**	**100.0**	

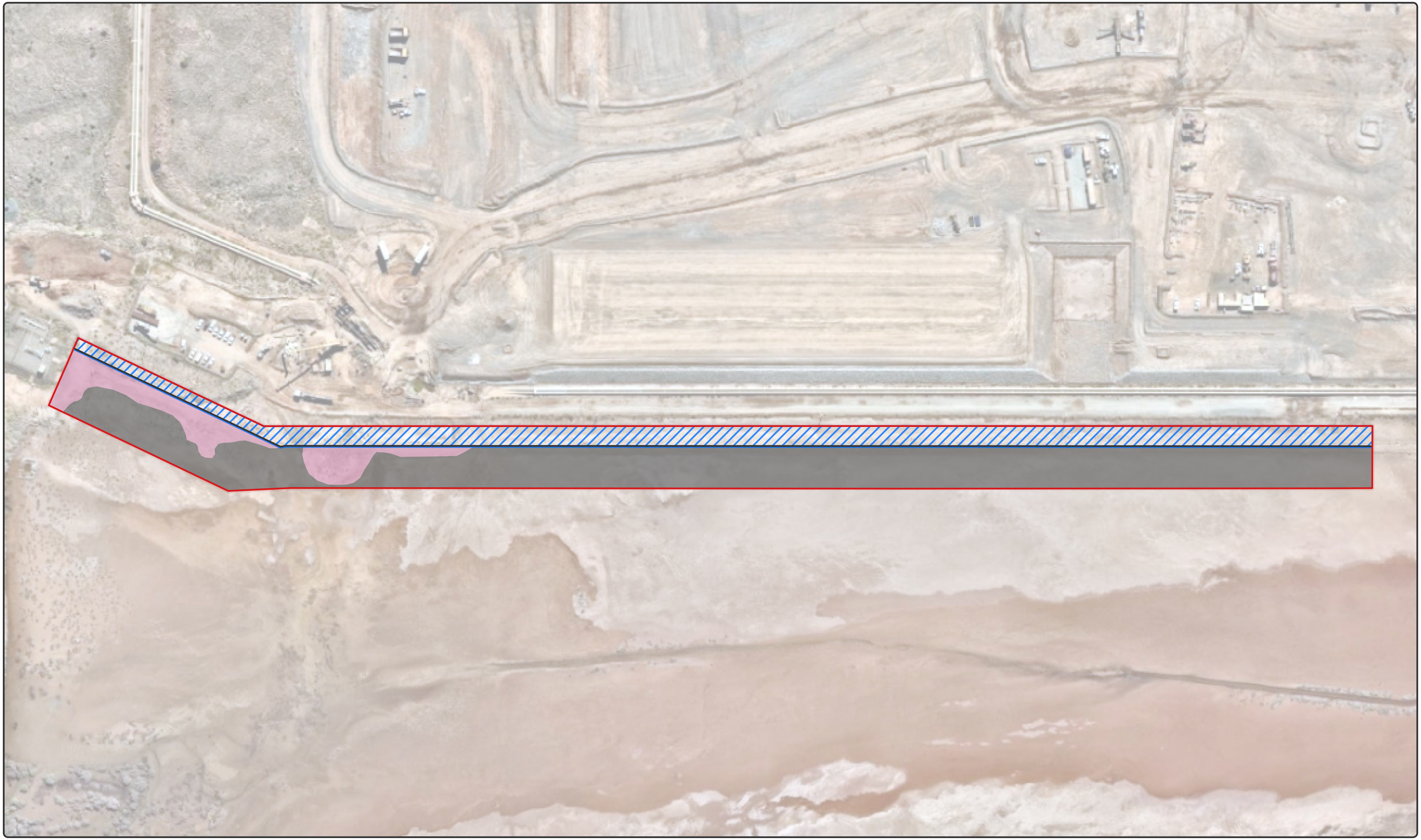


Figure 6-4: Vegetation Types Recorded within the Development Envelope

🟥 Development Envelope
▨ PL62 LoS
■ Mudflats
— Existing Rock Causeway

Vegetation Types

🟪 Vegetation Type 1 (VT01)

N

0 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 10/07/2024

6.3.2.5 Vegetation Condition

All vegetation within the Survey Area (0.21 ha) was classified as being in Poor condition, based on the Trudgen (1988) vegetation scale (Figure 6-5) (ELA 2024). The areas identified as Mudflat (1.22 ha) were not assigned a vegetation condition. Disturbances recorded within the Survey Area included previous clearing, infestation of weed species and deposition of dust.

6.3.2.6 Conservation Significant Ecological Communities

No vegetation types within the Survey Area were identified as representing any known or potential conservation significant ecological communities listed under the EPBC Act, the BC Act or by DBCA (ELA 2024).

The desktop assessment identified two Priority Ecological Communities (PECs) that occur within 5 km of the Survey Area (ELA 2024). Both PECs are considered not to occur within the Survey Area due to the lack of suitable species and habitats, as well as both PECs being restricted to rockpile formations.

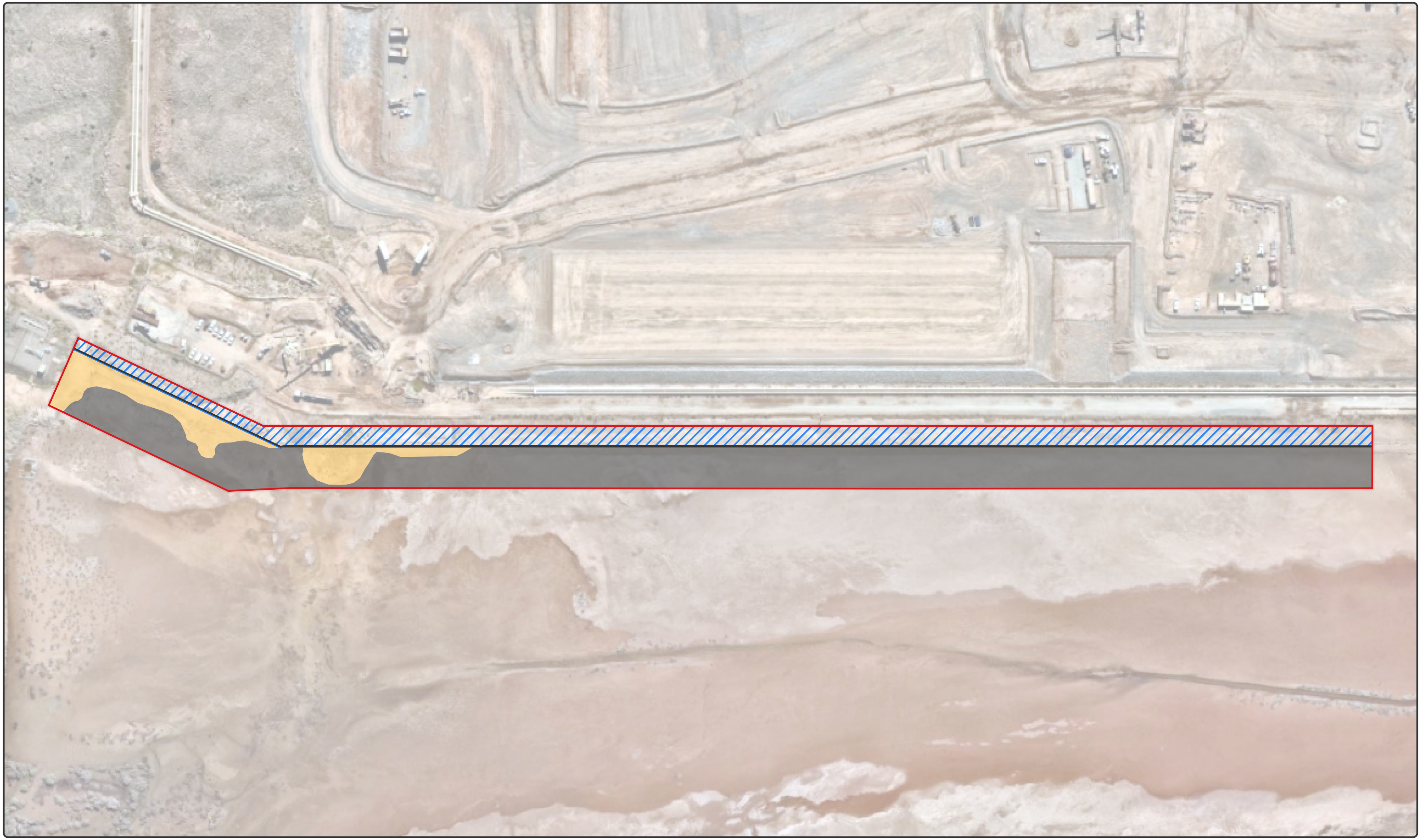


Figure 6-5: Vegetation Condition within the Development Envelope

▭ Development Envelope

▨ PL62 LoS

■ Mudflats

— Existing Rock Causeway

Vegetation Conditon

■ Poor

N

0 50 100

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 10/07/2024

6.3.3 Flora

A total of 10 flora species (nine native and one introduced) from eight genera and five families were recorded within the Survey Area (ELA 2024). Most recorded taxa were representative of the Chenopodiaceae (four taxa) and Poaceae (three taxa) families. *Tecticornia* was the best-represented genera throughout the Survey Area with three taxa recorded.

6.3.3.1 Conservation Significant Flora

No Threatened flora species listed under the EPBC Act or BC Act or Priority species listed by DBCA were recorded from within the Survey Area (ELA 2024).

6.3.3.2 Introduced Flora

One introduced flora species was recorded within the Survey Area, **Cenchrus ciliaris* (Buffel grass) (ELA 2024). The species is listed under the *Biosecurity and Agricultural Management Act 2007* (BAM Act) as Permitted (s-11), with no specific conditions for control required. This species was recorded at a 0.1% cover within vegetated areas of the Survey Area.

6.4 Potential Environmental Impacts

The potential direct, indirect and cumulative impacts from the Proposal on the flora and vegetation values present within the Development Envelope have been listed below.

6.4.1 Direct Impacts

The potential direct impacts of the Proposal on flora and vegetation have been identified as:

- Clearing of native vegetation.

6.4.2 Indirect Impacts

The potential indirect impacts of the Proposal on flora and vegetation have been identified as:

- Degradation of vegetation from increased dust deposition
- Increased fragmentation of native vegetation
- Introduction and/or spread of weed species
- Altered fire regimes as a result of construction activities.

6.4.3 Cumulative Impact

The Proposal has potential to contribute to the following cumulative impact at a regional scale:

- Clearing of native vegetation.

The following projects are located on the Burrup Peninsula within the BSIA and have been used to assess the cumulative impacts of the Proposal:

- AGI Operations Pty Ltd – Pluto North West Shelf Interconnector Pipeline
- Yara Pilbara Fertilisers Pty Ltd – Yara Pilbara Fertilisers Plant
- Regional Power Western Power – Burrup Common User Transmission Infrastructure.

Assessment of cumulative impacts on native vegetation includes projects which were approved by the EPA after 2018 as it is assumed that any clearing which was undertaken prior to this date has been captured in the 2018 native vegetation statistics (Government of Western Australia 2019).

Historical impacts from past clearing are assumed to have been captured in the consideration of the receiving environment.

6.5 Mitigation

The Proponent has applied the migration hierarchy through all stages of the Proposal to reduce the potential impacts of the Proposal on any flora and vegetation values within and surrounding the Development Envelope as far as practicable. Potential impacts have primarily been avoided or minimised through the design of the Proposal during the planning phase.

The specific mitigation and management measures proposed to be implemented by the Proponent have been detailed in Table 6-6.

Table 6-6: Proposed Flora and Vegetation Mitigation Measures

Impacts	Avoidance	Minimisation	Residual Impacts
Clearing of native vegetation	• Native vegetation clearing has been avoided through the reduction of the Development Envelope during the design phase • The Proposal will utilise the existing rock causeway for the construction of the pipeline avoiding the clearing of vegetation.	• A Native Clearing Clearance Procedure will be implemented including: ○ Authorisation to Clear Vegetation (ACV) or equivalent process is implemented ○ Delineation of approved area prior to clear and grade (pegging) • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction • Reinstatement work will be carried out in accordance with the DBNGP EP to preserve and promote the regeneration of natural vegetation within the Development Envelope.	Loss of 0.21 ha of native vegetation in Poor condition.
Degradation of vegetation from increased dust deposition	• Avoid clearing native vegetation as far as practicable.	• Construction of the pipeline will occur over a maximum of three weeks, minimising the time over which dust emissions will occur • Minimisation of time between trenching and backfilling • Use of a water cart to stabilise stockpiles, when required • Reducing speed limits on the ROW • Safe work method statements (SWMS) / Job Hazard Analysis (JHA) to identify dust risk at time of activity and apply controls (i.e. water cart / truck) • Limit topsoil stockpile height to less than 2 m in height.	Localised short-term increase in fugitive dust during construction
Increased fragmentation of native vegetation	• The Development Envelope has been designed to avoid increased fragmentation as far as practicable including positioning the Proposal adjacent to existing infrastructure (i.e. the existing causeway).	• Vegetation clearing will be kept to the minimum required to ensure effective implementation of the Proposal • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction • Reinstatement work will be carried out in accordance with the DBNGP EP to preserve and promote the regeneration of natural vegetation within the Development Envelope.	Negligible increase in fragmentation of remnant vegetation

Impacts	Avoidance	Minimisation	Residual Impacts
Introduction or spread of weed species	N/A	• Weed hygiene controls will be implemented in accordance with the DBNGP EP and CEMP, including: o Site personnel inductions o All vehicles and machinery will remain on existing tracks, as far as practicable o Clean on Entry Procedure will be implemented if Clean of Entry area is identified o Frequent visual inspections of vehicles and clean down as required o All fill to be certified as weed and seed free prior to use o Where possible restrict third-party access through physical barriers or discourage through signage o Targeted weed management practices if requires, during operations • Non-operational areas will be rehabilitated and reinstated back to previous landform, ensuring all weeds are removed.	Potential introduction and/or spread of weed species
Altered fire regimes as a result of construction activities	N/A	• Bushfire management measures will be implemented in accordance with the DBNGP EP, including: o All Bushfire Regulations will be abided by including total fire ban requirements o Fire-fighting equipment on all mobile plant and vehicles o Designated smoking areas o Daily checks on fire danger rating and fire bans included in daily prestart o All plant and equipment to comply with fire safety standards o Permit to Work and Hot Works Certificate including gas testing for hazardous areas as per the Hot Works Procedure, including: ▪ High gas risk areas are demarcated and signed ▪ Appropriate firefighting equipment is available at all times ▪ Selected personnel are trained in responding to fires ▪ Inductions include fire risks (hot works and smoking)	Potential short-term increased occurrence of bushfires

Impacts	Avoidance	Minimisation	Residual Impacts
		▪ All non-approved items are kept away from hazardous areas.	

6.6 Assessment and Significant Residual Impacts

6.6.1 Direct Impacts

6.6.1.1 Clearing of native vegetation

The Proposal has been designed to avoid clearing vegetation as far as practicable by locating the Development Envelope within an area that contains existing disturbance, including the existing rock causeway and PL62. As a result, a small (0.21 ha) area of vegetation in Poor condition is proposed to be cleared as part of the Proposal. None of the vegetation within the Survey Area is representative of any known conservation significant vegetation communities. In addition, the proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction.

At a regional scale, the Proposal will result in the clearing of vegetation within the Abydos Plain – Roebourne 117 Beard vegetation association, which currently retains 92.0% of its pre-European extent (Table 6-4). Clearing within the Development Envelope will represent a 0.0004% decline in the vegetation association’s mapped current extent within the Roebourne subregion and will be restricted to vegetation in Poor condition.

Given the limited extent of the proposed clearing, poor condition of the vegetation and the temporary nature of the clearing associated with the pipeline, the clearing of 0.21 ha of remnant vegetation is not considered to be significant at either a local or regional scale.

6.6.2 Indirect impact

6.6.2.1 Degradation of vegetation from increased dust deposition

Dust generation will be primarily attributable to construction activities for the Proposal, such as through the clearing of vegetation, trenching and backfilling. Dust emissions may also be generated through the movement of vehicles along the rock causeway during the operational phase. Dust emissions will be managed through the mitigation measures outlined in the Construction Environmental Management Plan (CEMP; Appendix C) and the DBNGP EP.

Given the small scale nature of the Proposal (550 m pipeline), short trenching time (up to three weeks) and short overall construction time (4-6 months), any impacts are likely to have a short duration and be restricted to the Development Envelope. In addition, the Proposal is largely located in a disturbed landscape with limited potential to impact on sensitive vegetation.

The Proposal may result in a minor, temporary increase in localised dust deposition, however, through the implementation of standard industry management and mitigation measures, as described in Section 6.5, as well as a CEMP and the DBNGP EP, impacts associated with increased dust emissions are considered unlikely to be significant.

6.6.2.2 Increased fragmentation of native vegetation

Fragmentation occurs when the continuity of vegetation is disrupted and reduced into several smaller patches. The spatial separation of these patches can lead to a decline in biodiversity and reduced population size. This can lead to reduced recruitment of flora species and altered community structures.

The landscape in which the Proposal occurs is already subject to anthropogenic disturbance and is highly fragmented as a result of the industries within the BSIA. The Proposal is bound by Burrup Road and the DBNGP to the west, the Burrup Desalinated Water and Seawater Supplies pipeline to the north and the Project Ceres causeway to the east (Figure 1-1). The pipeline lateral will also be located adjacent to the existing rock causeway and PL62 (Table 6-5).

As the Proposal has been designed to follow existing disturbed areas or tracks, or occurs along the periphery of patches of native vegetation the potential for fragmentation has been minimised. As such, the Proposal will not result in significant impacts to native vegetation as a result of fragmentation.

6.6.2.3 Introduction and/or spread of weed species

The landscape in which the Proposal occurs is largely disturbed, and weed species are known to occur throughout the local area, reflecting a high level of fragmentation and presence of other threatening processes (APM 2019). One introduced flora species (**Cenchrus ciliaris* [Buffel Grass]) was recorded within the Survey Area, and this species is known to be common in the local area (APM 2019). The Proposal is thus unlikely to result in impacts to flora and vegetation through the spread or introduction of weed species.

During the construction phase of the Proposal, the risk of introducing or spreading introduced flora species will be managed through the implementation of the mitigation measures outlined in the CEMP (Appendix C). The spread and/introduction of weeds during operation will be managed through the implementation of the DBNGP EP.

As a result, no significant residual impacts on vegetation condition from spread of weed are expected from the Proposal.

6.6.2.4 Accidental bushfires due to construction activities

Construction activities, particularly grinding, welding, and the movement of vehicles and heavy machinery have the potential to result in a bushfire that could cause widespread damage and loss of native vegetation and flora.

The landscape in which the Development Envelope occurs is largely devoid of vegetation; however, the invasive grass species **Cenchrus ciliaris* (Buffel Grass), was recorded in 0.21 ha of the Development Envelope. This weed can increase the intensity and frequency of fires, with fire sensitive Low Chenopod Shrubland at particular risk. However, given the negligible cover of Buffel Grass within the Development Envelope (0.1% cover in vegetated areas), and very small area of vegetation in general compared to the dominant presence of mudflats, the risk of ignition is considered very low and no significant impacts on fire regimes or native vegetation are expected.

In addition, the construction of the Proposal will be undertaken in accordance with the fire management measures outlined in the CEMP (Appendix C) and DBNGP EP, including the requirements of regulatory and local fire authorities.

Based on the above, increased fire frequency or intensity is not considered a significant impact as a result of the Proposal.

6.6.3 Cumulative impact

6.6.3.1 Clearing native vegetation

Pre-European Beard vegetation associations have been utilised as a proxy to calculate the cumulative impacts of clearing native vegetation associated with the Proposal. Cumulative impacts to vegetation associations impacted by the Proposal are negligible at a regional scale (Table 6-7).

The cumulative impact of clearing is a 0.12% reduction to the current extent of Abydos Plain – Roebourne 117 vegetation association, with a relatively negligible contribution to this associated with the Proposal. Cumulative clearing of vegetation associations associated with the Proposal and other nearby projects is not likely to represent a significant impact at a regional scale.

Table 6-7: Proposed Cumulative Clearing on Vegetation Associations

Vegetation Association	Pre-European Extent* (ha)	Current Extent* (ha)	Extent to be Cleared as Part of this Proposal (ha)	Extent to be Cleared as Part of Burrup Common User Transmission Infrastructure (ha)	Extent to be Cleared as Part of Yara Pilbara Fertilisers Plant (ha)	Extent to be Cleared as Part of Pluto North West Interconnector Pipeline (ha)	Cumulative Clearing (ha)	% of Current Extent Cumulatively Cleared
Abydos Plain – Roebourne 117	50,962.9	46,901.6	0.21	14.40	29.00	10.69	54.3	0.12

*within the Roebourne subregion

6.7 Environmental Outcomes

The Proposal is not anticipated to have any significant residual impacts on flora or vegetation, due to the following:

- The Proposal will result in the clearing of 0.21 ha of native vegetation in Poor condition
- The absence of any conservation significant flora species or ecological communities within or immediately adjacent to the Development Envelope
- The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the native vegetation surrounding the Development Envelope
- The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction
- Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP.

The Proponent considers that due to the avoidance and proposed management measures described, the Proposal can be implemented to ensure that the biological diversity and ecological integrity of the local environment will be maintained such that the EPA’s objective for the Flora and Vegetation factor can be met.

7. TERRESTRIAL FAUNA

7.1 EPA Environmental Factor

The EPA's objective for the Terrestrial Fauna factor is to: 'Protect terrestrial fauna so that biological diversity and ecological integrity are maintained' (EPA 2016c).

For the purposes of EIA, the EPA defines terrestrial fauna as animals living on land or using land (including aquatic systems) for all or part of their lives, inclusive of both vertebrate and invertebrate groups (EPA 2016c).

7.2 Relevant Policy and Guidance

The relevant policy and guidance documents for the Terrestrial Fauna Environmental Factor and how they have been considered for this Proposal are presented in Table 7-1.

Table 7-1: Terrestrial Fauna Relevant Policy and Guidance

Policy/Guidance	Consideration
Environmental Factor Guideline: Terrestrial Fauna (EPA 2016c)	The information provided in this section of the document has been tailored to address the 'considerations for environmental impact assessment' outlined within these guidelines.
Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment (EPA 2020)	The technical guidance outlines the methodologies and techniques required to obtain and collate terrestrial fauna data for this document. All surveys/studies related to the Proposal have been undertaken in accordance with the technical guidance.

7.3 Receiving Environment

7.3.1 Studies and Survey Effort

A basic fauna survey covering approximately 1.43 ha was undertaken within the Survey Area (ELA 2024). The survey excluded 0.62 ha of the Development Envelope which is associated with the existing rock causeway and the PL62 LoS (Section 2.1). The details and spatial extent of the survey is presented in Figure 7-1 and Table 7-2, respectively.

In addition to the above, the Development Envelope was also surveyed as part of the Project Ceres. A Pre- and Post-wet Season Biological Survey was conducted for this project in late 2018 and early 2019 and included fauna survey effort within and surrounding the Development Envelope (APM 2019). The findings of the survey were reviewed by ELA and have been referenced where appropriate to provide greater local context of the terrestrial fauna values present within the Survey Area and wider Development Envelope (ELA 2024).

Table 7-2: Terrestrial Fauna Studies

Survey	Area (ha)	Scope &Timing	Study/Survey Effort	Consistency with Guidance and Limitations
Perdaman Pipeline Flora and Fauna Survey (ELA 2024) (Appendix B)	1.43	The field survey was conducted on 26 March 2024. The scope of the survey included: • Desktop assessment of available literature and databases to identify potential values • Field survey to delineate and map fauna habitats and record opportunistic fauna sightings • Identification of fauna habitats that could be utilised by conservation significant fauna.	The field survey involved personnel walking transects through the Survey Area.	This survey was conducted in accordance with appropriate technical guidance including: • *Environmental Factor Guideline: Terrestrial Fauna* (EPA 2016c) • *Technical Guidance - Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020). No limitations or constraints were identified for the survey.

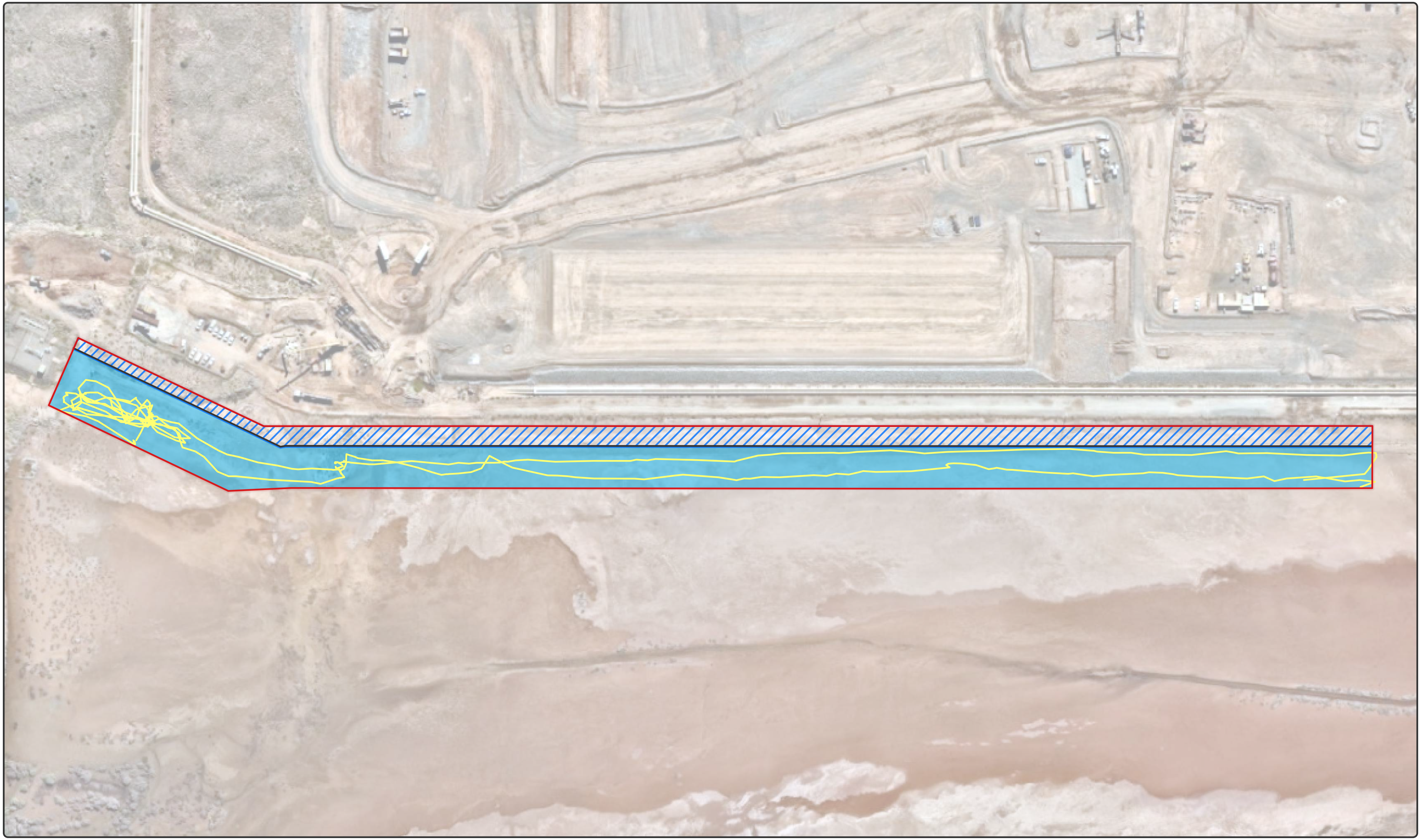


Figure 7-1: Terrestrial Fauna Survey Effort

Datum/Projection:
GDA 1994 MGA Zone 50

24PER7890-JP Date: 11/07/2024

7.3.2 Terrestrial Fauna Habitat

Two fauna habitat types were identified within the Survey Area: 'Mudflats' (1.22 ha) and 'Low Chenopod Shrubland' (0.21 ha) (ELA 2024). The remaining 0.62 ha of the Development Envelope is associated with the existing rock causeway and PL62 LoS. The description and spatial extent of these fauna habitats is provided in Table 7-3 and Figure 7-2.

Only the Mudflats habitat within the Development Envelope is considered to potentially provide foraging habitat to conservation significant fauna, with a range of migratory waders having the potential to use the habitat when it is occasionally inundated (e.g. during king tides and heavy rainfall). The vegetation within the Low Chenopod Shrubland habitat was in Poor condition and therefore not considered to provide habitat for any conservation significant fauna species (ELA 2024).

Neither habitat is considered to be locally or regionally restricted with 38.74 ha of Samphire Shrubland/Supra-tidal Flat habitat (which is considered representative of these habitats) recorded by APM (2019; Figure 7-2) as well as 43.7 ha of the Samphire Shrubland within the Murujuga National Park and 803.02 ha within the broader Burrup Peninsula (Cardno 2020).

Table 7-3: Habitat Types

Habitat Types	Description	Extent (ha) in Development Envelope	Proportion (%) of Development Envelope	Representative Photo
Mudflats	Species poor mudflat	1.22	59.52	
Low Chenopod Shrubland	Low sparse chenopods	0.21	10.24	

Habitat Types	Description	Extent (ha) in Development Envelope	Proportion (%) of Development Envelope	Representative Photo
Existing rock causeway and PL62 LoS (not surveyed)	-	0.62	30.24	
Total		**2.05**	**100.0**	

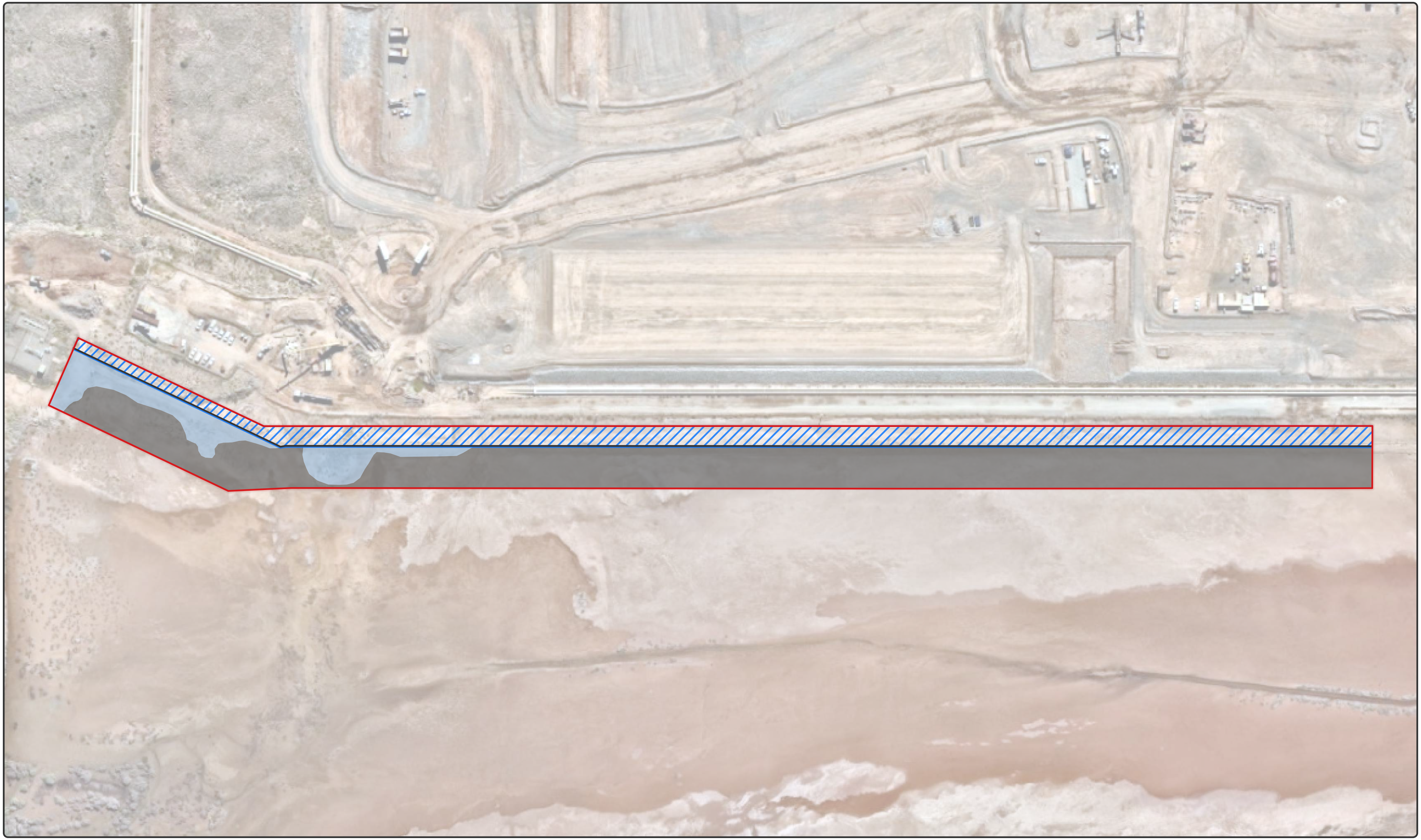
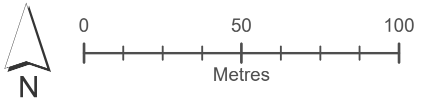


Figure 7-2: Terrestrial Fauna Habitat

▭	Development Envelope
▨	PL62 LoS
—	Existing Rock Causeway

Fauna Habitat Types

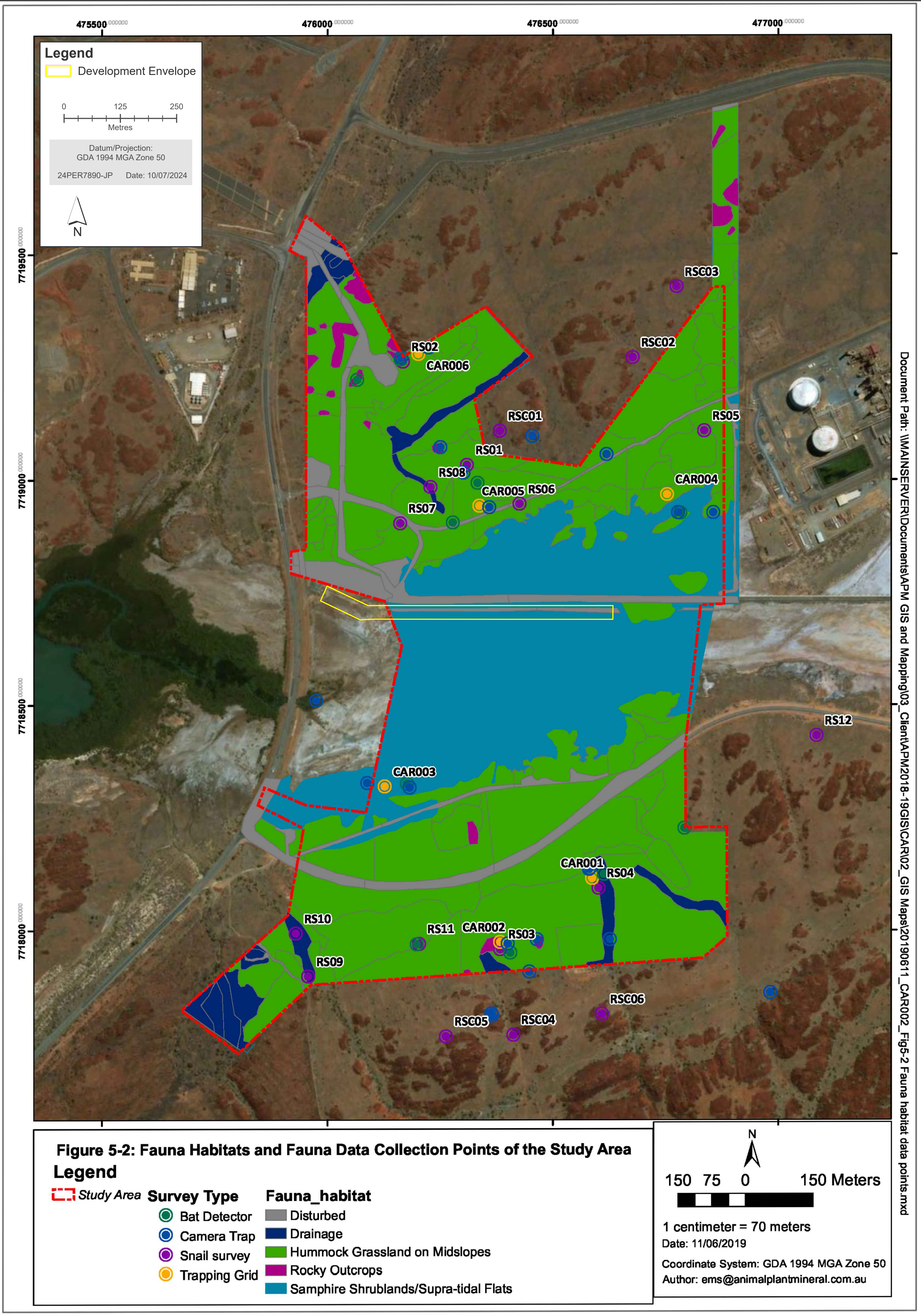
■	Low chenopod shrubland
■	Mudflats



Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 10/07/2024

Figure 7-3: Fauna Habitats Recorded in the APM Survey (APM 2019)



7.3.3 Vertebrate Fauna Species Assemblage

Historical and recent surveys of the Burrup Peninsula have recorded 30 mammal species, 150 bird species, 49 reptiles and two amphibians in proximity to the Proposal (Cardno 2020). No fauna species were recorded within the Survey Area during the recent survey (ELA 2024).

7.3.4 Conservation Significant Vertebrate Fauna

A desktop review identified 19 conservation significant fauna species as possibly occurring within the Survey Area, based on habitat preferences and proximity of records (ELA 2024, Appendix B). This included 18 species listed under the EPBC Act and BC Act, one of which is also listed as Priority 4 by DBCA, and one species listed as only under the BC Act (ELA 2024, Appendix B).

No direct (observations) or indirect (scats, tracks, diggings) evidence of Threatened species listed under the EPBC Act or BC Act or Priority species listed by DBCA were recorded within the Survey Area during the fauna survey (ELA 2024). Based on the results of the fauna survey, eight conservation significant fauna species were considered as having the potential to occur within the Development Envelope, based on the availability of suitable habitat and proximity of previous records (ELA 2024, Table 7-4).

The remaining 11 fauna species identified in the desktop assessment were considered unlikely to occur or do not occur within the Development Envelope, based on habitat requirements, lack of suitable habitat present, distance and age of previous records, and adequacy of the survey effort. Species considered unlikely to occur have not been included in this assessment; however, a comprehensive list (excluding pelagic marine fauna species) is provided in Appendix B.

Table 7-4: Conservation Significant Fauna Likelihood of Occurrence Assessment

Species	Conservation Status	Habitat Preferences	Suitable Habitat within the Development Envelope	Likelihood of Occurrence within the Development Envelope
Calidris ferruginea (Curlew Sandpiper)	Critically Endangered (EPBC Act and BC Act) Migratory (EPBC Act and BC Act)	Curlew Sandpiper mainly occurs on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and lagoons, also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.	Mudflats	**Potential** Potentially suitable habitat may occur within the Development Envelope (seasonally when inundated). Records occur within 1 km of the Development Envelope.
Tringa nebularia (Common Greenshank)	Endangered (EPBC Act) Migratory (EPBC Act and BC Act)	Inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.	Mudflats	**Potential** Potentially suitable habitat may occur within the Development Envelope (seasonally when inundated). Records occur within 1 km of the Development Envelope.
Xenus cinereus (Terek Sandpiper)	Vulnerable (EPBC Act) Migratory (EPBC Act and BC Act)	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks, sandbanks and spits, and near mangroves and occasionally in samphire (*Halosarcia* spp.).	Mudflats	**Potential** Potentially suitable habitat may occur within the Development Envelope (seasonally when inundated). Records occur within 1 km of the Development Envelope.
Gelochelidon nilotica (Gull-billed Tern)	Migratory (EPBC Act and BC Act)	Saltpans, coastal lagoons, mudflats, marshes and wet fields, overwintering on estuaries, saltpans, lagoons and saltmarshes, or in more inland sites such as large rivers, lakes, rice-fields, sewage ponds, reservoirs, saltpans and irrigation canals.	Mudflats	**Potential** Potentially suitable habitat may occur within the Development Envelope (seasonally when inundated). Records occur within 1 km of the Development Envelope.

Species	Conservation Status	Habitat Preferences	Suitable Habitat within the Development Envelope	Likelihood of Occurrence within the Development Envelope
Hydroprogne caspia (Caspian Tern)	Migratory (EPBC Act and BC Act)	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river deltas) and those with sandy or muddy margins are preferred. It also occurs on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks.	Mudflats	**Potential** Potentially suitable habitat may occur within the Development Envelope (seasonally when inundated). Records occur within 1 km of the Development Envelope.
Limosa lapponica (Bar-tailed Godwit)	Migratory (EPBC Act and BC Act)	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	Mudflats	**Potential** Potentially suitable habitat may occur within the Development Envelope (seasonally when inundated). Records occur within 1 km of the Development Envelope.
Pluvialis fulva (Pacific Golden Plover)	Migratory (EPBC Act and BC Act)	Beaches, mudflats and sandflats in sheltered areas including harbours, estuaries and lagoons.	Mudflats	**Potential** Marginal potentially suitable habitat is present (seasonally when inundated), however is highly degraded and adjacent to activity. Majority of records are coastal/intertidal mudflats.
Tringa stagnatilis (Marsh Sandpiper)	Migratory (EPBC Act and BC Act)	Permanent or ephemeral wetlands including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, inundated floodplains and intertidal mudflats.	Mudflats	**Potential** Marginal potentially suitable habitat is present (seasonally when inundated), however is highly degraded and adjacent to activity. Majority of records are coastal/intertidal mudflats.

7.4 Potential Environmental Impacts

The potential direct, indirect and cumulative impacts from the Proposal on the terrestrial fauna values present within the Development Envelope have been listed below.

7.4.1 Direct Impacts

The potential direct impacts of the Proposal on terrestrial fauna have been identified as:

- Loss of fauna habitat
- Injury, mortality or displacement of native fauna.

7.4.2 Indirect Impacts

The potential indirect impacts of the Proposal on terrestrial fauna have been identified as:

- Increased fragmentation of fauna habitat
- Disturbance to native fauna from increased light, dust, noise and/or vibration
- Habitat degradation as a result of introduction and/or spread of weed species
- Habitat degradation as a result of increased predation by feral fauna
- Habitat degradation as a result of altered fire regimes due to construction activities.

7.4.3 Cumulative Impact

The Proposal has the potential to contribute the following cumulative impact at a regional scale:

- Loss of fauna habitat.

The following projects are located on the Burrup Peninsula within the BSIA and have been used to assess the cumulative impacts of the Proposal:

- Yara Pilbara Fertilisers Pty Ltd – Yara Pilbara Fertilisers Plant
- Perdaman Chemicals and Fertilisers Pty Ltd – Project Ceres
- Regional Power Western Power – Burrup Common User Transmission Infrastructure.

7.5 Mitigation

The Proponent has applied the mitigation hierarchy through all stages of the Proposal to reduce the potential impacts of the Proposal on any terrestrial fauna values within and surrounding the Development Envelope as far as practicable. Potential impacts have primarily been avoided or minimised through the design of the Proposal during the planning phase.

The specific mitigation and management measures proposed to be implemented by the Proponent have been detailed in Table 7-5.

Table 7-5: Proposed Terrestrial Fauna Mitigation Measures

Impacts	Avoidance	Minimisation	Residual Impacts
Loss of fauna habitat	• Fauna habitat clearing has been avoided through the reduction of the Development Envelope during the design phase • The Proposal will utilise the existing causeway for the construction of the pipeline, avoiding the clearing of fauna habitat	• A Native Clearing Clearance Procedure will be implemented including: ○ ACV or equivalent process is implemented ○ Delineation of approved area prior to clear and grade (pegging) • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction • Reinstatement work will be carried out in accordance with the DBNGP EP.	Loss of 1.43 ha of fauna habitat.
Injury, mortality, or displacement of terrestrial fauna	• The construction of the Proposal will avoid the wet season and king tides when the area is most likely to be utilised by the conservation significant species listed in Section 7.3.4.	• The construction of the Proposal will be short (4-6 months), with trenching to occur for a maximum of three weeks • A Fauna Interaction Procedure will be implemented which will include: ○ Reducing speed limits (40 km/h on the rock causeway during construction and 60 km/h during operations) ○ Minimising travel in dawn and dusk periods ○ Ensuring no clearing outside of authorised clearing areas ○ Ensuring vehicles stick to existing tracks as much as possible ○ Implementation of fauna interaction controls (minimise handling, release ASAP to safe location, report all handling events) ○ Utilising trained personnel in fauna handling • Trench Management Controls will be implemented, including: ○ Trenches will be battered at 1H:1V to enable fauna egress ○ Twice daily trench inspections within three hours of sunrise and the second inspection between the hours of 3:00 pm and 6:00 pm of that same day ○ Installation of fauna egress and/or refuges from excavations or trenches at intervals no less than 100 m	Potential injury, mortality, or displacement of terrestrial fauna.

Impacts	Avoidance	Minimisation	Residual Impacts
		○ Completion of fauna inspection within 30 minutes prior to lowering in/backfill operations.	
Increased fragmentation of fauna habitat	• The Development Envelope has been designed to avoid increased fragmentation as far as practicable including positioning the Proposal adjacent to existing infrastructure (i.e. the existing causeway and PL62).	• Fauna habitat clearing will be kept to the minimum required to ensure effective implementation of the Proposal • The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction • Reinstatement work will be carried out in accordance with the DBNGP EP.	Negligible increase in fragmentation of fauna habitat.
Disturbance to native fauna from light, dust, noise and/or vibration	• The construction of the Proposal will avoid periods of inundation when the area is most likely to be utilised by the conservation significant species listed in Section 7.3.4. • Night construction activities will be avoided to mitigate the disturbance to fauna from increased light	• Construction of the Proposal will occur over 4-6 months, minimising the time over which light, dust, noise and/or vibration will occur • Trenching for pipeline construction will be over a maximum of three weeks, reducing the time over which dust emissions will occur • Excessive dust will be minimised through: ○ Minimisation of time between trenching and backfilling ○ Use of a water cart to stabilise stockpiles, when required ○ Reducing speed limits on the ROW ○ Safe work method statements (SWMS) / Job Hazard Analysis (JHA) to identify dust risk at time of activity and apply controls (i.e. water cart / truck) ○ Limit topsoil stockpile height to less than 2 m in height. • Noise emissions will be controlled in accordance with a Guide to Noise Control on Construction, Maintenance and Demolition Sites (AS/NZS 2436-1981), and the following minimisation measures will be applied in accordance with the DBGNP EP ○ Standard design and operating procedures to minimise noise ○ Mechanical vibratory compaction will not be utilised during backfill and compaction of the trench.	Potential short-term, disturbance of native fauna due to dust, noise, light and/or vibrations.

Impacts	Avoidance	Minimisation	Residual Impacts
Habitat degradation as a result of introduction or spread of weed species	N/A	• Weed hygiene controls will be implemented in accordance with the DBNGP EP, including: ○ Site personnel inductions ○ All vehicles and machinery will remain on existing tracks, as far as practicable ○ Clean on Entry Procedure will be implemented ○ Frequent visual inspections of vehicles and clean down as required ○ All imported fill to be certified as weed and seed free prior to use ○ Targeted weed management practices as required ○ Earthmoving equipment and plant to be certified as weed and seed free prior to use • Non-operational areas will be rehabilitated and reinstated, ensuring all weeds are removed.	Potential introduction and/or spread of weed species.
Habitat degradation as a result of increased predation by feral fauna	N/A	• Recording of feral animal sightings during construction. If feral animal numbers increase, targeted control measures will be implemented such as waste management.	Potential for increased predation by feral fauna.
Habitat degradation as a result of altered fire regimes due to construction activities	N/A	• Bushfire management measures will be implemented in accordance with the DBNGP EP, including: ○ All Bushfire Regulations will be abided by including total fire ban requirements ○ Fire-fighting equipment on all mobile plant and vehicles ○ Designated smoking areas ○ Daily checks on fire danger rating and fire bans included in daily prestart ○ All plant and equipment to comply with fire safety standards • Permit to Work and Hot Works Certificate including gas testing for hazardous areas as per the Hot Works Procedure, including: ○ High gas risk areas are demarcated and signed ○ Appropriate firefighting equipment is available at all times	Potential short-term increased occurrence of bushfires.

Impacts	Avoidance	Minimisation	Residual Impacts
		○ Selected personnel are trained in responding to fires ○ Inductions include fire risk (hot works and smoking) ○ All non-approved items are kept away from hazardous areas.	

7.6 Assessment and Significant Residual Impacts

7.6.1 Direct impact

7.6.1.1 Loss of fauna habitat

The Proposal has been designed to avoid clearing fauna habitat as far as practicable by locating the Development Envelope within an area that contains existing disturbance, including the existing rock causeway and PL62. A total of 1.43 ha of vertebrate fauna habitat will be disturbed as part of the Proposal, comprising Low Chenopod Shrubland (0.21 ha; 10.24%) and Mudflats (1.22 ha; 59.51%). The Low Chenopod Shrubland habitat does not provide value for any conservation significant species, however the Mudflats when inundated may provide foraging opportunities for Migratory shorebirds and waders listed under the EPBC Act and BC Act (Table 7-4).

The Low Chenopod Shrubland and Mudflats habitat are not considered locally or regionally restricted with approximately 38.74 ha of representative habitat recorded within the APM survey (APM 2019), approximately 43.7 ha recorded within the Murujuga National Park (approximately 1 km from the Development Envelope) and approximately 803.02 ha recorded within the broader Burrup Peninsula (Cardno 2020).

In addition, the final constructed lateral pipeline will be underground, and therefore most of the surface disturbance will be temporary with the fauna habitat in these areas to be reinstated post construction.

Given the scale of proposed permanent disturbance and remaining extent of similar habitat in the surrounding area, the clearing of 1.43 ha of fauna habitat is not considered likely to result in a significant impact to terrestrial fauna.

7.6.1.2 Injury, mortality, or displacement of conservation significant fauna

Vehicle and machinery movements for clearing, construction and operation of the Proposal may result in fauna strike, causing injury or death. Vehicle movements will be required primarily during the construction phase, however, will also occur along the rock causeway during operations for maintenance purposes.

Mitigation measures implemented during construction, including avoiding periods of inundation, restricting vehicle movement to existing tracks and implementing speed limits, will reduce the potential for fauna strike. Vehicle movement during construction will also be minimised in dawn and dusk periods to avoid interactions with nocturnal species. Mitigation measures during operation, including restricting vehicle movement to existing tracks and implementing speed limits, will reduce the potential for fauna strike.

The conservation significant species that have the potential to occur within the Development Envelope are highly mobile bird species, which may utilise the area for foraging during occasional inundated periods. The construction phase will be short (4-6 months), with trenching for the pipeline to occur for a maximum of three weeks. Trenching for the pipeline will not occur during the wet season or during king tides. Consequently, the impacts on conservation significant fauna from vehicles and machinery movement are not expected to be significant.

There is also a risk of individual non conservation significant fauna mortality through being displaced in open trenches, formed by excavation during construction of the pipeline. As no dewatering is proposed to occur as part of the Proposal, these open trenches will also contain water which increases the risk of fauna mortality to individual non conservation significant fauna if they were to be displaced into an open trench. To mitigate this risk, fauna egress point and/or refuges will be installed every 100 m along the length of the trench, with twice daily trench inspections to occur. In addition, the trench will only remain open for a maximum of three weeks.

Overall, impacts associated with clearing, vehicle and machinery movements and trench excavation are unlikely to result in a degree of fauna injury or mortality that local populations, including conservation significant species, will be significantly impacted.

7.6.2 Indirect Impacts

7.6.2.1 Increased fragmentation of fauna habitat

Fragmentation of fauna habitat occurs when the continuity of fauna habitat is disrupted and reduced into several patches, with the separation of these patches potentially fragmenting existing fauna populations into two or more populations.

The landscape in which the Proposal occurs is already subject to anthropogenic disturbance and is highly fragmented as a result of the industries within the BSIA. The Proposal is bound by Burrup Road and the DBNGP to the west, the Burrup Desalinated Water and Seawater Supplies pipeline to the north and the Project Ceres causeway to the east (Figure 1-1). The pipeline lateral will also be located adjacent to the existing rock causeway and PL62 pipeline lateral and LoS.

As the Proposal has been designed to follow existing disturbed areas or tracks, the potential for fauna habitat fragmentation has been minimised. As such, the Proposal will not result in significant impacts to fauna as a result of fragmentation.

7.6.2.2 Disturbance to native fauna from light, dust, noise and/or vibration

Light, noise, dust and vibration may impact terrestrial fauna in the vicinity of construction and operational activities. Night construction activities will be avoided. Noise and vibration may cause temporary disturbance and avoidance behaviour during construction; however, these will be temporary. Increased dust emissions from earthwork activities and vehicle and machinery movements may result in degradation of fauna habitat; however, given the small scale nature of the Proposal (550 m pipeline), short trenching time (up to three weeks) and short overall construction time (4-6 months), this is likely to be minimal and restricted to the Development Envelope.

In addition to this, the Proposal is also located in an area surrounded by anthropogenic disturbance from the industries within the BSIA, therefore any fauna that utilise the Development Envelope are likely to be resilient and adapted to dust, noise and vibration emissions.

Thus, the Proposal may result in a minor, temporary increase in localised dust, noise and/or vibration emissions, however, through the implementation of standard industry management and mitigation measures, as described in Section 7.5, as well as the CEMP and the DBNGP EP, significant impacts to terrestrial fauna are considered unlikely.

7.6.2.3 Introduction and/or spread of weed species

The landscape in which the Proposal occurs is largely disturbed, and weed species are known to occur throughout the local area, reflecting a high level of fragmentation and presence of other threatening processes (APM 2019). One introduced flora species (**Cenchrus ciliaris* [Buffel Grass]) was recorded within the Survey Area, and this species is known to be common in the local area (APM 2019). The Proposal is thus unlikely to result in impacts to fauna habitats through the spread or introduction of weed species.

Nonetheless, during the construction phase of the Proposal, the risk of introducing or spreading introduced flora species will be managed through the implementation of the mitigation measures outlined in the CEMP (Appendix C). The spread and/or introduction of weeds during operation will be managed through the implementation of the DBNGP EP.

As a result, no significant residual impacts on fauna habitat from spread of weeds are expected from the Proposal.

7.6.2.4 Increased predation by feral fauna

No feral fauna species have been recorded within the Development Envelope. However, the feral Cat has been identified in proximity to the Proposal during previous surveys (APM 2019). The environment surrounding the Proposal is already disturbed by anthropogenic activities; therefore, any construction within these areas is not expected to alter the existing presence of feral predators within the Development Envelope. Furthermore, the construction timeframe will be short (approximately 4-6 months), with trenching to occur for a maximum of three weeks. Trenching will not occur during the wet season or during king tides, when the area has higher potential to be used by the eight listed bird species. During the construction phase, periods of inundation will be avoided, where possible. Therefore, the Proposal is not expected to significantly impact fauna as a result of increased feral fauna presence.

7.6.2.5 Accidental bushfires due to construction activities

Construction activities, particularly welding and the movement of vehicles and heavy machinery, have the potential to result in a bushfire that could cause loss of fauna habitat.

The landscape in which the Development Envelope occurs is largely devoid of vegetation; however, the invasive grass species **Cenchrus ciliaris* (Buffel Grass), was recorded in 0.21 ha of the Development Envelope. This weed can increase the intensity and frequency of fires, with fire sensitive Low Chenopod Shrubland at particular risk. However, given the negligible cover of Buffel Grass within the Development Envelope (0.1% cover in vegetated areas), and very small area of vegetation in general compared to the dominant presence of mudflats, the risk of ignition is considered very low and no significant impacts on fire regimes or native vegetation are expected.

In addition, the construction of the Proposal will be undertaken in accordance with the fire management measures outlined in the CEMP (Appendix C) and DBNGP EP, including the requirements of regulatory and local fire authorities.

Based on the above, increased fire frequency or intensity is not considered a significant impact as a result of the Proposal.

7.6.3 Cumulative Impact

7.6.3.1 Clearing of fauna habitat

The extent remaining of Samphire Shrubland/Supratidal Flats fauna habitat within the Burrup Peninsula, referred to within the Perdaman Urea Project (Project Ceres) Environmental Review Document (Cardno 2020), has been utilised as a proxy to calculate the cumulative loss of Mudflats/Low Chenopod Shrubland fauna habitat associated with this Proposal (Table 7-6).

The maximum cumulative impact for loss of fauna habitat is a 21.47 ha (2.67%) reduction in Samphire Shrubland/Supratidal Flats habitat in the Burrup Peninsula. Only a minor contribution of the 2.67% cumulative loss of fauna habitat is associated with the Proposal (Table 7-6). Approximately 782.77 ha of Samphire Shrubland/Supratidal Flats will remain on the Burrup Peninsula, including 43.7 ha within the Murujuga National Park (Cardno 2020).

Cumulative loss of Samphire Shrubland/Supratidal Flats fauna habitat associated with the Proposal and other nearby projects is not expected to represent a significant impact at a regional scale.

Table 7-6: Proposed Cumulative Clearing of Fauna Habitat

Fauna Habitat	Current Extent in the Burrup Peninsula	Extent to be Cleared as Part of this Proposal (ha)	Extent to be Cleared as Part of Burrup Common User Transmission Infrastructure (ha)	Extent to be Cleared as Part of Project Ceres (ha)	Extent to be Cleared as Part of Yara Pilbara Fertilisers Plant (ha)	Cumulative Clearing (ha)	% of Current Extent	Approximate Extent Remaining (ha)
Samphire Shrubland/Supratidal Flats	803.02	1.43	7.88	12.00	0.16	21.47	2.67%	782.77*

*Based on the extent mapped by Cardno (2020)

7.7 Environmental Outcomes

The Proposal is not anticipated to have any significant residual impact on terrestrial fauna, due to the following:

- The Proposal will result in the clearing of 1.22 ha of Mudflats fauna habitat and 0.21 ha of Low Chenopod Shrubland habitat
- Direct impacts to terrestrial fauna are unlikely to be significant given foraging habitat is widespread in the region, the construction timeframe will be short (4-6 months) and will avoid the wet season and king tides, when the conservation significant species may be utilising the Development Envelope. Trenching will occur for a maximum of three weeks and will not occur during the wet season or during king tides
- The Proposal has been designed to be constructed primarily within already disturbed areas or tracks or occurs along the periphery of patches of native vegetation and is thus unlikely to cause significant fragmentation to the fauna habitat surrounding the Development Envelope
- The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction
- Indirect impacts as a result of the Proposal, namely increased dust deposition, accidental bushfires, and the introduction of weed species, will be minimised through the implementation of the mitigation measures outlined in the CEMP (Appendix C) and DBNGP EP.

The Proponent considers that due to the avoidance and proposed management measures described, the Proposal can be implemented to ensure that the biological diversity and ecological integrity of the local environment will be maintained such that the EPA’s objective for the Terrestrial Fauna factor can be met.

8. INLAND WATERS

8.1 EPA Environmental Factor

The EPA's objective for the Inland Waters factor is to: 'maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected' (EPA 2018).

For the purposes of EIA, the EPA defines the Inland Waters factor as 'the occurrence, distribution, connectivity, movement, and quantity (hydrological regimes) of inland water including its chemical, physical, biological and aesthetic characteristics (quality)' (EPA 2018). This includes groundwater and surface water, where a waterway is any inland water system that flows permanently, for part of the year, or occasionally.

8.2 Relevant Policy and Guidance

The relevant policy and guidance documents for the Inland Waters Environmental Factor and how they have been considered for this Proposal are presented in Table 8-1.

Table 8-1: Inland Waters Policy and Guidance

Policy/Guidance	Consideration
Environmental Factor Guideline: Inland Waters (EPA 2018)	The information provided in this section of the document has been tailored to address the 'considerations for environmental impact assessment' outlined within these guidelines.
Rights in Water and Irrigation Act 1914 (RiWI Act)	Used to inform the description of values of the receiving environment.

8.3 Receiving Environment

8.3.1 Surface Water

The Development Envelope occurs within the Port Hedland Coast basin and is located within a saline coastal flat (Figure 8-1; DWER 2018a). The Development Envelope does not intersect any significant surface water bodies or wetlands, nor any Public Drinking Water Source Areas (DWER 2024).

A minor (non-perennial) watercourse lies directly south of the Development Envelope, draining into Kings Bay.

The Development Envelope occurs within a mudflat area which drains westward to King Bay (Cardno 2020). The mudflats are tidal and are subject to flooding during heavy rainfall periods and during extreme spring tides.

8.3.2 Groundwater

The Pilbara Fractured Rock Aquifer underlies the Development Envelope, and it forms part of the Pilbara Proclaimed Groundwater Area (DWER 2018b). Groundwater investigations were undertaken for the Project Ceres which found that the local groundwater levels range between 0.7–2.8 m below ground surface (Soil and Rock Engineering 2000) and had a total dissolved salt concentrations that exceed that of the surrounding seawater (40,000–50,000 mS/cm) (SKM

2001). Groundwater levels within the Development Envelope range between 0.276 and 0.376 m below ground level (Senversa 2024).

8.3.3 Site Contamination

Three lots within the Development Envelope (Lots 540, 3013 and 704) have been classified by DWER as 'Possibly Contaminated – Investigation Required', with restrictions on groundwater abstraction requiring testing prior to its use (Section 3.5).

The classification is due to the results of contamination assessments carried out in 2017-2018 at the Technical Ammonium Nitrate (TAN) Yara Fertilisers Plant, which found ammonia, nitrates and nitrites at elevated concentrations in soil and groundwater, approximately 1.1 km northeast of the Proposal (Figure 1-1; Attachment C in Senversa 2024). The investigations found that nutrient seepage was occurring at the TAN plant embankment into the adjacent supratidal flats, as a result of faulty infrastructure. The receiving sediments of the adjacent 'upper' supratidal flats were found to be acting as a nutrient sink, with potential for migration to downstream areas in the 'lower' supratidal flats and King Bay during high rainfall events.

Following a significant rainfall event in May 2021, environmental monitoring data indicated unacceptably high nitrate concentrations in surface waters migrating from the TAN plant, with the potential to impact sensitive ecological receptors in the supratidal flats and King Bay (Attachment C in Senversa 2024; Appendix A).

Because of the above, the Proponent commissioned Senversa to undertake a Baseline Environmental Site Assessment (ESA) of the Development Envelope to assess the potential contamination within the Development Envelope to inform management (Senversa 2024; Appendix A).

Based on the results of the survey, the soils within the Development Envelope were not found to contain evidence of anthropogenic contaminants, including hydrocarbons, PFAS and metals. However, the ESA did identify the potential for ASS occurring if soils were oxidised.

The groundwater was found to have low levels of PFAS; however, the concentrations were below adopted guidelines for human health and the environment. All hydrocarbons in the groundwater were below LoR and subsequently below the adopted assessment criteria. The groundwater was found to have exceedances of Zinc; however, in the absence of a defined contaminant source, and in light of comparatively low concentration of other reported metals, the zinc concentrations were considered to be reflective of ambient groundwater conditions.

The groundwater did have elevated nutrients (ammonia, total nitrogen and phosphorus). The elevated nutrients were considered consistent with the nutrient seepage from the TAN plant.

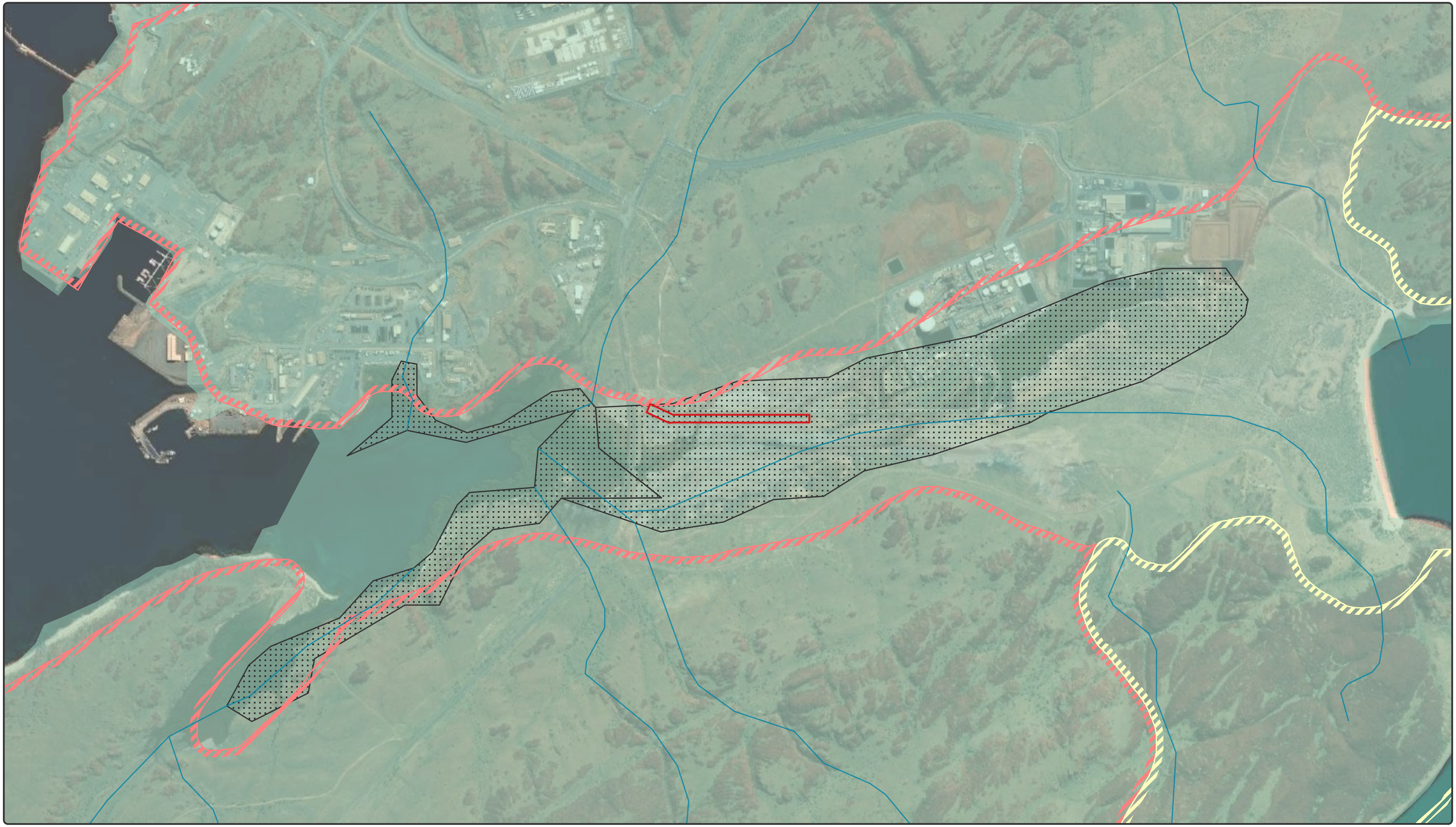


Figure 8-1: Hydrology of the Development Envelope

▭ Development Envelope

▒ Saline Coastal Flat

Drainage (Statewide):

— Minor watercourse

Catchments:

🟩 Coastal

Groundwater Dependent Ecosystems (GDE):

▨ Moderate potential GDE

▨ Low potential GDE

0 200 400 800

Metres

Datum/Projection:
GDA 1994 MGA Zone 50
23PER6340-JP Date: 10/07/2024

N

8.4 Potential Environmental Impacts

The potential direct and indirect impacts from the Proposal on the Inland Waters values surrounding the Development Envelope have been listed below.

8.4.1 Direct Impacts

The potential direct impacts of the Proposal on inland waters have been identified as:

- Alteration of surface water drainage and waterflow pathways.

8.4.2 Indirect Impacts

The potential indirect impacts of the Proposal on inland waters have been identified as:

- Contamination of surface water from the excavation/exposure of contaminated groundwater or ASS
- Contamination of surface water or groundwater from the accidental spilling of hazardous materials
- Reduction of quality of surface water due to site construction works and earthworks exposing underlying soil followed by increased erosion and sediment load.

8.5 Mitigation

The Proponent has applied the mitigation hierarchy through all stages of the Proposal to reduce its potential impacts on any hydrological values within and surrounding the Development Envelope. Potential impacts have primarily been avoided or minimised through the design of the Proposal during the planning phase. A key avoidance measure utilised for the Proposal is the use of a concrete-coated pipe which can be lowered into water eliminating the need to dewater or discharge.

Mitigation and management measures will also be regulated by DEMIRS in an approved Environment Plan. Environment Plans are required to meet the form and content requirements of the Petroleum and Geothermal Energy Resources (Environment) Regulations 2012 and Petroleum Pipelines (Environment) Regulations 2012. The objectives of the regulations are to ensure that any petroleum activity is carried out in a manner consistent with the principles of ecologically sustainable development and in accordance with the EP. The EP must show that the environmental impacts and risks will be reduced to As Low As Reasonably Practicable, and include appropriate environmental performance objectives and standards and appropriate measurement criteria for determining whether those objectives and standards have been met. An OSCP is required as part of the EP, which will assist to mitigate impacts to the environment from accidental spills of hazardous materials. The DBNGP EP and OSCP will be updated to include the Proposal, which will mitigate potential impacts to Inland Waters.

The specific mitigation and management measures proposed to be implemented by the Proponent have been detailed in Table 8-2.

Table 8-2: Proposed Inland Waters Mitigation Measures

Impacts	Avoidance	Minimisation	Residual Impacts
Alteration of surface water drainage and waterflow pathways	• The Development Envelope has been designed to avoid significant surface water bodies.	• The construction phase will be short (4-6 months) and activities will avoid the wet season and king tides. • The proposed pipeline will be underground. As such, the natural surface will be reconstituted throughout the majority of the Development Envelope to reinstate surface water drainage patterns.	Potential minor, short-term alteration of surface water drainage and waterflow pathways.
Contamination of surface water from the excavation/exposure of contaminated groundwater or ASS	• No dewatering or discharge will be required as part of the Proposal.	• The entire pipeline will be trenched at the same time and the trench will remain open for a maximum of three weeks • Trenching will not occur during the wet season or king tides, to enable backfilling to occur prior to when the site is at most risk of inundation • Periods of inundation will be avoided by: ○ Reviewing the Bureau of Meteorology (BoM) forecasts on daily basis and prior to mobilisation, to avoid commencing construction activities if extreme weather events (such as cyclones) are likely to occur and to enable backfilling to occur prior to periods of inundation ○ Reviewing tide charts to avoid construction activities during periods of king tides • In accordance with DBNGP EP, an ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015) • Potential ASS spoil will be treated as per the ASS Management Plan prior to stockpiling	Potential contamination of surface water or groundwater.
Contamination of surface water or groundwater from the accidental loss or spill of hazardous materials	• Vehicles and machinery will be refueled offsite avoiding the storage of large quantities of hazardous materials within the Development Envelope.	• DBNGP EP and OSCP will be implemented • Spill response equipment will be readily available and regularly maintained • All spills will be recorded and immediately cleaned up in accordance with the OSCP • In accordance with the DBNGP EP:	

Impacts	Avoidance	Minimisation	Residual Impacts
		○ Handle hazardous materials in accordance with the Hazardous Materials Handling and Storage Procedure (S-PRO-016) ○ Avoid hazardous materials handling within 100 m of watercourses such as refuelling of machinery and vehicles • A Waste Management Procedure will be implemented which sets out the controls for waste onsite and the disposal process including the: ○ Licensing of waste contractor ○ Segregation of waste streams including hydrocarbon waste and batteries. ○ Bunding or containment of liquid wastes ○ Frequent removal of waste product to minimise waste hydrocarbon storage time onsite (vacuum truck)	
Increased erosion and/or sediment load and reduction of quality of surface water	• The Development Envelope has been designed to avoid significant surface water bodies.	• The construction phase will be short (4-6 months) and activities will avoid the wet season and king tides, which has the potential to mobilise sediments • Ensure all vehicles remain on existing tracks where possible • Implement erosion controls on stockpiles (where required) • Rock armouring will be placed strategically around the metering station and inlet facility to reduce the potential for erosion	No residual impact anticipated.

8.6 Assessment and Significant Residual Impacts

8.6.1 Hydrogeological processes

8.6.1.1 *Alteration of surface water drainage and waterflow pathways*

Surface water drainage and waterflow pathways may be temporarily disrupted during construction of the Proposal. However, the construction phase will be short (4-6 months) and avoid the wet season and king tides, therefore the likelihood of significant waterflow across the Development Envelope during construction is considered low. In addition, the Proposal does not intersect any significant drainage lines. As the proposed pipeline will be underground, the natural surface will be reconstituted throughout the majority of the Development Envelope. Thus, impacts to surface water flows, if any, are likely to be minimal and only occur for a short duration.

Through the implementation of management and mitigation measures as described in Section 8.5 and the DBNGP EP, no significant alteration of surface water drainage and waterflow pathways is anticipated to result from the Proposal.

8.6.2 Water Quality

8.6.2.1 *Increased erosion and/or sediment load*

The construction phase for the Proposal has potential to increase erosion and the volume of sediment available to be mobilised during high rainfall events. Increased sediment load and reduction of quality of surface water in King Bay could occur due to sediment transport from disturbed areas via surface water runoff.

The entire pipeline will be trenched at the same time and will remain open for a maximum of three weeks. Trenching for the pipeline will not occur during the wet season or during king tides, to enable backfilling to occur prior to when the site is at most risk of inundation. In addition, rock armouring will be placed strategically around the metering station and inlet facility to reduce the potential for erosion. As such, it is considered unlikely that sediment will be mobilised and result in a reduction in surface water quality.

Other construction activities are proposed to avoid periods of inundation through:

- Reviewing BoM forecasts on a daily basis and prior to mobilisation, to avoid extreme weather events (such as cyclones)
- Reviewing tide charts to avoid construction activities during periods of king tides.

Through the implementation of management and mitigation measures as described in Section 8.5, as well as a CEMP and the DBNGP EP, no significant impacts to surface water or groundwater quality as a result of erosion or sedimentation are anticipated to result from the Proposal.

8.6.2.2 *Spills or leaks*

The Proposal has the potential to result in accidental spills of hazardous materials, particularly of hydrocarbons during the construction phase. This inherent risk is greatest for groundwater, given the proximity of local groundwater levels to the surface, as well as for King Bay given its proximity.

There will be no storage or handling of chemical and hazardous materials within the Development Envelope of quantities that will be required to be regulated and managed under the Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007. Vehicles and Machinery will be refulled offsite. Therefore, as only minor quantities of hazardous materials will be required over a short construction period (4-6 months), the risk of significant leaks or spills in considered low.

Standard operating procedures will be implemented for handling and for the use of hazardous material required. All hazardous materials (including chemicals and hydrocarbons) will be managed in accordance with the procedures, with key mitigation commitments documented in the CEMP and included in the DBNGP EP.

All spills will be recorded and immediately cleaned up in accordance with the OSCP. Furthermore, any contaminated material will be removed and disposed offsite to a licenced facility using a licensed contractor. Regular monitoring will also be in place to ensure all procedures are being followed and onsite storage is in good working order. Ongoing environmental monitoring will inform containment and remediation of any identified contamination prior to impacts to ecosystem health values or other beneficial uses.

Given only minor quantities of hazardous materials will be required over a short construction period (4-6 months) and given the provision for appropriate containment and clean-up in the event of a spill, accidental spills are unlikely to result in significant residual impacts to inland waters.

8.6.2.3 Exposure of Contaminated Groundwater

Ground disturbing activities such as trenching for the pipeline may expose contaminated groundwater.

No dewatering is required for trenching and pipeline burials, hence, there is negligible risk of contaminated groundwater being discharged into the environment.

The entire pipeline will be trenched at the same time and will remain open for a maximum of three weeks. Trenching for the pipeline will not occur during the wet season or during king tides, to enable backfilling to occur prior to when the site is at most risk of inundation. As such, it is considered unlikely that contaminated groundwater will be mobilised at a volume that may result in a reduction in surface water quality.

Through the implementation of standard industry management and mitigation measures, as described in Section 8.5, as well as a CEMP and the DBNGP EP, no significant contamination of inland waters is anticipated as a result of the Proposal.

8.6.2.4 Excavation/Exposure of ASS

The ESA conducted within the Development Envelope identified a high to moderate risk of ASS if disturbed (Section 8.3.3). Therefore, ground disturbing activities such as trenching for the pipeline may expose ASS.

No dewatering is required for trenching and pipeline burials, minimising the risk of exposing potential ASS. However, spoil will be extracted and stockpiled adjacent to the trench to allow for the pipeline to be laid. All spoil will be either backfilled into the trench or respread over the pipeline centreline and battered against the rock causeway.

In accordance with the DBNGP EP, an ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015). Potential ASS spoil will be treated as per the ASS Management Plan prior to stockpiling.

Through the implementation of standard industry management and mitigation measures, as described in Section 8.5, as well as a CEMP and the DBNGP EP, no significant contamination of inland waters is anticipated as a result of the Proposal.

8.7 Environmental Outcomes

The Proposal is not anticipated to have any significant residual impact on inland waters, due to the following:

- The Proposal is located away from major surface waterways or wetlands and does not intersect any drainage lines
- The majority of the natural surface of the Development Envelope will be reinstated following pipeline burial; hence the Proposal is unlikely to permanently alter surface water flows
- Construction activities have been designed to avoid periods of inundation as much as possible and occur over a short time period (4-6 months). Trenching will not occur during the wet season or during king tides. Hence, the Proposal is unlikely to significantly alter surface water flows or result in reduced quality of inland waters
- No dewatering is required for the Proposal, further minimising contamination risks associated with discharging groundwater to the environment
- Contamination of surface water from the Proposal will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP.
- An ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015).

The Proponent considers that due to the avoidance and proposed management measures described, the Proposal can be implemented to ensure that the hydrological regimes and quality of groundwater and surface water will be maintained such that the EPA's objective for the Inland Waters factor can be met.

9. SOCIAL SURROUNDINGS

9.1 EPA Environmental Factor

The EPA's objective for the Social Surroundings factor is to: 'Protect social surroundings from significant harm' (EPA 2023a).

For the purposes of EIA, social surroundings are a part of the environment and are considered where there is a 'clear direct link between a proposal or scheme's impact on the physical or biological surroundings and the subsequent effect on a person's aesthetic, cultural, economic or other social surroundings' (EPA 2023a).

9.2 Relevant Policy and Guidance

The relevant policy and guidance documents for the Social Surroundings Environmental Factor and how they have been considered for this Proposal are presented in Table 9-1.

Table 9-1: Social Surroundings Policy and Guidance

Policy/Guidance	Consideration
Environmental Factor Guideline: Social Surroundings 2023	The information provided in this section of the document has been tailored to address the 'considerations for environmental impact assessment' outlined within these guidelines
Technical Guidance Environmental impact assessment of Social Surroundings – Aboriginal cultural heritage (EPA 2023b)	Used to inform the requirements of impact assessment for Aboriginal cultural heritage including information requirements and EPA expectations.
Aboriginal Heritage Act 1972 (AH Act)	Considered during development of this referral and supporting document

9.3 Receiving Environment

9.3.1 Aboriginal Cultural Heritage

The Proposal is located within the Ngarluma-Yindjibarndi Native Title Determination Area (WAD6017/1996), which is held jointly by the Ngarluma Aboriginal Corporation and the Yindjibarndi Aboriginal Corporation. The Prescribed Body Corporate for the BMIEA is the MAC.

The mapped boundaries of seven registered Aboriginal Heritage sites from the DPLH Aboriginal Cultural Heritage Register overlap the Development Envelope, including:

- Place ID 9069: Kissing Birds
- Place ID 9073: Rock Shot
- Place ID 9215: Haul Road South 06
- Place ID 9216: Haul Road South 07
- Place ID 9813: DRD Area A-07
- Place ID 19766: DN-09 Engravings
- Place ID 26008: Hearson Engravings.

An archaeological and an ethnographic heritage survey was conducted concurrently on 17 November 2023, advised by Traditional Owners from MAC (ACHC 2023; Scarp Archaeology

2024). An endorsement of the findings of the survey reports was received from MAC on 28 March 2024 (MAC 2024).

Key outcomes and requirements of the site identification archaeological and ethnographic survey include, but are not limited to:

- Although the mapped boundaries of the seven registered Aboriginal Heritage sites from the DPLH Aboriginal Cultural Heritage Register intersect the Development Envelope, there is no significant heritage material or other aspects of significant Aboriginal heritage value specifically located within the Development Envelope
- No new isolated artefacts, new heritage sites or heritage features were recorded
- There are no Aboriginal heritage sites with ethnographic values that intersect with the proposed Development Envelope.
- Four monitors be present for all earthworks
- Employees and contractors carrying out the proposal must be informed of the contents of the final survey reports (ACHC 2023; Scarp Archaeology 2024) and their obligations to have zero harm on heritage
- The Proponent must inform MAC of any changes to the Proposal
- In the event that additional sites are located at any stage during the proposal, MAC Heritage procedures must be followed, and all works must halt immediately in the area to prevent any impacts
- In the event that human remains are located at any stage during the proposed works, DPLH procedures must be followed, and all works must halt immediately in the area to prevent any further impacts to the remains.

One previously recorded midden site (WC-2023-M001-01 and WC-2023-M001-02) was recorded during the survey (Scarp Archaeology 2024). The Development Envelope has been subsequently revised to avoid impact to this midden site.

9.3.2 Local Sensitive Receptors

The Proposal occurs within an existing industrial area and is located within the BSIA, with the land designated as a service corridor. As such, there are limited sensitive receptors in the area.

The nearest sensitive receptor is the Dampier Archipelago National Heritage Place, occurring approximately 0.25 km east of the Development Envelope. This National Heritage Place was instated for its Indigenous heritage values, representing a sacred place that has been home to Indigenous Australians for tens of thousands of years. Public concern has been raised regarding the impact of cumulative industrial air emissions on the integrity of rock art within the Dampier Archipelago National Heritage Place. Sulfur emissions are considered the main industrial emission with potential to impact the integrity of rock area (AHC 2012).

In addition, the Murujuga Cultural Landscape (*Murujuga* is the Aboriginal traditional name for the Dampier Archipelago and surrounds, including the Burrup Peninsula) has been proposed as a World Heritage site (DBCA 2020). If accepted, the boundaries of the potential World Heritage area are expected to reflect the Dampier Archipelago National Heritage Place.

The nearest townsite is Dampier, with the closest residence located approximately 15 km southwest of the Development Envelope. Given the distance to these nearest residences, no impacts are expected to occur as a result of the Proposal.

9.4 Potential Environmental Impacts

The potential impacts to social surroundings values associated with the Proposal include:

- Reduced amenity to the surrounding landscape through the placement of infrastructure
- Reduced amenity to the surrounding landscape during construction from dust, noise, vibrtation and light
- Impacts to the integrity of Aboriginal rock art resulting from air emissions.

9.5 Mitigation

The Proponent has applied the mitigation hierarchy through all stages of the Proposal to reduce its potential impacts on any social surroundings values within and surrounding the Development Envelope. Potential impacts have primarily been avoided or minimised through the redesign of the Proposal during the planning phase.

The specific mitigation and management measures proposed to be implemented by the Proponent are detailed in Table 9-2.

Table 9-2: Proposed Social Surroundings Mitigation Measures

Impacts	Avoidance	Minimisation	Residual Impacts
Reduced amenity to the surrounding landscape through the placement of infrastructure	• The Development Envelope has been reduced as far as practicable during the design phase.	• The proposed pipeline will be underground. As such, the majority of surface disturbance will be temporary, with natural landforms to be reinstated post-construction • Construction of the Proposal will occur over 4-6 months, minimising the time over which amenity will be reduced • The Proposal is located within an existing industrial area, subject to high levels of anthropogenic disturbance. The Proposal is surrounded by the Perdaman Urea Plant to the north, east and south, and Burrup Road to the west.	No residual impacts expected.
Impacts to Aboriginal heritage as a result of clearing	• A known midden site (WC-2023-M001-01 and WC-2023-M001-02; Scarp Archaeology 2024) has been avoided through the reduction of the Development Envelope during the design phase.	• Traditional Owner monitoring will be undertaken throughout construction of the Proposal • Employees and contractors carrying out the proposal must be informed of the contents of the final survey reports (ACHC 2023; Scarp Archaeology 2024) and their obligations to have zero harm on heritage • The Proponent must inform MAC of any changes to the Proposal • In the event that additional sites are located at any stage during the proposal, MAC Heritage procedures must be followed, and all works must halt immediately in the area to prevent any impacts • In the event that human remains are located at any stage during the proposed works, DPLH procedures must be followed, and all works must halt immediately in the area to prevent any further impacts to the remains.	No residual impacts expected.
Reduced amenity to the surrounding landscape during construction from dust, noise, vibration and light	• Avoid clearing native vegetation as far as practicable • Night construction activities will be avoided to mitigate the disturbance to amenity from increased light	• Construction of the Proposal will occur over 4-6 months, minimising the time over which light, dust, and/or noise will occur • Trenching for pipeline construction will be over a maximum of three weeks, reducing the time over which dust emissions will occur • Excessive dust will also be minimised through: ○ Minimisation of time between trenching and backfilling ○ Use of a water cart to stabilise stockpiles, when required ○ Reducing speed limits on the ROW ○ Safe work method statements (SWMS) / Job Hazard Analysis (JHA) to identify dust risk at time of activity and apply controls (i.e. water cart / truck)	Potential short-term impacts on the amenity of the surrounding landscape.

Impacts	Avoidance	Minimisation	Residual Impacts
		○ Limit topsoil stockpile height to less than 2 m in height. • Noise emissions will be controlled in accordance with a Guide to Noise Control on Construction, Maintenance and Demolition Sites (AS/NZS 2436-1981), and the following minimisation measures will be applied in accordance with the DBGNP EP: ○ Standard design and operating procedures to minimise noise ○ Mechanical vibratory compaction will not be utilised during backfill and compaction of the trench.	
Impacts to the integrity of Aboriginal rock art resulting from air emissions	• Complete avoidance of air emissions is not possible.	• Low sulfur diesel will be used for vehicles and machinery, as this produces less air emissions than conventional diesel • Construction of the Proposal will occur over 4-6 months, minimising the time over which air emissions will occur.	Air emissions potentially contributing to the degradation of Aboriginal rock art.

9.6 Assessment and Significant Residual Impacts

9.6.1 Reduced amenity to the surrounding landscape through the placement of infrastructure

The Proposal infrastructure has the potential to reduce the amenity of the surrounding landscape. The proposed pipeline will be underground, with the majority of surface disturbance to be temporary and the natural topography and landforms to be reinstated post-construction. In addition, the landscape in which the Proposal occurs is already subject to anthropogenic disturbance as a result of the industries within the BSIA. The Proposal is bound by Burrup Road and the DBNGP to the west, the Burrup Desalinated Water and Seawater Supplies pipeline to the north and the Project Ceres causeway to the east (Figure 1-1). The pipeline lateral will also be located adjacent to the existing rock causeway and PL62 pipeline lateral and LoS.

The Proposal may result in a minor reduction to the amenity of the surrounding landscape; however, given the context of the Development Envelope within an existing industrial area, the impacts are not considered to be significant.

9.6.2 Reduced amenity to the surrounding landscape during construction from dust, noise and light

Increased light, noise and/or dust emissions may impact the amenity of the landscape immediately surrounding Development Envelope. Night construction activities will be avoided. Noise and vibration emissions will be temporary, occurring over the short 4–6-month construction timeframe. Increased dust emissions from earthwork activities and vehicle and machinery movements may result in reduced visual amenity; however, given the small scale nature of the Proposal (550 m pipeline) short trenching time (up to three weeks) and short overall construction time (4-6 months), this is likely to be minimal and restricted to the Development Envelope.

In addition to this, the landscape in which the Proposal occurs is already subject to anthropogenic disturbance as a result of the industries within the BSIA. Therefore, any dust, noise or vibration emissions resulting from the Proposal are unlikely to significantly impact the amenity of the area.

The Proposal may result in a minor, temporary increase in localised dust, vibration and noise emissions; however, through the implementation of standard industry management and mitigation measures, as described in Section 9.5, as well as the CEMP and DBNGP EP, significant impacts to social surroundings as a result of reduced amenity are considered unlikely.

9.6.3 Impacts to the integrity of Aboriginal rock art resulting from air emissions

Air emissions during construction of the Proposal will be generated from vehicle and machinery operation. The Proposal is not expected to have significant fuel requirements for construction, given its small scale and short timeframe (4-6 months). As such, the likelihood of significant impacts to the integrity of Aboriginal rock art within the Murujuga National Park is low. The use of low sulfur diesel will ensure the Proposal does not significantly contribute to the cumulative impacts of harmful air emissions on Aboriginal rock art.

Through the implementation of standard industry management and mitigation measures, as described in Section 9.5, as well as the CEMP and DBNGP EP, significant impacts to Aboriginal rock art within the Murujuga National Park as a result of Proposal air emissions are considered unlikely.

9.7 Environmental Outcomes

The Proposal is not anticipated to have any significant residual impact on social surroundings, due to the following:

- No Aboriginal Cultural Heritage sites of significance intersect the Development Envelope according to archaeological and ethnographic heritage surveys
- The Proposal has been sited within an industrial area, therefore sensitive receptors are limited
- Reduced amenity to the surrounding landscape from dust, noise and vibration will be minimised through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP
- The Proposal is not expected to impact the integrity of Aboriginal rock art within the Murujuga National Park given the small scale nature of the project, short timeframe of construction and as low sulfur diesel will be used to reduce air emissions.

The Proponent considers that due to the avoidance and proposed management measures described, the Proposal can be implemented to ensure that social surrounds are protected from significant harm such that the EPA's objective for the Social Surroundings factor can be met.

10. GREENHOUSE GAS EMISSIONS

10.1 EPA Environmental Factor

The EPA's objective for the Greenhouse Gas (GHG) Emissions factor is to: 'Minimise the risk of environmental harm associated with climate change by reducing greenhouse gas emissions as far as practicable' (EPA 2023c).

Greenhouse gases include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), sulphur hexafluoride (SF_6), hydro fluorocarbons (HFCs), perfluorocarbons (PFCs) and nitrogen trifluoride (NF_3).

10.2 Relevant Policy and Guidance

The relevant policy and guidance documents for the GHG Emissions Environmental Factor and how they have been considered for this Proposal are presented in Table 10-1.

Table 10-1: Greenhouse Gas Emissions Relevant Policy and Guidance

Policy/Guidance	Consideration
Environmental Factor Guideline: Greenhouse Gas Emissions (EPA 2023c)	The information provided in this section of the document has been tailored to address the 'considerations for environmental impact assessment' outlined within these guidelines.
Greenhouse Gas Emissions Policy for Major Projects (Government of Western Australia 2020)	The Proponent is committed to contributing towards the State's aspiration of net zero by 2050.

In recognition of the established link between cumulative sources of GHG emissions and the risk of climate change, GHG emissions from a proposal are generally considered under the EP Act when they are likely to exceed 100,000 tonnes of CO_2 equivalent (tCO_2-e) of Scope 1 or Scope 2 emissions in any year (EPA 2023c).

Emissions associated with the Proposal are estimated to be 1,362 tCO_2-e during construction and 8 tCO_2-e per annum during the operations phase. Although this is well below the 100,000 tCO_2-e per year threshold, the Proponent has provided detail on GHG emissions estimates and mitigation for the Proposal to demonstrate that impacts are not significant.

10.3 Receiving Environment

GHG emissions are a key contributor to climate change, with the effects of a changing climate predicted to be significant in Western Australia (EPA 2023c). Australia has committed to reducing GHG emissions to 43% below 2005 levels by 2030. Alongside this, Western Australia is committed to achieving net-zero emissions by 2050 as outlined in the Western Australian Climate Policy (Government of Western Australia 2020).

GHG emissions are classified as follows (EPA 2023c):

- Scope 1: emissions generated as a direct result of an activity e.g. diesel combustion by vehicles or gas consumption for on-site power generation
- Scope 2: emissions generated from the consumption of an energy commodity

- Scope 3: indirect emissions, other than Scope 2 emissions, that are generated in the wider community as a consequence of the activities of a proposal.

10.4 Greenhouse Gas Emission Estimates

A GHG assessment for the Proposal was undertaken according to the requirements outlined in the EPA's Environmental Factor Guideline for Greenhouse Gas Emissions (EPA 2023b).

To determine Scope 1 emissions the Proponent undertook an internal GHG assessment based on the Front-End Engineering Design (FEED) report (AGIG 2024) and expected emissions from the machinery required for construction. Key inputs used to calculate Scope 1 GHG emissions associated with the Proposal for the purpose of this assessment are outlined in Table 10-2.

As all electricity required for the Proposal will be generated from the onsite generators there are no Scope 2 emissions within the scope of the Proposal.

To calculate Scope 3 GHG emissions for the Proposal, the Proponent considered the Scope 1 of the Perdaman Urea Plant. Scope 3 emissions are those that are generated as a consequence of the activities of a proposal. Given that the Proposal will transport gas directly from the DBNGP to the Perdaman Urea Plant, it is considered appropriate to consider the Scope 3 emissions for this Proposal as the supply of natural gas from the DBNGP and the Scope 1 emissions of the Perdaman Urea Plant.

The estimated GHG emissions from the Proposal are estimated to be well below 100,000 tonnes of CO_2 equivalent (tCO_2-e) of Scope 1 or Scope 2 emissions in any year. This is being achieved through the small scale nature of the project and the mitigation as discussed in Section 10.6 below.

Table 10-2: Key Project Inputs

Activity	Parameter	Value
Heavy vehicle use	Earthmoving equipment	238 kL
Light vehicle use	Diesel combustion for transport purposes	72 kL
Generators	Diesel combustion for stationary energy purposes	156 kL
Loss of carbon sink from land clearing	Emission factor of 287 t CO_2-e/ha	0.21 ha
Commissioning venting of natural gas	Natural gas	4 TJ
Fugitive emissions		
Methane leakage from the pipeline	Methane	11.62 tCO_2-e / km

10.5 Potential Environmental Impacts

Scope 1 GHG emissions from the Proposal will be derived from:

- The combustion of hydrocarbons by machinery, generators and other vehicles during construction and clearing
- Gas venting during commissioning
- Methane leakage from the pipeline during operations.

Scope 3 emissions are all other indirect emissions that are a consequence of the activities of a proposal. The following Scope 3 emissions are relevant to the Proposal:

- Upstream emissions associated with the supply of natural gas from the DBNGP
- Downstream emissions associated with the urea manufacturing operations at the Perdaman Urea Plant.

10.6 Mitigation

The Proponent is committed to contributing towards the State's aspiration of net zero by 2050. As part of this they have developed an Environmental, Social and Governance (ESG) strategy which includes targets and initiatives to reduce GHG emissions across their operations to achieve Net Zero by 2050.

As part of the review of opportunities to reduce GHG emissions from the Proposal, solar and solar with battery backup (BESS) was reviewed as an alternative power source for the meter station. Solar and battery will be utilised at the meter station.

The specific mitigation and management measures proposed to be implemented by the Proponent have been detailed in Table 10-3.

Table 10-3: Proposed Greenhouse Gas Mitigation Measures

Impacts	Avoidance	Minimisation	Residual Impacts
GHG emissions	• The Proposal has been designed to avoid the use of diesel-powered machinery to as low as practicable • The pipeline has been designed to avoid methane leakage as far as practicable.	• All fuel use will be logged and monitored to ensure excessive amounts are not being consumed • Solar and battery will be utilised at the meter station • The following measures will be implemented to minimise the risk of significant unplanned release of methane from the pipeline, in accordance with the DBNGP EP: ○ Ensure facility design meets required standards as per Asset Management Plan ○ Include alarms for all significant pressure relief valves ○ Only introduce gas post leak testing or pre-commissioning tasks for enhancement works ○ Ongoing maintenance including leak testing as per Asset Management Plan and Safety Case ○ Use the Supervisory Control and Data Acquisition (SCADA) online system to monitor accidental release of gas from the pipeline.	A total of 1,362 t CO_2-e during construction. A total of 8 t CO_2-e per annum during operation as a result of methane leakage.

10.7 Assessment and Significant Residual Impacts

10.7.1 Scope 1 GHG Emissions

The emissions calculated from fuel consumption, fugitive emissions, gas venting, land clearing and methane leakage have been combined to provide an overall estimate of Scope 1 GHG emissions associated with the Proposal. The estimated total Scope 1 GHG emissions is 1,362 t CO_2-e during construction and 8 t CO_2-e per annum for the operation phase (Table 10-4).

This is well below the 100,000 t CO_2-e threshold for Scope 1 emissions, hence the impacts associated with GHG emissions from construction and operation of the Proposal are not considered to be significant.

Table 10-4: Estimated GHG Emissions for the Proposal

Phase	Category	Total Emissions (t CO_2-e)
Land clearing	Diesel combustion for Earthmoving equipment	842
	Diesel combustion for transport purposes	
	Diesel combustion for stationary energy purposes	422
	Loss of carbon sink from land clearing	60
Commissioning	Emissions from Venting	2
Total Emissions - Construction		**1,324**
Operation	Emissions from methane leakage	8
Total Emissions – Operations		**8**

10.7.2 Scope 3 Emissions

Scope 3 emissions for the Proposal have been estimated to be approximately 820,000 t CO_2-e per annum during the operational stage. A summary of key Scope 3 GHG emission sources and estimates for the Proposal is outlined in Table 10-5.

Table 10-5: Estimated Scope 3 Emissions for the Proposal

Scope 3 Emission Source	Annual Emissions (t CO_2-e/year)
Upstream: Supply of natural gas from the DBNGP	170,000
Downstream: Urea manufacturing operations at the Perdaman Urea Plant	650,000
Total	**820,000**

10.7.3 Cumulative Impacts

Australia’s total estimated emissions for the year to December 2023 were 432.9 million t CO_2-e (DCCEEW 2024b). For the 2022-2023 year, corporations required to report under the *National Greenhouse and Energy Reporting Act 2007* (NGER Act) reported a total of 307 million t CO_2-e of Scope 1 GHG emissions (CER 2024). Western Australian projects contributed approximately 69.4 million t CO_2-e of Scope 1 GHG emissions (CER 2024).

Based on these figures, the Scope 1 construction and operation emissions for the Proposal would represent approximately 0.0003% of the national emissions and 0.001% of the Western Australian Scope 1 emissions.

10.8 Environmental Outcomes

The Proposal will contribute to GHG emissions, primarily from the consumption of fuel, fugitive emissions, gas venting and loss of stored carbon through vegetation clearance. The emissions from the Proposal are estimated to total 1,362 t CO_2-e during construction and 8 t CO_2-e per annum during operation. This is below the EPA assessment threshold of 100,000 t CO_2-e per year (EPA 2023c) and impacts associated with GHG emissions from the Proposal are therefore not considered to be significant.

Through the implementation of mitigation measures, GHG emissions have been reduced to as low as is reasonably practicable to minimise the risk of environmental harm associated with climate change and the Proponent considers that the EPA's objective for Greenhouse Gas Emissions will be met.

11. MARINE FACTORS

11.1 EPA Environmental Factors

Given the impacts associated with the Proposal on Marine Environmental Quality and Benthic Communities and Habitats are minimal and the receiving environment similar, these factors are discussed together in this section.

The EPA's objective for the Marine Environmental Quality Environment Factor is: 'To maintain the quality of water, sediment and biota so that environmental values are protected' (EPA 2016d).

The EPA's objective for the Benthic Communities and Habitats Environmental Factor is: 'To protect benthic communities and habitats so that biological diversity and ecological integrity are maintained' (EPA 2016e).

The EPA defines ecological integrity as 'the composition, structure, function and processes of ecosystems, and the natural variation of these elements' (EPA 2016e).

11.2 Relevant Policy and Guidance

The relevant policy and guidance documents for the Marine Environmental Quality Environmental Factor and Benthic Communities and Habitats Environmental Factor and how they have been considered in developing the Proposal and this document are presented in Table 11-1.

Table 11-1: Marine Environmental Quality and Benthic Communities and Habitats Policy and Guidance

Policy/Guidance	Consideration
Environmental Factor Guideline: Marine Environmental Quality (EPA 2016d)	The information provided in this section of the document has been tailored to address the 'considerations for environmental impact assessment' outlined within these guidelines.
Environmental Factor Guideline: Benthic Communities and Habitats (EPA 2016e)	The information provided in this section of the document has been tailored to address the 'considerations for environmental impact assessment' outlined within these guidelines.
Technical Guidance: Protecting the Quality of Western Australia's Marine Environment (EPA 2016f)	Used to inform the requirements of impact assessment for the marine environment including information requirements and EPA expectations.

11.3 Receiving Environment

The marine ecosystem of the Pilbara is considered unique, being the only marine ecosystem in Australia that is offshore from the arid tropics (DoE 2006). Marine related industries are prevalent in the region, comprising offshore oil and gas, ports, shipping, mining, aquaculture and ecotourism (DoE 2006).

The Development Envelope is located in proximity to the Dampier Archipelago Marine Park which is considered to be of significant environmental value and as such, is protected under Marine Levels of Ecological Protection (LEP) (DoE 2006). The majority of the marine environment in proximity to the Development Envelope is allocated high to maximum LEPs (DWER 2019).

Approximately, 85.3% of the Development Envelope overlies mudflats which become inundated with seawater during extreme rainfall events and high tides. The King Bay mangrove community occurs adjacent to Burrup Road to the west of the Development Envelope and is supported by the tidal movement of the bay that provides sedimentation, seawater recharge, nutrient delivery and recruitment of benthos (Cardno 2020). This mangrove community is not considered regionally significant under the *Guidance Statement for Protection of Tropical Arid Zone Mangroves Along the Pilbara Coastline* (EPA 2001).

11.3.1 Site Contamination

As previously outlined (Section 8.3.3):

- The Development Envelope has been classified as 'Possibly Contaminated – Investigation Required'
- Assessments carried out in 2017-2018 found:
  - Ammonia, nitrates and nitrites at elevated concentrations in soil and groundwater at the TAN Yara Fertilisers Plant (Figure 1-1)
  - Nutrient seepage was occurring into the adjacent supratidal flats
  - Receiving sediments of the adjacent 'upper' supratidal flats were found to be acting as a nutrient sink, with potential for migration to downstream areas in the 'lower' supratidal flats and King Bay during high rainfall events.
- Monitoring data indicated unacceptably high nitrate concentrations in surface waters migrating from the TAN plant, with the potential to impact sensitive ecological receptors in the supratidal flats and King Bay.
- The Proponent commissioned a Baseline ESA of the Development Envelope that identified the occurrence of low levels of PFAS, Zinc and elevated nutrients within the groundwater, as well as potential ASS in the soil (Senversa 2024; Section 8.3.3).

11.4 Potential Environmental Impacts

The potential impacts from the Proposal on marine values associated with the Proposal include:

- Elevated turbidity from fugitive dust emissions resulting in reduced marine environmental quality and impacts to the King Bay mangrove community
- Elevated turbidity resulting in reduced marine environmental quality and impacts to the King Bay mangrove community due to site construction works and earthworks exposing underlying soil followed by increased sediment load
- Reduced marine environmental quality and associated impacts to the King Bay mangrove community from accidental spills of hazardous materials
- Reduced marine environmental quality and associated impacts to the King Bay mangrove community from excavation/exposure of contaminated groundwater or ASS.

11.5 Mitigation

The Proponent has applied the mitigation hierarchy through all stages of the Proposal to reduce its potential impacts on any marine values within and surrounding the Development Envelope. Potential impacts have primarily been avoided or minimised through the design of the Proposal during the planning phase. A key avoidance measure utilised for the Proposal is the use of a concrete-coated pipe which can be lowered into water, eliminating the need to dewater the trench or discharge into the environment.

Mitigation and management measures will also be regulated by DEMIRS in an approved EP (see Section 8.5). The DBNGP EP and OSCP will be updated to include the Proposal, which will mitigate potential impacts to the Marine Factors.

The specific mitigation and management measures proposed to be implemented by the Proponent have been detailed in Table 11-2.

Table 11-2: Proposed Marine Factors Mitigation Measures

Impacts	Avoidance	Minimisation	Residual Impacts
Elevated turbidity from fugitive dust emissions resulting in reduced marine environmental quality and impacts to the King Bay mangrove community	Avoid clearing vegetation as far as practicable, avoiding increased dust emissions.	• Construction of the Proposal will occur over four to six months, minimising the time over which dust emissions will occur • The entire pipeline will be trenched at the same time and the trench will remain open for a maximum of three weeks • Dust suppression techniques will be implemented in accordance with the DBNGP EP, including: ○ Minimisation of time between trenching and backfilling ○ Use of a water cart to stabilise stockpiles, when required ○ Ensure all vehicles transporting fill material are appropriately covered during transport ○ Reducing speed limits on the ROW.	Potential short-term elevated turbidity of adjacent marine waters.
Elevated turbidity resulting in reduced marine environmental quality and impacts to the King Bay mangrove community due to increased sediment load	The Development Envelope has been designed to avoid significant water bodies.	• The construction phase will be short (4-6 months) and activities will, where possible, avoid periods of inundation (such as the wet season or king tides), which has the potential to mobilise sediments • The entire pipeline will be trenched at the same time and the trench will remain open for a maximum of three weeks • Trenching will not occur during the wet season or during king tides, to enable backfilling to occur prior to when the site is at most risk of inundation • Periods of inundation will be avoided by: ○ Reviewing the BoM forecasts on daily basis and prior to mobilisation, to avoid commencing construction activities if extreme weather events (such as cyclones) are likely to occur and to enable backfilling to occur prior to periods of inundation ○ Reviewing tide charts to ensure the any open trenches will not be inundated by tides	No residual impact anticipated.

Impacts	Avoidance	Minimisation	Residual Impacts
		• Rock armouring will be placed strategically around the metering station and inlet facility to reduce the potential for erosion.	
Reduced marine environmental quality and associated impacts to the King Bay mangrove community from excavation/exposure of contaminated groundwater or ASS	The Proposal has been designed to avoid construction during periods of heavy rainfall and king tides, when risks associated with stormwater runoff are highest.	• The entire pipeline will be trenched at the same time and the trench will remain open for a maximum of three weeks • Trenching will not occur during the wet season or during king tides, to enable backfilling to occur prior to when the site is at most risk of inundation • Periods of inundation will be avoided by: ○ Reviewing the BoM forecasts on daily basis and prior to mobilisation, to avoid commencing construction extreme weather events (such as cyclones) are likely to occur and to enable backfilling to occur prior to periods of inundation ○ Reviewing tide charts to ensure the any open trenches will not be inundated by tides. • In accordance with the DBNGP EP, an ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015) • Potential ASS spoil will be treated as per the ASS Management Plan prior to stockpiling.	Potential contamination of marine waters.
Reduced marine environmental quality and associated impacts to the King Bay mangrove community from accidental spills of hazardous materials	The Proposal has been designed to avoid construction during periods of extreme weather events and king tides, when risks associated with accidental spills are highest Vehicles and machinery will be refueled offsite avoiding the storage of large quantities of hazardous materials within the Development Envelope.	• DBNGP EP and OSCP will be implemented • Spill response equipment will be readily available and regularly maintained • All spills will be recorded and immediately cleaned up in accordance with the OSCP • In accordance with the DBNGP EP: ○ Handle hazardous materials in accordance with the Hazardous Materials Handling and Storage Procedure (S-PRO-016) ○ Avoid hazardous materials handling within 100 m of watercourses such as refuelling of machinery and vehicles.	No residual impact anticipated.

11.6 Assessment and Significance of Residual Impacts

11.6.1 Elevated turbidity from fugitive dust emissions resulting in reduced marine environmental quality and impacts to the King Bay mangrove community

Dust generation will be primarily attributable to construction activities for the Proposal, such as through the clearing of vegetation, trenching and backfilling. Dust emissions may also be generated through the movement of vehicles along the rock causeway during the operational phase.

Given the small scale nature of the Proposal (550 m pipeline), short trenching time (up to three weeks) and short overall construction time (4-6 months), impacts are likely to be temporary and restricted to the Development Envelope. Therefore, it is unlikely that significant amounts of dust will be deposited into the marine environment.

In addition, through the implementation of management and mitigation measures, as described in Section 11.5, as well as a CEMP and the DBNGP EP, impacts associated with fugitive dust emissions on marine environmental quality are considered unlikely to be significant.

11.6.2 Elevated turbidity resulting in reduced marine environmental quality and impacts to the King Bay mangrove community due to site construction works and earthworks exposing underlying soil followed by increase sediment load

The construction phase for the Proposal has potential to increase erosion and the volume of sediment available to be mobilised during high rainfall events. Increase sediment load and reduction of quality of the marine environment in King Bay could occur due to sediment transport from disturbed areas via surface water runoff.

The entire pipeline will be trenched at the same time and will remain open for a maximum of three weeks. Trenching for the pipeline will not occur during the wet season or during king tides, to enable backfilling to occur prior to when the site is at most risk of inundation. In addition, rock armouring will be placed strategically around the metering station and inlet facility to reduce the potential for erosion. As such, it is considered unlikely that sediment will be mobilised and result in a reduction in quality of the marine environment.

Other construction activities are proposed to avoid periods of inundation through:

- Reviewing BoM forecasts on a daily basis and prior to mobilisation, to avoid extreme weather events (such as cyclones)
- Reviewing tide charts to avoid construction activities during periods of king tides.

Through the implementation of management and mitigation measures as described in Section 11.5, as well as a CEMP and the DBNGP EP, no significant impacts to marine environmental quality or the King Bay mangrove community as a result of sedimentation are anticipated to result from the Proposal.

11.6.3 Reduced marine environmental quality and associated impacts to the King Bay mangrove community from accidental spills of hazardous materials

Mangroves can be sensitive to modifications in water quality conditions. The adjacent King Bay mangrove community may be indirectly impacted by the Proposal, particularly during construction when the likelihood of accidental spills of hazardous materials is highest.

The Proposal has the potential to result in accidental spills of hazardous materials, particularly of hydrocarbons during the construction phase. However, there will be no storage or handling of chemical and hazardous materials within the Development Envelope of quantities that will be required to be regulated and managed under the Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007. Vehicles and Machinery will be refulled offsite. Therefore, as only minor quantities of hazardous materials will be required over a short construction period (4-6 months), the risk of significant leaks or spills in considered low.

Standard operating procedures will be implemented for handling and for the use of hazardous material and storage areas will be fully bunded. All hazardous materials (including chemicals and hydrocarbons) will be managed in accordance with the procedures, with key mitigation commitments documented in the CEMP and included in the DBNGP EP.

Regardless, all spills will be recorded and immediately cleaned up in accordance with the OSCP, prior to periods of inundation reducing the risk of impacts to the downstream marine environment. Furthermore, any contaminated material will be removed and disposed offsite to a licenced facility using a licensed contractor. Regular monitoring will also be in place to ensure all procedures are being followed and onsite storage is in good working order. On-going environmental monitoring will inform containment and remediation of any identified contamination prior to impacts to ecosystem health values or other beneficial uses.

To further minimise the risk of reduced marine environmental quality, appropriate management and mitigation measures, as described in Section 11.5, as well as a CEMP and the DBNGP EP, will be implemented. As such, the impacts associated with accidental spills of hazardous materials and/or ASS on marine values are considered unlikely to be significant.

11.6.4 Reduced marine environmental quality and associated impacts to the King Bay mangrove community from exposure of contaminated groundwater

Ground disturbing activities such as trenching for the pipeline may expose contaminated groundwater, potentially reducing the quality of the marine environment if contamination occurs.

No dewatering is required for trenching and pipeline burials, hence, there is negligible risk of potentially acidic or contaminated groundwater being discharged into the marine environment.

The entire pipeline will be trenched at the same time and will remain open for a maximum of three weeks. Trenching for the pipeline will not occur during the wet season or during king tides, to enable backfilling to occur prior to when the site is at most risk of inundation. As such, it is considered unlikely that contaminated groundwater will be mobilised at a volume that may result in a reduction in quality of the marine environment.

Through the implementation of standard industry management and mitigation measures, as described in Section 11.5, as well as a CEMP and the DBNGP EP, no significant impacts to marine environmental quality or the King Bay mangrove community are anticipated as a result of the Proposal.

11.6.5 Reduced marine environmental quality and associated impacts to the King Bay mangrove community from excavation/exposure of ASS

The ESD conducted within the Development Envelope identified a high to moderate risk of ASS if disturbed (Section 8.3.3). Therefore, ground disturbing activities such as trenching for the pipeline may expose ASS.

No dewatering is required for trenching and pipeline burials, minimising the risk of exposing potential ASS. However, spoil will be extracted and stockpiled adjacent to the trench to allow for the pipeline to be laid. All spoil will be either backfilled into the trench or respread over the pipeline centreline and battered against the rock causeway.

In accordance with the DBNGP EP, an ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015). Potential ASS spoil will be treated as per the ASS Management Plan prior to stockpiling.

Through the implementation of standard industry management and mitigation measures, as described in Section 11.5, as well as a CEMP and the DBNGP EP, no significant contamination of the marine environment is anticipated as a result of the Proposal.

11.7 Environmental Outcomes

The Proposal is not anticipated to have any significant residual impacts on marine environmental quality or benthic communities due to the following:

- Impacts to marine environmental quality and the King Bay mangrove community are unlikely to be significant given the small scale nature of the Proposal and that the construction timeframe will be short and will avoid periods of inundation and increased storm activity, when marine waters are most at risk of being impacted
- No dewatering is required for the Proposal, further minimising contamination risks associated with discharging groundwater to the marine environment
- Impacts to the marine environment will be further managed through the implementation of the mitigation measures outlined in the CEMP and DBNGP EP
- An ASS Management Plan will be developed and implemented in accordance with the DWER Guideline *Treatment and Management of Soil and Water in ASS Landscapes* (2015).

The Proponent considers that due to the avoidance and proposed management measures described, the Proposal can be implemented to ensure that the EPA’s objectives for the Marine Environmental Quality and Benthic Communities and Habitats factors can be met.

12. HOLISTIC IMPACT ASSESSMENT

The previous sections of this document have provided a detailed assessment of the Proposal's potential environmental impacts on each of the EPA's environmental factors individually. This section provides information regarding the interrelationships between each factor, to fully understand the impacts of the Proposal and the suitability of proposed management actions to ensure appropriate environmental outcomes are achieved.

The environmental factors relevant to the Proposal are:

- Flora and Vegetation
- Terrestrial Fauna
- Inland Waters
- Social Surroundings
- Greenhouse Gas Emissions
- Marine Factors.

The Proposal's relationship between these factors is demonstrated in Figure 12-1.

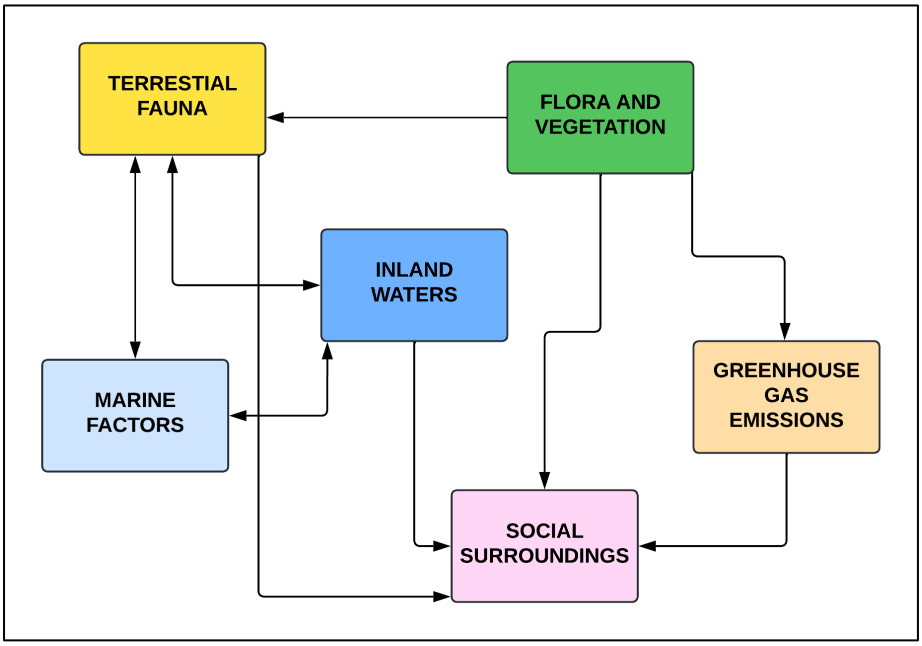


Figure 12-1: Holistic View of Links Between Environmental Factors Relevant to the Proposal

The residual impacts of the Proposal are minimal due to the absence of significant environmental values within the Development Envelope and surrounding environment, and due to the mitigation measures that are proposed to be implemented.

The Proposal is small scale in nature (550 m pipeline) and construction is proposed to occur over a short period of time (4-6 months). The Proposal is located within an existing industrial area and the BSIA, surrounded by existing areas of anthropogenic disturbance and separated from sensitive receptors. Vegetation within the Development Envelope is minimal (0.21 ha) and in Poor condition. No residual impacts to individual factors are considered to be significant.

The environmental impacts as a result of the Proposal as a whole includes:

- Clearing of 0.21 ha of vegetation in Poor condition, comprising Low Chenopod Shrubland fauna habitat
- Clearing of 1.22 ha of Mudflat fauna habitat considered potential habitat for conservation significant bird species
- Short-term, temporary impacts associated with construction, largely mitigated through management measures implemented under the CEMP and DBNGP EP.

Potential impacts associated with dust, light, noise, open trenches impacting fauna, potential soil contamination from accidental spills etc. are expected to be short-term, highly localise be effectively managed. A CEMP has been developed for this purpose, and the DBNGP EP and OSCP will be updated to include the Proposal. For these reasons, overall impacts during the construction phase are not likely to contribute to combined effects that could result in a significant overall impact.

A holistic perspective has been considered when developing management and mitigation measures. For example, the Proposal has been designed to have a short trenching timeframe of three weeks. This approach will minimise the risk of fauna entrapment, reduce dust emissions and minimise the risk of contamination, reducing impacts to Terrestrial Fauna, Flora and Vegetation, Social Surroundings, Inland Waters and Marine Factors.

The combined effects of the terrestrial environment as a whole are no greater than the effects on individual factors and residual impacts of the overall Proposal are not considered significant.

13. CUMULATIVE IMPACT ASSESSMENT

In line with EPA guidance, the Proponent has considered the cumulative effects of the Proposal, taking into account the successive, incremental and interactive impacts on the environment of the Proposal with past, present and reasonably foreseeable future activities (EPA 2023d).

The Proposal is located on the Burrup Peninsula, within the City of Karratha local government area in the Pilbara region of Western Australia. The surrounding landscape is highly cleared and developed, being dominated by industrial developments related to the oil and gas sector. The impact of the historical clearing and present industrial activities is assumed to have been captured in the description of the receiving environment which forms the basis for the impact assessment for the relevant EPA factors.

Reasonably foreseeable future activities are defined as third party (or proponent) activities which are already approved, are in a government approvals process, or are otherwise reasonably likely to proceed (EPA 2021). The cumulative impact assessment considers the projects located on the Burrup Peninsula within the BSIA (Figure 1-1) and these were used to differing degrees depending on the environmental factor and information publicly available, to inform the cumulative impact assessment of the Proposal:

- AGI Operations Pty Ltd – Pluto North West Shelf Interconnector Pipeline
- Perdaman Chemicals and Fertilisers Pty Ltd – Project Ceres
- Regional Power Western Power - Burrup Common User Transmission Infrastructure
- Woodside Energy Ltd – Karratha Gas Plant
- Woodside Energy Ltd – North West Shelf Project Extension
- Woodside Energy Ltd – Pluto LNG Development
- Yara Pilbara Fertilisers Pty Ltd – Ammonia Plant and Renewable Hydrogen Project
- Yara Pilbara Fertilisers Pty Ltd – Liquid Ammonia Plant
- Yara Pilbara Nitrates Pty Ltd (initially referred by Burrup Nitrates Pty Ltd) – Technical Ammonium Nitrate Production Facility.

The North West Shelf Project Extension (Woodside Energy Ltd), which occurs on the Burrup Peninsula, has not been included in the cumulative impact assessment as it will not require clearing of native vegetation or fauna habitat.

Where relevant, cumulative impacts of the Proposal are discussed in detail in each environmental factor chapter. A summary of how cumulative impacts have been considered for each factor and the outcomes of the assessment is provided below in Table 13-1.

From a cumulative impact perspective, the Proposal will result in the following environmental outcomes:

- Minor or negligible cumulative impacts to Flora and Vegetation including:
    - 0.12% decline of Pre-European vegetation association Abydos Plain – Roebourne 117
- Minor cumulative impacts to Terrestrial Fauna including:
    - Clearing of up to 21.47 ha of mudflats (or equivalent) habitat that provides suitable foraging habitat for Migratory birds

The Proponent has considered the cumulative effects of the Proposal along with present and reasonably foreseeable future activities in the area and considers that the EPA’s objective for all environmental factors can be met.

Table 13-1: Summary of Cumulative Impact Assessment

Environmental Factor	Consideration	Impacted values	Outcome of cumulative impact assessment
Flora and Vegetation	Historical impacts and projects implemented prior to 2019 are assumed to be reflected in consideration of the receiving environment. It is assumed that vegetation clearing undertaken prior to this date would have been captured in the native vegetation statistics published in 2019 (Government of Western Australia 2019). The following current or reasonably foreseeable projects approved by the EPA after 2019 were included in the cumulative impact assessment for Flora and Vegetation based on available data: • AGI Operations Pty Ltd – Pluto North West Shelf Interconnector Pipeline • Regional Power Western Power - Burrup Common User Transmission Infrastructure • Yara Pilbara Fertilisers Pty Ltd – Yara Pilbara Fertilisers Plant.	The following values were identified as having cumulative impacts: • Loss of native vegetation due to clearing based on Pre-European Beard vegetation associations (Abydos Plain – Roebourne 117).	Clearing associated with the projects, including the current Proposal will result in a combined impact of 54.3 ha to Abydos Plain – Roebourne 117. The cumulative impact of clearing is a 0.12% reduction to the current extent of the vegetation association (Table 6-4), with a minor contribution of this associated with the Proposal (<0.01% of the total extent).
Terrestrial Fauna	The following current or reasonably foreseeable projects were included in the cumulative impact assessment for Terrestrial Fauna based on available data: • Perdaman Chemicals and Fertilisers Pty Ltd – Project Ceres • Regional Power Western Power - Burrup Common User Transmission Infrastructure • Yara Pilbara Fertilisers Pty Ltd – Ammonia Plant and Renewable Hydrogen Project.	The following values were identified as having cumulative impacts: • Mudflats habitat (or equivalent)	Cumulative impacts to Terrestrial Fauna associated with the projects are as follows: • Impact up to 21.47 ha of mudflats (or equivalent) habitat that provides suitable foraging habitat for Migratory birds Overall, cumulative impacts to Migratory birds and other conservation significant fauna are not expected to be significant, given there are areas of larger and less disturbed habitats available nearby outside of the industrial landscape.
Greenhouse Gas Emissions	Cumulative impact assessment for the GHG factor considers the latest Quarterly Update of Australia's National Greenhouse Gas Inventory (DCCEEW 2023) and emissions reported under the NGER Act.	GHG emissions	Scope 1 construction and operation emissions for the Proposal represent approximately 0.0003% of the national emissions and 0.001% of the Western Australian Scope 1 emissions, which is considered negligible in terms of cumulative impacts.

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Appendix A: Baseline Environmental Site Assessment (Senversa 2024)

Perdaman Lateral Pipeline, Burrup Peninsula

9 August 2024

Baseline Environmental Site Assessment

Document Information

Baseline Environmental Site Assessment

Perdaman Lateral Pipeline, Burrup Peninsula

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Revision	Date	Author	Reviewed	Approved	Detail
0	7 August 2024	Ashton Betti Rebecca Duong Egan Churchill-Gray	Jeremy Hogben	Jeremy Hogben	Draft for client review
1	9 August 2024	Ashton Betti Rebecca Duong Egan Churchill-Gray	Jeremy Hogben	Jeremy Hogben	Final

Project Manager: Ashton Betti

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Senversa acknowledges the traditional custodians of the land on which this work was created and pay our respect to Elders past and present.

Executive Summary

Senversa was engaged by Australian Gas infrastructure Group to conduct a Baseline Environmental Site Assessment (ESA) at the proposed location of the Perdaman Lateral Pipeline in the Burrup Peninsula where a 700 m natural gas pipeline is proposed to be constructed to connect the site to the Dampier to Bunbury Natural Gas Pipeline.

Lots 540, 3013 and 704, which form the site, have been classified by the Department of Water and Environmental Regulation as "*possibly contaminated – investigation required*" with restrictions on groundwater abstraction requiring testing prior to its intended use based on the presence of ammonia, nitrate and nitrite in surface water and sediments which originates from a nearby ammonium nitrate production facility.

The soil and groundwater investigations undertaken as part of this ESA indicated that there are no current risks to human health or ecological receptors associated with anthropogenic sources at the site, including per- and polyfluoroalkyl substances, metals and hydrocarbons. Elevated nutrients (ammonia, total nitrogen and phosphorus) were present in groundwater above adopted human health and ecological assessment levels, as consistent with known off-site sources which have migrated onto the site (and formed the basis for the current site classification).

The acid sulfate soils (ASS) investigation found the presence of potential ASS (PASS) in soils within the proposed excavation footprint that will require management if disturbed. The ASS management measures are detailed in **Section 10.0** of this report and include soil neutralisation treatment. The ASS management requirements are considered appropriate to mitigate any potential risks associated with PASS at the site.

It is understood that no dewatering/effluent abstraction will be undertaken as part of the works and therefore no management of groundwater is proposed for the site. If dewatering is subsequently proposed, additional management measures will be required associated with this.

Contents

Tables in Text

Appendices

List of Acronyms

Acronym	Definition
AGIG	Australian Gas infrastructure Group
ANZECC	Australian and New Zealand Environment and Conservation Council
ASS	Acid sulfate soils
BTEX	Benzene, toluene, ethylbenzene, xylenes
COC	Chain of custody
CoPC	Contaminant of potential concern
DBNGP	Dampier to Bunbury Natural Gas Pipeline
DER	Department of Environment Regulation (former)
DO	Dissolved oxygen
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
ESA	Environmental Site Assessment
EC	Electrical conductivity
EIL	Ecologically based investigation level
GME	Groundwater monitoring event
HIL	Health-based investigation level
HSL	Health screening level
LNAPL	Light non-aqueous phase liquid
LoR	Limit of reporting
MW	Monitoring well
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure

Acronym	Definition
NHMRC	National Health and Medical Research Council
PAH	Polycyclic aromatic hydrocarbons
PASS	Potential acid sulfate soils
PFAS	Per- and polyfluoroalkyl substances
QA	Quality assurance
QC	Quality control
RPD	Relative percentage difference
SWL	Standing water level
TDS	Total dissolved solids
TRH	Total recoverable hydrocarbons

1.0 Introduction

1.1 Background

Senversa Pty Ltd was engaged by Australian Gas infrastructure Group (AGIG) to conduct a Baseline Environmental Site Assessment (ESA) at the proposed location of the Perdaman Lateral Pipeline in the Burrup Peninsula, Western Australia (the site).

AGIG is proposing to construct a 700 m lateral natural gas pipeline from the Dampier to Bunbury Natural Gas Pipeline (DBNGP) to the Perdaman site on the Burrup Peninsula. The proposed pipeline location is shown on **Figure 1**. The project will require referral to the Western Australian Environmental Protection Authority (EPA).

Three lots (Lots 540, 3013 and 704) that the proposed lateral pipeline covers have been classified by the Department of Water and Environmental Regulation (DWER) as "*possibly contaminated – investigation required*" with restrictions on groundwater abstraction requiring testing prior to its intended use. The classification is due to the presence of ammonia, nitrate and nitrite in surface water and sediments which originates from a nearby ammonium nitrate production facility. Several other contamination issues may also be present which will require management during construction works, including the possible presence of per- and polyfluoroalkyl substances (PFAS) in groundwater and the potential for disturbance of acid sulfate soils (ASS).

AGIG commissioned an ESA to assess the potential contamination and environmental issues that will require management as part of the proposed construction works.

1.2 Objective

The objective of the ESA was to establish environmental conditions of the site prior to construction of the lateral pipeline. The information will be used as an input for the required management measures during construction works, including supporting the required EPA approvals.

1.3 Scope of Work

To meet the project objectives, the following scope of work was undertaken:

- Review of relevant existing environmental setting information available for the site.
- Soil investigation comprising 12 soil bores to a maximum depth of 0.5 m bgl via hand auger / hand excavation.
- Installation of five pre-packed temporary piezometers to a maximum depth of 1.5 m bgl using a hollow stem auger fitted to the back of an excavator.
- Completion of a groundwater monitoring event at the temporary piezometers.
- Submission of representative soil and groundwater samples to a National Association of Testing Authorities (NATA) accredited laboratory for analysis for Contaminants of Potential Concern (CoPC).
- Comparison of analytical results to Tier 1 assessment criteria.
- Provision of ASS management requirements.
- Preparation of this report.

1.4 Relevant Legislation / Guidelines

The scope of work was completed in general accordance with the following relevant legislation and guidelines:

- *National Environmental Protection (Assessment of Site Contamination) Measure (as amended 15 May 2013)* (ASC NEPM) (National Environment Protection Council [NEPC] 1999).
- *Assessment and management of contaminated sites – Contaminated sites guidelines* DWER (2021). November 2021.
- *Identification and investigation of acid sulfate soils and acidic landscapes* (Department of Environment Regulation [DER] 2015a).
- *Treatment and management of soil and water in acid sulfate soil landscapes* (DER 2015b).

2.0 Site Identification

Site identification details are provided in **Table 2-1**. The site location and boundary are shown on **Figure 1**. Certificates of title are provided in **Appendix A**.

Table 2-1: Site Identification Details

Item	Details
Site Address	Burrup Road, Burrup Peninsula,
Certificate of Title (CoT)	Lot 540 on Deposited Plan 221364 (LR3122 / 50) Lot 3013 on Deposited Plan 42282 (LR3139 / 36) Lot 704 on Deposited Plan 411759 (LR3174 / 529)
Site Boundary Coordinates	Site boundary coordinates are provided on **Figure 1**.
Site Area	10,816 m^2
Local Government Authority	City of Karratha
Site Owner	Crown Land, Responsible Agency: Department of Planning, Lands and Heritage Lot 540 – Status: Unallocated Crown Land, Primary Interest Holder: State of Western Australia Lot 3013 – Status: Reserve without Management Order, Primary Interest Holder: State of Western Australia Lot 704 – Status: Reserve without Management Order, Primary Interest Holder: Western Australian Land Authority
Current Zoning	Strategic Industry (City of Karratha Local Planning Scheme No. 8)
Current Site Use	Vacant
Proposed Site Use	Lateral natural gas pipeline
Surrounding Site Use	North: Construction associated with the Perdaman gas plant South: Tidal flats East: Vacant tidal flats West: Burrup Road, followed by tidal flats

3.0 Environmental Setting

The key environmental attributes of the site are provided in **Table 3-1**.

Table 3-1: Environmental Setting

Item	Details
Land-use Zoning and Surrounding Uses	The site is zoned ‘Strategic Industry’ under the City of Karratha Local Planning Scheme No. 8. The areas surrounding the site include “District Roads’ zoning to the west (Burrup Road Reserve). \
Topography and Landforms	Topographic data from Landgate indicates that the site is predominately flat with an elevation of less than 10 m Australian Height Datum (AHD). Regional topographic mapping indicates that the site exists within a topographic low, with the elevation increasing up to 80 m AHD surrounding the site. A review of the *Elvis – Elevation and Depth – Foundation Spatial Data* database (Intergovernmental Committee on Surveying and Mapping [ICSM] 2022) identified that lower portion of the site (within the culvert) is situated at an elevation of approximately 5 m AHD, being lower than the adjacent portion of road at approximately 7 m AHD.
Geology	**Regional Geology:** 1:50,000 Western Australia Geological Survey mapping (Hickman, 1997; Sheet 2256, Dampier) indicates that the bedrock geology underlying the general site area comprises Archaean granophyre and gabbro (AyG and AyGo) underlain by metamorphosed Archaean granite to granodiorite (AgDm). The overlying superficial geology is mapped to comprise silt and mud in supratidal to intertidal flats and lagoons (Qhmu). The surrounding superficial soil to the north and south of the site consists of outwash fan/scree colluvium (Qc), followed by Gidley granophyre (AyG). **Site-Specific Geology:** Investigations completed in 2022 to the east and north of the site (Tetra Tech Coffey 2022a) indicated the presence of a layer of superficial deposits overlying granophyre bedrock. The maximum depth of investigation within the vicinity of the site was 2.8 m prior to refusal (MW02). Borehole records for nearby installations (MW02 - 100 m north, and MW07 and MW08 - 50 m east) are provided as **Appendix B** and the generalised lithologies summarised below: • **MW02**: Superficial deposits of brown to pale brown, medium grained sandy clay with cobbles (2.6 m), underlain by grey, staline and fresh granophyre bedrock (to 2.8 m). • **MW07**: Superficial deposits consisting of fine grained, brown and very soft sandy clay (to 0.75 m) underlain by grey-black clay with trace granophyre fragments (to 1.0 m termination depth). • **MW08**: Superficial deposits consisting of red brown poorly graded sandy gravel (to 0.5 m), underlain by brown clay with calcrete fragments (to 0.75 m termination depth).
Acid Sulfate Soils	**Regional ASS Mapping:** A search of the ‘Acid Sulfate Soil Risk Map, Pilbara Coastline (DWER-053)’ layer within the *SLIP Locate V5* database (Landgate 2024) identified that the site is located within an area designated as Level 1 ASS Risk, which is described as *“High to moderate risk of ASS occurring within 3 m of natural soil surface.”* Comparatively smaller areas of land designated as Level 2 ASS Risk are located to the north, east and south-west of the site, and are at least 300 m from the site. Level 2 ASS Risk areas as described as “*Moderate to low risk of ASS occurring within 3 m of natural soil surface, but high to moderate risk of ASS beyond 3 m of natural soil surface.”*

Item	Details
Acid Sulfate Soils (continued)	**Site-Specific ASS:** A series of soil investigations have been undertaken within the vicinity of the site. Previous environmental investigations have indicated the presence of ASS within shallow soils. The following information was noted in the Detailed Site Assessment for Acid Sulfate Soil (Tetra Tech Coffey 2022b) undertaken for the Perdaman Urea Project upgrade located to the north and east of the site: • Field pH screening undertaken during preliminary ASS investigation (Enveng Group 2020) indicates that soils within Level 1 areas are basic (pH >7), with a low to extreme reaction rate. This is expected for potential ASS (PASS) found within the Pilbara region. SPOCAS and S_{CR} analysis was undertaken on representative samples collected from shallow soils (surface to 1 metre below ground level [m BGL]) in the assessments by EnvEng (2020) and Tetra Tech Coffey (2022b). Reported net acidity for these samples indicated that PASS is present within shallow soils within the Level 1 area.
Climate and Rainfall	The climate in Karratha can be descibed as sub-tropical with a mixture of humid, wet weather conditions in the wet season and extended, hot dry spells in the dry season. The highest rainfall typically occurs in February, with an average of 74 mm. The wettest period of the year is from January to March. The lowest rainfall occurs in October, with an average of only 1 mm. The hottest month is January, with an average high of 35°C and low of 27°C. The coldest month of the year is July, with an average low of 17°C and high of 26°C.
Hydrology	The site is located within a local topographic low and is expected to receive surface runoff during watershed events. The primary drainage feature in the site locality is the ephemeral drainage feature approximately 50 m south of the site. The drainage feature discharges into King Bay approximately 400 m west of the site. Flow across this feature would be expected under wet season conditions or a falling king tide event. The lower reaches of the creek in the coastal discharge zone may be inundated for more prolonged periods throughout the year, where groundwater levels approach sea level in the locality of the flats.
Hydrogeology	**Regional Hydrogeology:** The site falls within the hydrogeological setting of the Pilbara – Fractured Rock aquifer, which is a non-target aquifer, according to the Pilbara groundwater allocation plan (DoW, 2013a). Available groundwater is hosted in fractures and voids within the bedrock and tends to be very localised. Groundwater recharge is episodic and affected by direct rainfall infiltration in areas where the rocks are fractured. The fractures fill during rainfall and then drain during periods of abstraction or negligible rainfall. Recharge of the fractured rock aquifer also occurs by leakage from surface water flows. Abstraction impacts from fractured rock aquifers are far more localised than from alluvial and sedimentary rock aquifers (DoW, 2013b). The fractured rock aquifers within the Pilbara region are acknowledged to be structurally complex and irregular, and the amount and quality of available water storage is highly variable and unreliable and, as a result, water supplies can be problematic both in terms of quantity (yield) and quality. Alluvial aquifers overly the fractured rock aquifers along coastal areas where groundwater is generally hosted under unconfined conditions in the Quaternary sediments. Groundwater is generally in hydraulic continuity with the underlying weathered fractured rock aquifers. Consequently, the most important areas for groundwater resources are where the major surface watercourses traverse the coastal plain. Groundwater salinity is also lowest in these zones. **Site-Specific Hydrogeology:** No on-site groundwater monitoring bores existed prior to the proposed investigation scope, however baseline hydrogeological investigations were undertaken to the north and east of the site by Tetra Tech Coffey (2022a). Based on groundwater monitoring (Tetra Tech Coffey 2022a) groundwater flow is expected to be in a westerly direction towards King Bay. The hydraulic gradient was shown to be relatively gradual with water levels very close to the surface, with surface waters in this area likely to be surface expression of groundwater during high rainfall events. Due to tidal influences in the area, it is likely that groundwater flow direction will change during periods of high tide. Drilling and gauging records for nearby wells MW07 and MW08 indicated that groundwater was hosted between approximately 0.915 m below top of collar (m BTOC) and 1.130 m BTOC respectively. Groundwater elevations at these locations (at the time of gauging) corresponded to 1.898 m AHD and 1.774 m AHD.
Public Drinking Water Source Areas (PDWSA)	A search of the DWER Public Drinking Water Source Area (PDWSA) Map identified that the site is not located within a PDWSA and there are no PDWSAs within a 5 km radius of the site.

Item	Details
Groundwater Abstraction	A search of the DWER Water Information Reporting Database (DWER 2024a) indicated that there were no registered groundwater bores located onsite or within 500 m of the site boundary. The closest registered groundwater bore is located approximately 5 km southwest of the site. A search of the DWER Water Register (DWER 2024b) produced no licensed abstraction licences within the site or within 500 m of the site boundary. The closest licenced groundwater abstraction area belongs to Yara Pilbara Nitrated Pty Ltd, located approximately 1 km northeast of the site.
Beneficial Uses of Groundwater	The Baseline Hydrogeological Assessment (Tetra Tech Coffey 2022a) assessed the likely beneficial uses of groundwater within the study area. The assessment indicated that the beneficial use of groundwater within the immediate vicinity of the site and surrounds would be limited to supporting marine water ecosystems, as immediate groundwater discharge is to the supratidal area and eventually discharges to King Bay. Industrial uses of groundwater were considered unlikely due to the low yielding nature of the aquifer and/or the saline nature of groundwater (Tetra Tech Coffey 2022a).
Flora / Vegetation	The following information has been provided by AGIG: *Ten flora species (nine native and one introduced) recorded in the 1.43 ha Survey Area.* *No ecological communities or flora species listed under the EPBC Act, BC Act or as Priority by DBCA have been recorded or are considered to potentially occur.* *One broad vegetation type consisting of low sparse chenopod shrubland has been identified. A total of 0.21 hectares has been mapped. This was considered to be in Poor condition.* *The remaining 1.22 ha of the survey area is described as 'Mudflat' and had no vegetation present. Areas of Mudflat were not assigned a vegetation condition.*
Fauna	A review of the Coastal Management Strategy prepared by Essential Environmental (2016) for the City of Karratha, recognised the high conservation status species such as the turtles, dugongs, migratory seabirds/ waders and whale sharks all inhabit Pilbara waters. Six species of sea turtle inhabit local waters and three nest on various beaches within the province, a change to the turtle nesting environment may pose a risk to the turtle incubation period and other factors. Marine water quality is likely to be impacted by storm water runoff and pollutants entering the marine environment. The following information has been provided by AGIG: *No fauna species of conservation significance have been recorded within the Survey Area.* *Six conservation significant fauna* [bird] *species are considered to potentially occur within the Development Envelope.* *Two fauna habitats have been identified, namely 'Mudflats' and 'Low Chenopod Shrubland'* *0.22 ha of low sparse chenopod shrubland that is unlikely to be utilised by conservation significant species.* *1.22 ha of Mudflats may provide potential foraging habitat for the species listed above when seasonally inundated (e.g. during king tides).*
Wetlands and Sensitive Ecosystems	There are no RAMSAR sites located on site or within a 500 m radius of the site. A search of the Bureau of Meteorology (BoM) Groundwater Dependent Ecosystem (GDE) atlas (BoM 2024) indicates that there are no aquatic or subterranean groundwater dependent ecosystems (GDEs) located on site or within a 500 m radius of the site. There are moderate potential terrestrial GDEs mapped approximately 200 m north and 500 m south of the site. This ecosystem consists of rugged granitic hills supporting shrubby hard and soft spinifex grasslands (hummock grasslands). No environmentally sensitive areas (ESAs) are recorded on-site, or down inferred hydraulic gradient of the site (Landgate 2024). Murujuga National Park located approximately 1 km north of the site, which may hold ecological significance despite not being listed as an ESA.
Aboriginal Heritage	The following information has been provided by AGIG: *The Traditional Owners were represented by Murujuga Aboriginal Corporation with whom AGIG is developing a Cultural Heritage Agreement for this and subsequent projects.* *Archeological and Ethnographic Heritage Survey was conducted 17 November 2024. The Traditional Owners preliminary advice indicated there were no sites of importance or significance along the chosen pipeline route although two midden sites were identified in the adjacent pipeline easement. A full report with a clearance was received on 28 March 2024.*

Item	Details
European Heritage	A search of the Heritage Council's InHerit database did not return any results for a registered heritage site on or within a 500 m radius of the site.
Contaminated Sites Database	Three lots (Lots 540, 3013 and 704) that the proposed lateral pipeline covers have been classified by DWER as '*possibly contaminated – investigation required*' with restrictions on groundwater abstraction for testing prior to its intended use. The classification is due to the presence of ammonia, nitrate and nitrite in surface water and sediments which originates from a nearby ammonium nitrate production facility. A copy of the notice of classification is provided as **Appendix C**. The nearest publicly registered contaminated site is located approximately 1 km to the north-east of the site. The nearby site (3017 Village Road, Burrup) has been classified as '*contaminated - remediation required*' due to the presence of ammonia, nitrate and nitrite in soils, groundwater, surface water and sediments at the site and off-site.

4.0 Site Inspection

A site inspection was undertaken on 27 June 2024 by Senversa Environmental Scientist, Egan Churchill-Gray, to assess the site for visual and/or olfactory evidence of potential contamination (including potential primary and secondary sources), and to ground truth general site conditions.

A summary of the site inspection is provided in **Table 4-1** and site photographs are provided in **Appendix D**. Site features are shown on **Figure 1** (attached).

Table 4-1: Site Inspection Summary

Item	Observations
Site Identification and Access	The site access was unrestricted from Burrup Road via an unsealed track along the Water Corporation easement. The site is rectangular/linear, undeveloped and unfenced.
Buildings, Structures and Key Areas	No infrastructure currently exists on the site. The proposed lateral pipeline easement is aligned parallel to the existing Water Corporation, Telstra and Burrup fertiliser easements, which are located north of the site. An underground optical fibre line runs parallel to and 10 m north of the northern site boundary. No dangerous goods or chemical storage was observed at the site. No underground storage tanks, above ground storage tanks, pits or traps were observed on site. No groundwater monitoring bores were located on the site or were observed in the vicinity of the site. The site area was visually free of any surficial possibly asbestos containing material (ACM).
Surface and Ground Conditions	The entire site was flat with surface conditions consisting of clayey sand. The site surface was saturated with up to 50 mm of standing water at the time of inspection. A minor access track is aligned directly north of the site, consisting of gravelly material mounded 150 mm above the natural surface.
Topography and Drainage	The site is flat and drains from east to west, ultimately flowing into King Bay and the Indian Ocean. No onsite surface water drainage infrastructure was observed during the site inspection. A series of culverts were present east of the site aligned north-south.
Vegetation	The site is free of vegetation.
Presence/ absence of stockpiles / Waste	No stockpiles or waste was observed at the time of inspection.
Surrounding Land Uses	The site was surrounded by vacant tidal flats to the east, south and west. Land use directly north of the site included utility easements and construction activity associated with the Perdaman gas plant, followed by native vegetation. An ammonium nitrate production facility is located approximately 500 m northeast of the site.
Interviews	No interviewees were identified at the site.

5.0 Adopted Assessment Criteria

5.1 Assessment Guidelines

The following documents form the primary basis of contaminated site investigations in Western Australia:

- *Contaminated Sites Act 2003* and *Contaminated Sites Regulations 2006*.
- *Assessment and management of contaminated sites* (DWER 2021).
- ASC NEPM (NEPC 1999).

In addition, the following documents have been included for adoption of assessment criteria:

- *Health screening levels for petroleum hydrocarbons in soil and groundwater. Part 1: Technical development document*, Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) Technical Report No. 10 (Friebel and Nadebaum 2011).
- *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (Australian and New Zealand Governments [ANZG] 2018).
- *PFAS National Environmental Management Plan (NEMP) Version 2.0* (National Chemicals Working Group of the Heads of EPAs Australia and New Zealand [HEPA] 2020).
- *Identification and investigation of acid sulfate soils and acidic landscapes* (DER 2015a).

Senversa has adopted assessment criteria in consideration of the current and potential future land use and potential receptors.

5.2 Adopted Assessment Criteria

A summary of the adopted assessment criteria is provided in **Table 5-1** and **Table 5-2**.

Table 5-1: Adopted Assessment Criteria for Soil

Exposure Scenario	Assessment Criteria	Guideline Source
Ecological	• Ecological Investigation Level (EIL) for commercial / industrial. Site-specific EILs have also been adopted in accordance with the ASC NEPM Toolbox and Section 2.5 of Schedule B1, as included in **Section 5.3**. • Ecological Screening Level (ESL) for coarse grained soils, applicable to commercial / industrial.	NEPC (1999)
	• Ecological direct exposure for PFAS. • Ecological indirect exposure for PFAS.	HEPA (2020)
Human Health	• Health-based Investigation Level (HIL) for commercial / industrial (HIL-D). • Health Screening Level (HSL) for vapour intrusion for sand, 0 m - <1 m for commercial / industrial (HSL-D). Use of these values for screening purposes is considered conservative for samples collected at greater depth.	NEPC (1999)
	• HSL for direct contact (for intrusive maintenance workers).	Friebel and Nadebaum (2011)
	• HIL for commercial / industrial (HIL-D).	HEPA (2020)

Exposure Scenario	Assessment Criteria	Guideline Source
ASS Action Criteria	- Field indicators for PASS and actual ASS (AASS). - Net action criteria for coarse to medium texture sands to loamy sands and peats, for >1,000 tonnes of material disturbed.	DER (2015a)

Table 5-2: Adopted Assessment Criteria for Groundwater

Exposure Scenario	Assessment Criteria	Guideline Source
Ecological	- Marine water - 95% species protection level (MWG)[1]	ANZG (2018)
	- Ecological water quality guideline values for interim marine - 99% species protection level (MWG-99).	HEPA (2020)
Human Health	- Domestic Non-Potable Use Guidelines (NPUG)	DWER (2021)
	- HSL for groundwater vapour intrusion for sand, 2 m - <4 m for commercial/ industrial (HSL-D). Use of these values for screening purposes is considered conservative for samples collected at greater depth.	NEPC (1999)
	- Drinking water quality guideline value (DWG) (PFAS only).[2]	HEPA (2020)
	- NPUG, equivalent to 10 times the drinking water quality guideline value for PFAS as per HEPA (2020)	DWER (2021)

5.3 Site-Specific Soil Ecological Investigation Levels

Site specific EILs were derived for metals (copper, chromium, nickel and zinc) using the Interactive (Excel) Calculation Spreadsheet provided in the ASC NEPM Toolbox assuming the contamination is “aged”, no background concentrations, and using site specific clay content, pH, CEC and TOC values, as follows[3]:

- Clay content: 6%
- pH: 8.6
- CEC: 44.1 meq/100g
- TOC: 0.14%

Based on these results, the following site-specific EILs were calculated. A copy of the EIL calculation spreadsheets for the site are included in **Appendix E**.

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[1] For TPH/TRH, no moderate or high reliability trigger values were derived by ANZECC/ARMCANZ (2000) and no default guideline values are available from ANZG (2018). Aquatic habitat screening levels recommended by the California Regional Water Quality Board have therefore been adopted. The CRWB (2016) screening levels are those derived for use at San Francisco Airport and the Presidio and are based on chronic aquatic toxicity tests of petrol and jet fuel mixtures. For each TPH/TRH fraction, the lowest value derived for petroleum mixtures within the fraction has been adopted. It is noted that these values are adopted by other US jurisdictions (e.g. Hawaii Department of Health) and are comparable to the current Dutch intervention value for mineral oil (600 µg/L).

[2] Consistent with DWER (2021) guidance, drinking water guideline values were adopted as Tier 1 PFAS screening levels for non-potable uses (such as watering gardens) in situations where consumption of home-grown produce is a viable/plausible exposure pathway. This is considered to be the case for semi- rural residential lots down-gradient of the site (but not on-site).

[3] Derived using the most conservative values from the two samples that were analysed for the relevant parameters (SB09_0-0.1 and SB09_0.4-0.5).

Table 5-3: Site Specific EILs

Analyte	Commercial / Industrial
Chromium III	580 mg/kg
Copper	250 mg/kg
Nickel	780 mg/kg
Zinc	2,100 mg/kg

6.0 Site Investigation Methodology

6.1 Methodology

Soil and groundwater sampling was undertaken to assess the contamination status of the proposed pipeline alignment. Soil and groundwater sampling locations are shown on **Figure 2** and **Figure 3**, respectively. The investigation methodology is provided in **Table 6-1**.

Table 6-1: Investigation Methodology

Task	Proposed Scope
Soil Investigation	The soil investigation comprised sampling at 12 shallow soil bores along the proposed pipeline alignment. The soil sampling locations were spaced at approximate 50 m intervals along the alignment to meet the minimum number of samples required based on ASS guidelines[4]. The coordinates of soil sample locations were defined using a hand-held GPS. The accuracy of such a method was ±3 to 5 m. Soil samples were collected via hand auger or manual excavation using a shovel to a maximum depth of 0.5 m bgl. This depth was considered practical given site conditions and timing and allowed for representative samples to be collected. Geological and environmental conditions encountered at each location were logged based on the Unified Soil Classification System (USCS). Soil logs are included in **Appendix F** and photographs of the soil profile for each sampling location are included in **Appendix D**. Soil samples were collected into laboratory supplied sample containers. Samples were stored in a cooler box containing ice prior to and during transit to the laboratory. Samples were transported to ALS Environmental with accompanying chain of custody (CoC) documents and laboratory supplied security seals. ALS Environmental operates under accreditation number 825, with the Perth laboratory being site number 15847. Samples were submitted for the following analysis: • Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn) • Total recoverable hydrocarbons (TRH) • Benzene, toluene, ethylbenzene, xylene, naphthalene (BTEXN) • PFAS • ASS field indicators (pH_F and pH_{FOX}) • Suspension peroxide oxidation combined acidity and sulfate (SPOCAS) suite • Chromium reducible sulfur (S_{CR}) suite • pH, total organic carbon, cation exchange capacity and clay content (two samples only). All soil cuttings were returned to the hole in the approximate order they were removed.

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[4] DER (2015a) Identification and investigation of acid sulfate soils and acidic landscapes. June 2015.

Task	Proposed Scope
Groundwater Investigation	A groundwater monitoring event (GME) was undertaken comprising installation of five temporary piezometers to a depth of 1.5 m bgl using a mechanical auger fitted to an excavator. The coordinates of piezometer locations were defined using a hand-held GPS. The accuracy of such a method was ±3 to 5 m. Geological and environmental conditions encountered at each location were logged based on the USCS. Soil logs are included in **Appendix F** and photographs of the soil profile for each sampling location are included in **Appendix D**. Piezometers comprised a pre-packed well screen and were fitted with a capped PVC standpipe above ground level. After the installation, each piezometer was developed using a groundwater pump until water appeared to be free of sediment. Piezometers were left for 24 hours to stabilise after installation before sampling. The temporary piezometers were gauged using an interface probe and sampled using low-flow methodologies (peristaltic pump). Field water quality parameters were recorded during purging until stabilisation occurred. Groundwater sampling records are provided in **Appendix F**. Samples were placed into laboratory prepared containers, preserved for the relevant analyses. Groundwater samples analysed for dissolved metals (where required) were field filtered with a dedicated 0.45-micron disposable filter. Samples were stored in a cooler box containing ice prior to and during transit to the laboratory. Samples were transported to the laboratory with accompanying CoC documents and laboratory supplied security seals. Samples were submitted to ALS Environmental for the following analysis: • Heavy metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn) • TRH • BTEX • PFAS • Nutrients (including nitrate, nitrite and ammonia) • pH • Alkalinity and acidity • Major ions All purge water was disposed of back down the piezometer.

6.2 Quality Assurance / Quality Control

The QA/QC adopted by Senversa provide a consistent approach to evaluation of whether the data quality objectives required by the project have been achieved. The process focuses on assessment of the useability of the data in terms of accuracy and reliability in forming conclusions on the condition of the element of the environment being investigated. Based on the results of the review, the data was considered suitable for use in forming conclusions relating to the contamination status of the soil and groundwater at the site. The QA/QC and data validation review is detailed in **Appendix G**.

7.0 Soil Investigation Results

7.1 Field Observations

Soil bores for the soil investigation and for the installation of monitoring wells (as piezometers) were installed on 4 July 2024. The maximum investigation depth was 1.5 m bgl (for installation of monitoring wells). The shallow soil profile (to 1.5 m bgl) was found to be generally consistent across the site, and described as: silty sand, being pale brown in colour, poorly graded, fine to coarse grained, with the presence of trace shell fragments at some locations. All locations encountered a high clay component from 0.4 m bgl and below, with some mottling present. No evidence of anthropogenic materials or contamination was identified at any location, as summarised in **Table 7-1** below.

Table 7-1: Soil Field Observations – Contamination Indicators

Potential Contamination Indicator	Description
Fill Presence	There was no evidence of fill (including reworked natural soils) at any investigation location. All soils appeared natural.
Evidence of Contamination	No visual or olfactory evidence of hydrocarbon impacts, or other contaminants, was observed in soils during the investigation.

7.2 Soil Analytical Results

A total of 24 samples from 12 soil bores were submitted for analysis of CoPCs, including metals, hydrocarbons and PFAS. Soil analytical results were compared against the relevant adopted assessment criteria as per **Section 5.0**. The tabulated results are present in **Table 1** (attached) and laboratory reports are provided in **Appendix H**.

A review of the results indicated that:

- Hydrocarbons (TRH, BTEXN, PAHs) were below the laboratory limit of reporting (LoR) for all samples, and subsequently below all adopted assessment criteria.
- PFAS results were below the laboratory LoR for all samples, and subsequently below all adopted assessment criteria.
- Metals were variously detected in all samples, including arsenic, chromium, copper, lead, nickel and zinc. All results were below the adopted assessment criteria.

7.3 ASS Results

7.3.1 Field Observations and Soil Types

Soil lithologies encountered at the site were grouped on their physical characteristics and visual differentiation. Two distinct soil profiles were noted, being pale brown silty sand (SS), present as the uppermost horizon, underlain by mottled grey and brown silty, clayey sand (SS(C)). The soil profile descriptions and particle size analysis (PSA) results from soil bore location SB09 are provided in **Table 7-2** with bore logs included in **Appendix F**.

Table 7-2: Generalised Lithology and PSA Results

Depth (m bgl)	Soil Profile Code	Lithological Description/Observations	Particle Size Analysis Results (SB09)				
			Clay	Sand	Silt	Gravel	Cobbles
0.0 – 0.4 m	SS	**Pale brown silty sand** May include shell fragments. Typically dry to moist.	6%	67%	11%	16%	<1%
0.4 – 1.5 m	SS(C)	**Mottled grey and brown silty, clayey sand** May include trace gravel or cobbles. Typically moist to wet.	12%	60%	24%	4%	<1%

7.3.2 ASS Field Indicators

Consistent with DER (2015a), ASS field screening for field pH (pH_F) and oxidised field pH (pH_{FOX}) are used to determine indicators of potential ASS (PASS) and actual ASS (AASS):

- Indicators of AASS: pH_F <4 and pH_{FOX} <3.
- Indicators of PASS: pH_F >4 and pH_{FOX} <3.

Where the change in pH (Δ pH) between pH_F and pH_{FOX} is significant (nominally >3 pH units difference), the sample is also considered to indicate the presence of PASS (DER 2015a).

A total of 24 samples from 12 soil bores were screened for ASS indicators, field screening for field pH (pH_F) and oxidised field pH (pH_{FOX}) and are presented in **Table 2** (attached). Indicators of PASS or AASS were not present in any sample, noting the following:

- pH_F results were between pH 8.2 and pH 8.8.
- pH_{FOX} results were between pH 6.8 and pH 8.1.
- ΔpH ranged between 0.1 pH units (SB01_0-0.1) and 1.8 pH units (SB11_0-0.1).

pH_F and pH_{FOX} values were comparable between the SS and SS(C) profiles.

7.3.3 SPOCAS/ S_{CR} Results

All samples were submitted for SPOCAS and S_{CR} analysis. The SPOCAS analytical method is considered more accurate for the determination of a soil's potential to generate acidity particularly for soils with pH_{OX} >6.5, and therefore the SPOCAS results have been used as the primary indicator of PASS at the site.

The SPOCAS results are used to determine the net acidity of each sample, which is determined from the existing and potential acidity of the soil. DER (2015a) provides a calculation to determine net acidity of a soil:

Net acidity = potential acidity + existing acidity – acid neutralising capacity (ANC), where:

- Potential acidity is calculated from the sulfur trail of the SPOCAS analysis, which gives a measure of the maximum oxidisable sulfur. Potential acidity is reported as peroxide oxidisable sulfur (S_{POS}).
- Existing acidity is calculated from the Titratable Actual Acidity (TAA) of a soil, which measures the soluble and readily exchangeable acidity of a particular soil.
- ANC is a measure of a soil's ability to buffer against decreases in soil pH (i.e. increased acidity). DER (2015a) states that without confirmatory kinetic testing or modified laboratory methods, ANC cannot be used to reduce ASS management where potential and/ or existing acidity exist.

Therefore:

Net acidity = S_{POS} + *TAA*

The calculated net acidity results for each soil profile are provided in **Table 7-3** below. The DER Action Criteria of 0.03%S was adopted for assessment based on the soil type (medium textured sandy loams to light clays with a clay content of 5% – 40%), and an estimate disturbance of >1000 tonnes of material.

The tabulated analytical results are provided in **Table 2** (attached) and the laboratory reports are provided in **Appendix H**.

Table 7-3: SPOCAS Results

Soil Profile		**SPOCAS**		
		TAA	**SPOS**	**Net Acidity (excl. ANCE)**
SS	Min	<0.005	0.007	<0.02
	Max	<0.005	0.150	0.15
SS(C)	Min	<0.005	0.039	0.04
	Max	<0.005	0.255	0.26
Action Criteria (DER 2015)		-	-	0.03
Units	-	*%S*	*%S*	*%S*

The net acidity results indicate that both soil types exceeded the DER Action Criteria, which trigger the requirement for ASS management.

8.0 Groundwater Investigation Results

8.1 Groundwater Elevation and Flow Direction

Groundwater depth was measured to be very shallow, between 0.276 m bgl (well MW03) and 0.376 m bgl (MW01). Site-specific groundwater flow direction was not able to be calculated as wells were not surveyed. It is expected that groundwater flow would be in a westerly direction towards King Bay.

8.2 Groundwater Field Indicator Parameters

Following purging, a representative groundwater sample was collected from wells MW01 to MW05. Stabilised groundwater was typically colourless (except for well MW03 which was pale brown), slightly to moderately turbid and without sheen. A sulphurous odour was detected from groundwater collected at wells MW04 and MW05. Field parameters are provided in full in **Table 3** (attached) and summarised below in **Table 8-1**.

Table 8-1: Groundwater Field Parameters

Field Parameter	**pH**	**EC**	**TDS**	**DO**	**Redox (Eh)**	**Temperature**
Minimum	6.95 (MW05)	130,858 (MW01)	85,058 (MW01)	0.38 (MW02)	54.8 (MW05)	22.5 (MW05)
Maximum	7.56 (MW01)	192,348 (MW05)	125,026 (MW05)	2.59 (MW04)	144.4 (MW03)	25.3 (MW02)
Units	*pH units*	*µS/cm*	*mg/L*	*mg/L*	*mV*	*°C*

Notes:
TDS calculated based on a conversion factor of 0.65.

The field data indicates that groundwater at the site is near-neutral, hyper-saline, typically present aerobic and oxidising conditions.

8.3 Groundwater Analytical Results

The groundwater analytical results were compared to the adopted assessment criteria. Limited exceedances of the MWG (ANZG 2018) and NPUG (DWER 2021) assessment criteria were identified. No exceedances of the HSL-D for groundwater vapour intrusion (NEPC 1999) or the DWG - Health (HEPA 2020) were reported.

A review of the groundwater analytical results indicated that:

- All metal concentrations except for zinc were below the laboratory LoR. Concentrations of zinc were reported for wells MW01 and MW02, marginally above the LoR and above the MWG.
- Inorganic compounds and ions (ammonia, total nitrogen, phosphorus, chloride and sulfate) variously exceeded NPUG and/or MWG at all locations.
- Hydrocarbons (TRH and BTEXN) were below the laboratory LoR for all samples, and subsequently below all adopted assessment criteria.

- PFAS results were variably reported above the LoR in all samples, generally present as perfluoroalkane carboxylic acids. For those PFAS compounds for which an assessment criterion is available (PFOA, PFOS and PFHxS), only well MW01 reported concentrations above the LoR (albeit at a low concentration of 0.0006 µg/L). No exceedances of the adopted assessment criteria were reported for PFAS.

Groundwater exceedances of the adopted assessment criteria are summarised in **Table 8-2** below. The tabulated groundwater analytical results are presented in **Table 4** (attached) and laboratory reports are provided in **Appendix H**.

Table 8-2: Groundwater Criteria Exceedances (5 July 2024)

Analytes	**Units**	**LoR**	**NPUG (DWER 2021)**	**MWG (ANZG 2018)**	**Well ID**				
					MW01	**MW02**	**MW03**	**MW04**	**MW05**
Metals									
Zinc	mg/L	0.005	3	0.008	0.125	0.113	-	-	-
Inorganics and Major Ions									
Ammonia (as N)	mg/L	0.01	0.388	0.91	0.49	1.7*	-	0.68	0.44
Total Nitrogen (as N)	mg/L	0.1	-	0.1	1.4	1.3*	1.3	1.7	0.8
Phosphorus (as P)	mg/L	0.01	-	0.015	-	-	0.24	0.12	0.16
Chloride	mg/L	1	250	-	54,000	72,800	96,000	74,400	88,800
Sulfate (as SO4)	mg/L	1	1,000	-	6,920	13,000	9,750	8,760	9,840

Notes:
'*' indicates that the concentration is the adopted replicate result.

9.0 Discussion

9.1 Soil

Soils encountered at the site did not indicate the presence of anthropogenic contaminants, including hydrocarbons, PFAS and metals. No exceedances of the adopted human health and ecological assessment criteria were present, indicating that there is currently no plausible risk to receptors from these contaminants within soils likely to be disturbed during site works.

The outcomes of the ASS investigation indicated that soil at the site is slightly alkaline with no field indicators of PASS or ASS based on the pH_F and pH_{FOX} results. However, the majority of soils have a net acidity above the DER Action Criteria of 0.03%S, which indicates that there is the potential for acidification of soils if oxidised. These results are consistent with the regional ASS mapping, which indicates that there is a "*high to moderate risk of ASS occurring within 3 m of natural soil surface*".

Soils encountered during the investigation were classified into two primary soil types, based on their physiological properties, being pale grey silty sand (SS) and mottled grey and brown silty, clayey sand (SS(C)). The SS soil type reported a maximum net acidity of 0.15%S and the SS(C) soil type reported a maximum net acidity of 0.26%S, indicating that all disturbed soil of consistent with these geological profiles will require ASS management if disturbed. Further ASS management actions are discussed in **Section 10.0**.

9.2 Groundwater

The groundwater analytical results were assessed against the adopted assessment criteria for human health and ecological receptors. The results indicated that there are currently no risks to receptors in regards to PFAS, with low-level PFAS detected at all locations however the concentrations were below the adopted guidelines for human health and the environment. It is noted the assessment criteria currently only exist for a limited number of PFAS compounds and therefore the conclusion should be considered in this regard.

All hydrocarbon concentrations were below LoR and subsequently below the adopted assessment criteria, indicating that hydrocarbons in groundwater in the vicinity of the proposed works does not pose a risk to receptors, including from a vapour intrusion pathway.

Exceedances of zinc were reported above the MWG at wells MW01 and MW02. It is noted that the reported LoR for all samples was elevated, due to matrix interference during laboratory analysis, as is common with samples of elevated TDS. The increased LoR was above the MWG criterion of 0.008 mg/L and therefore it is likely that the remaining samples would also have reported zinc concentrations above the MWG. In the absence of a defined contaminant source, and in light of comparatively low concentration of other reported metals, the zinc concentrations are likely to be reflective of ambient groundwater conditions.

The location of the site (north-western Australia, in close proximity to the ocean) is consistent with the hypersaline conditions encountered. The elevated chloride and sulfate results are indicative of these ambient conditions and the NPUG exceedances are not considered to indicate contamination or a risk to receptors.

Nutrients including ammonia, total nitrogen and phosphorus variously exceeded NPUG and/or MWG which is consistent with known impacts from the nearby ammonium nitrate production facility. However, given the hypersaline conditions and limited beneficial use of groundwater, including potential for the presence of aquatic ecosystems, any risks from elevated nutrients are considered to be low.

Overall, the results of the groundwater investigation indicate that groundwater encountered at the site is shallow, hypersaline and has limited beneficial uses. The groundwater conditions are considered to be representative of ambient conditions that are consistent with the site's geographical location, with no indication of anthropogenic impacts.

10.0 ASS Management

The outcomes of the ASS investigation indicated that soils encountered at the site requirement treatment for the mitigation of PASS (where disturbed), in accordance with the *Treatment and management of soil and water in acid sulfate soil landscapes* (DER 2015b):

- Soil type SS:
  - Pale brown silty sand.
  - Encountered between the surface and nominally to 0.4 m bgl.
  - May include shell fragments.
  - Typically dry to moist.
- Soil type SS(C):
  - Mottled grey and brown silty, clayey sand
  - Encountered between nominally 0.4 m bgl to the lowest investigation depth (1.5 m bgl).
  - May include trace gravel or cobbles.
  - Typically moist to wet.

The following management measures should be implemented during intrusive works which result in the disturbance/ excavation of soils within the investigation area.

- Soil treatment should be undertaken on a treatment pad.
  - The treatment pad should consistent of a minimum 300 mm thickness compacted limestone base (or other neutralising material).
  - The treatment pad should have bunded edges to prevent leachate runoff.
- Soils should be segregated into SS and SS(C) soil types. Where soils are not separated, the soil should be treated at the higher treatment rate (i.e. applicable to the SS(C) soil type).
- Soils should be appropriately treated with a neutralising agent (see **Section 10.1.1** for dosing rate calculations).
  - An alkaline material, such as calcium carbonate ($CaCO_3$), in the form of finely crushed limestone or aglime, is commonly used as a neutralising agent. Sodium based compounds are not recommended for ASS treatment.
  - Treatment should be undertaken via mechanical mixing of the neutralising agent with the excavated soil so that the material is uniform.
  - Untreated soils should not be left exposed for long periods of time. Loamy sands should be treated within 2.5 days of stockpiling.
- Treated soils should be validated prior to backfilling. Where possible, validated soils should be placed above the water table.
- Following decommissioning of the treatment pad, validation of the soil beneath the treatment pad should be undertaken to ensure that leaching has not occurred.

Note: Where soils are encountered that do not correspond with either of the soil profiles described above, further investigations should be undertaken to determine whether soils present ASS risks, and is so, the treatment rate that should be applied.

10.1.1 Liming Rates

The neutralising agent is to be mixed through the excavated soil, at a rate that is calculated from the highest net acidity of each soil type. The calculation to determine the volume of lime to be applied is as follows:

Lime (kg $CaCO_3$*/ tonne soil) = bulk density x (net acidity x 30.59) x 1.02 x safety factor x 100/ENV, where:*

- Bulk density value is applied in tonne/m^3. The DWER default value for loamy sands (most applicable to the site) is a factor of 1.5.
- Net acidity value is applied %S units. The highest net acidity for each soil type should be used.
- A safety factor of 1.5 should be applied at a minimum to account for non-homogeneous mixing.
- The effective neutralising value (ENV) should be used for the specific ENV from the neutralising agent used. This information can be obtained from the supplier.

The site-specific inputs for the liming rate calculation are presented in **Table 10-1**.

Table 10-1: Inputs for Liming Rate Calculation

Soil Type	Bulk Density (loamy sands)	Maximum Net Acidity	Safety Factor
SS	1.5	0.15	1.5
SS(C)	1.5	0.26	1.5
Units	*tonne/*m^3	*%S*	-

Based on the above inputs, the calculation for the SS soil type is:

Lime (kg $CaCO_3$*/ tonne soil)* *= 1.5 x (0.15 x 30.59) x 1.02 x 1.5 x 100/ENV*

= 10.53 x 100/ENV

Based on the above inputs, the calculation for the SS(C) soil type is:

Lime (kg $CaCO_3$*/ tonne soil)* *= 1.5 x (0.26 x 30.59) x 1.02 x 1.5 x 100/ENV*

= 18.25 x 100/ENV

The ENV of a specific neutralising agent should be calculated for each particle size, based on the following calculation:

ENV = % Proportion/100 x Utilisation Factor x NV

The percentage proportion and neutralising value (NV) should be provided by the supplier of the neutralising agent. The utilisation factors for each particle size are included in **Table 10-2** below.

For **Table 10-2:**

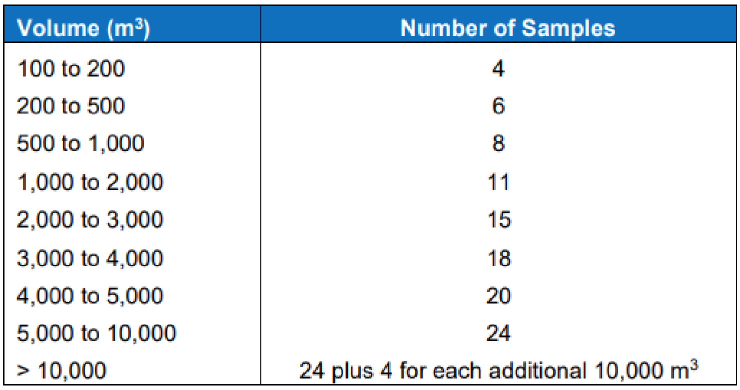
- ‘X’ indicates factors provided by the supplier of the neutralising agent.
- ‘A’ to ‘D’ indicate the calculated ENV for each particle size.
- The total ENV to be used in the liming rate calculation is the sum of A, B, C and D.

Table 10-2: Calculating ENV Values

Particle size	Proportion (%)	Utilisation factor	NV (%)	ENV
1.00–2.00mm	X	0.01	X	A
0.85–1.00mm	X	0.10	X	B
0.300–0.850mm	X	0.60	X	C
<0.300mm	X	1.00	X	D
Total	100	-	-	Sum of A, B, C, D

10.1.2 Validation Sampling

Prior to the on-site reuse or backfilling of excavated material, validation sampling should be undertaken and the results verified to ensure effective neutralisation has been achieved. As per DER (2015b), sampling frequency should be undertaken in accordance with DWER's current *Landfill waste classification and waste definitions* (DWER 2019). The required sampling frequency is presented in **Plate 1**.



Volume (m^3)	Number of Samples
100 to 200	4
200 to 500	6
500 to 1,000	8
1,000 to 2,000	11
2,000 to 3,000	15
3,000 to 4,000	18
4,000 to 5,000	20
5,000 to 10,000	24
> 10,000	24 plus 4 for each additional 10,000 m^3

Plate 1: Validation sampling frequency (DWER 2019)

Noting that the field ASS results did not indicate PASS or AASS, all validation samples should be analysed for SPOCAS. Analysis should be undertaken on an unground sample. The following validation criteria should be met:

- Evidence that the neutralising material has been thoroughly mixed with the soil.
- pH$_F$ >6.0 pH units.
- Net acidity <0.03%S.

Note: Where validation samples do not meet the validation criteria of <0.03%S, further neutralisation should be undertaken, and subsequent validation sampling, until the validation criteria is met.

10.1.3 Groundwater and Effluent Management

It is understood that no groundwater dewatering is proposed as part of this project and therefore no management of groundwater is proposed for the site.

Should dewatering be proposed, specific management measures will need to be implemented to ensure that groundwater acidification does not occur. The management measures will need to be documented in a separate management plan.

11.0 Conclusions and Recommendations

Senversa was engaged by AGIG to conduct a Baseline ESA at the proposed location of the Perdaman Lateral Pipeline in the Burrup Peninsula where a 700 m natural gas pipeline is proposed to be constructed to connect the site to the DBNGP.

Lots 540, 3013 and 704, which form the site, have been classified by the DWER as "*possibly contaminated – investigation required*" with restrictions on groundwater abstraction requiring testing prior to its intended use based on the presence of ammonia, nitrate and nitrite in surface water and sediments which originates from a nearby ammonium nitrate production facility.

The soil and groundwater investigations undertaken as part of this ESA indicated that there are no current risks to human health or ecological receptors associated with anthropogenic sources at the site, including PFAS, metals and hydrocarbons. Elevated nutrients (ammonia, total nitrogen and phosphorus) were present in groundwater above adopted human health and ecological assessment levels, as consistent with known off-site sources which have migrated onto the site (and formed the basis for the current site classification).

The ASS investigation found the presence of PASS in soils within the proposed excavation footprint that will require management if disturbed. The ASS management measures are detailed in **Section 10.0** of this report and include soil neutralisation treatment. The ASS management requirements are considered appropriate to mitigate any potential risks associated with PASS at the site.

It is understood that no dewatering/effluent abstraction will be undertaken as part of the works and therefore no management of groundwater is proposed for the site.

12.0 Principles and Limitations

The following principles are an integral part of site contamination assessment practices and are intended to be referred to when resolving any ambiguity or exercising such discretion as is accorded the user or site assessor.

Area	Principle and Limitation
Elimination of Uncertainty	Some uncertainty is inherent in all site investigations. Furthermore, any sample, either surface or subsurface, taken for chemical testing may or may not be representative of a larger population or area. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.
Limitations of Information	The effectiveness of any site investigation may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historic site uses or prior site assessment activities despite the efforts of the user and assessor to obtain such information.
Level of Assessment	The investigation herein should not be considered to be an exhaustive assessment of environmental conditions on a property. There is a point at which the effort required to obtain information is outweighed by the time required to obtain that information, and, in the context of private transactions and contractual responsibilities, may become a material detriment to the orderly conduct of business. If the presence of target analytes is confirmed on a property, the extent of further assessment is a function of the degree of confidence required and the degree of uncertainty acceptable in relation to the objectives of the assessment.
Comparison with Subsequent Inquiry	The justification and adequacy of the findings of this investigation in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.
Data Useability	Investigation data generally only represent the site conditions at the time the data were generated. Therefore, the usability of data collected as part of this investigation may have a finite lifetime depending on the application and use being made of the data. In all respects, a future reader of this report should evaluate whether previously generated data are appropriate for any subsequent use beyond the original purpose for which they were collected, or are otherwise subject to lifetime limits imposed by other laws, regulations or regulatory policies.
Nature of Advice	The investigation works herein are intended to develop and present sound, scientifically valid data concerning actual site conditions. Senversa does not seek or purport to provide legal or business advice.

13.0 References

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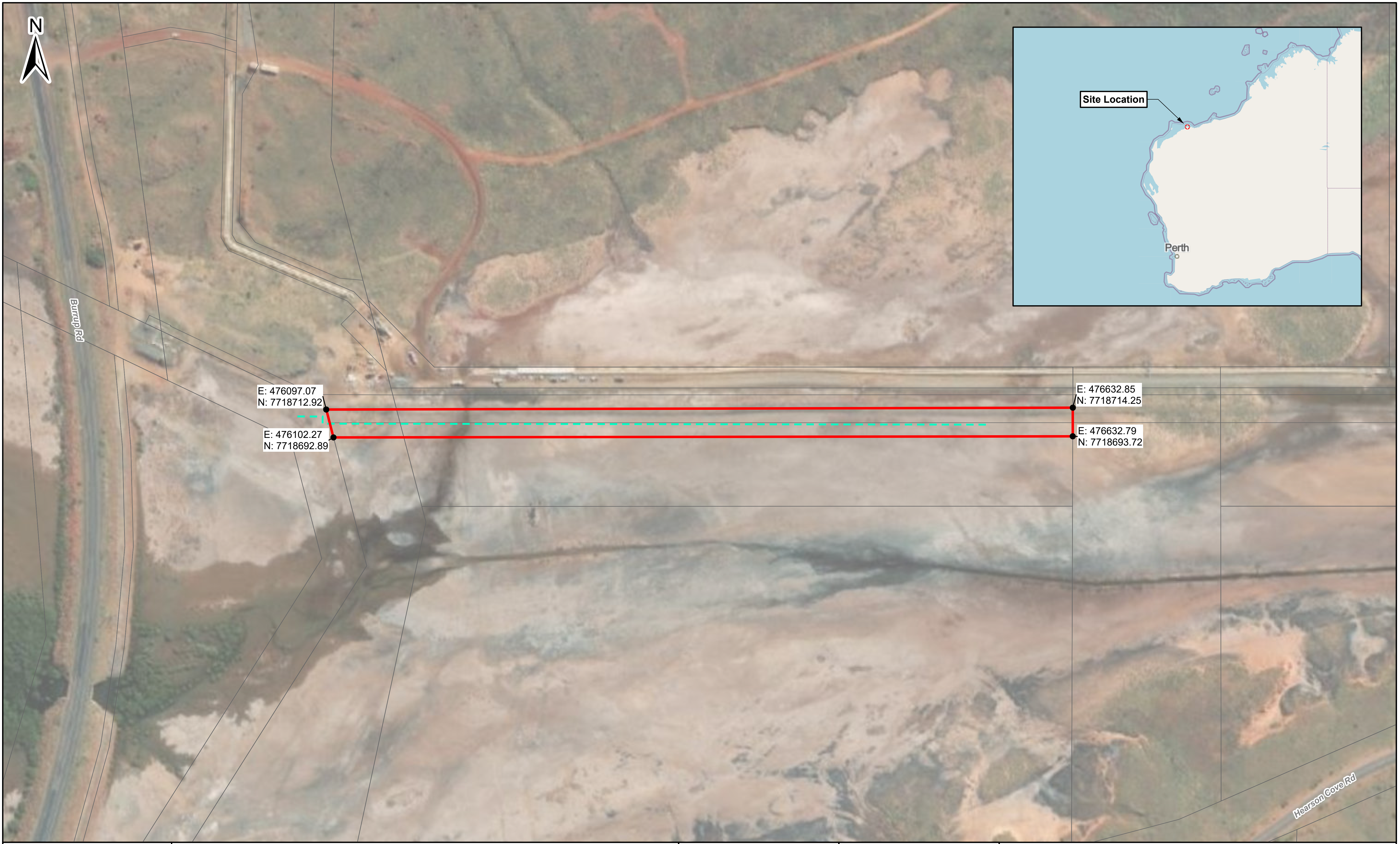
Tetra Tech Coffey (2022b) Perdaman Urea Project - Project Destiny. Detailed Site Assessment for Acid Sulfate Soil. 19 April 2022. (Reference: 754-PEREN297100).

Figures



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Legend
- 🟥 Boundary
- ‐ ‐ Proposed Pipeline
- ☐ Cadastre (LGATE-001)

Aerial Imagery © ESRI World Imagery

Created:	A. Murray	Date:	6/08/2024
Reviewed:	E. Churchill-Gray	Revision:	0
Approved:	A. Betti	Scale:	1:2,500 (A3)
File:	P21705_002_F001 Site Location		

0 12.5 25 50 75 100 125 Metres

Coordinate System: GDA2020 MGA Zone 50

Figure No: **1**

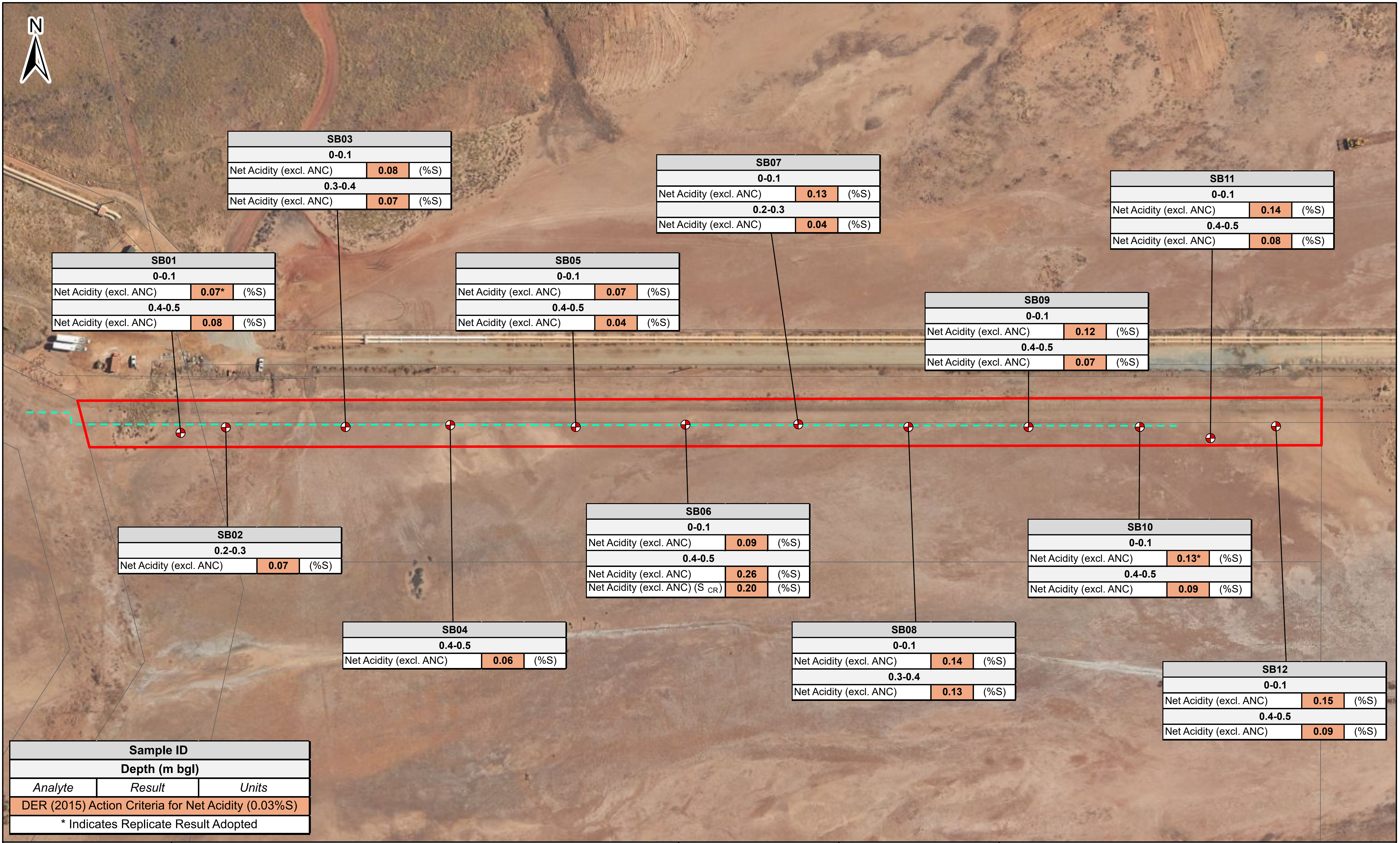
Title: **Site Location**

Project: Baseline Environmental Site Assessment

Location: Perdaman Lateral Pipeline, Burrup Peninsula

Client: Australian Gas Infrastructure Group

Path: S:\01_Jobs\6.WA_Jobs\P21705_AGIG_BURRUP PIPELINE_BASELINE ASSESSMENT\APRX\P21705_002.aprx



SB01		
0-0.1		
Net Acidity (excl. ANC)	**0.07***	(%S)
0.4-0.5		
Net Acidity (excl. ANC)	**0.08**	(%S)

SB02		
0.2-0.3		
Net Acidity (excl. ANC)	**0.07**	(%S)

SB03		
0-0.1		
Net Acidity (excl. ANC)	**0.08**	(%S)
0.3-0.4		
Net Acidity (excl. ANC)	**0.07**	(%S)

SB04		
0.4-0.5		
Net Acidity (excl. ANC)	**0.06**	(%S)

SB05		
0-0.1		
Net Acidity (excl. ANC)	**0.07**	(%S)
0.4-0.5		
Net Acidity (excl. ANC)	**0.04**	(%S)

SB06		
0-0.1		
Net Acidity (excl. ANC)	**0.09**	(%S)
0.4-0.5		
Net Acidity (excl. ANC)	**0.26**	(%S)
Net Acidity (excl. ANC) (S $_{CR}$)	**0.20**	(%S)

SB07		
0-0.1		
Net Acidity (excl. ANC)	**0.13**	(%S)
0.2-0.3		
Net Acidity (excl. ANC)	**0.04**	(%S)

SB08		
0-0.1		
Net Acidity (excl. ANC)	**0.14**	(%S)
0.3-0.4		
Net Acidity (excl. ANC)	**0.13**	(%S)

SB09		
0-0.1		
Net Acidity (excl. ANC)	**0.12**	(%S)
0.4-0.5		
Net Acidity (excl. ANC)	**0.07**	(%S)

SB10		
0-0.1		
Net Acidity (excl. ANC)	**0.13***	(%S)
0.4-0.5		
Net Acidity (excl. ANC)	**0.09**	(%S)

SB11		
0-0.1		
Net Acidity (excl. ANC)	**0.14**	(%S)
0.4-0.5		
Net Acidity (excl. ANC)	**0.08**	(%S)

SB12		
0-0.1		
Net Acidity (excl. ANC)	**0.15**	(%S)
0.4-0.5		
Net Acidity (excl. ANC)	**0.09**	(%S)

Sample ID		
Depth (m bgl)		
Analyte	*Result*	*Units*
DER (2015) Action Criteria for Net Acidity (0.03%S)		
* Indicates Replicate Result Adopted		

Path: S:\01_Jobs\6.WA_Jobs\P21705_AGIG_BURRUP PIPELINE_BASELINE ASSESSMENT\APRX\P21705_002.aprx

senversa

Legend

- ⊕ Hand Auger
- 🟥 Boundary
- -- Proposed Pipeline
- ☐ Cadastre (LGATE-001)

Aerial Imagery © Landgate

Created:	A. Murray	Date:	6/08/2024
Reviewed:	E. Churchill-Gray	Revision:	0
Approved:	A. Betti	Scale:	1:1,500 (A3)
File:	P21705_002_F002 Soil Locations		

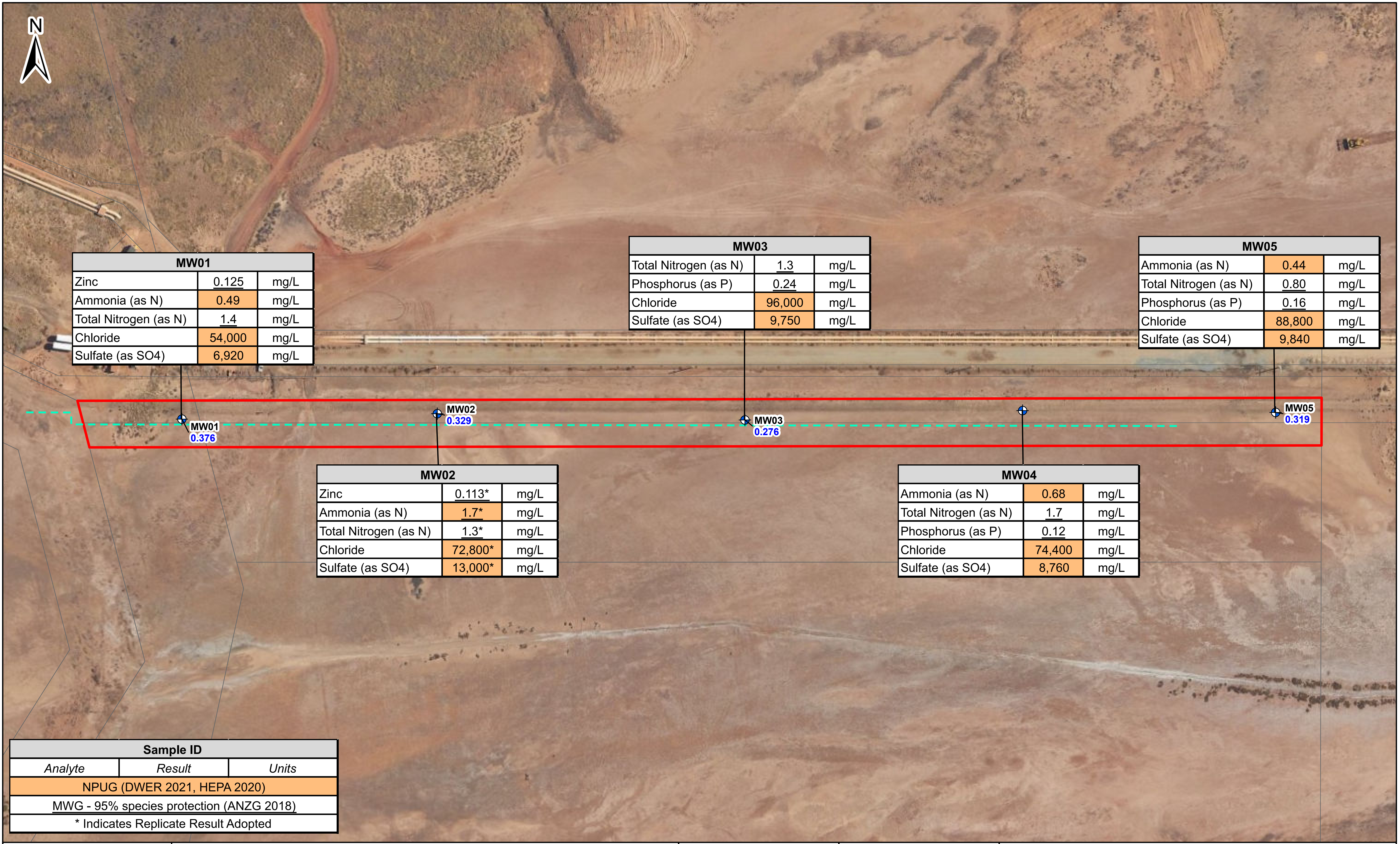
0 5 10 20 30 40 50 Metres

Coordinate System: GDA2020 MGA Zone 50

Figure No: **2**

Title: **Soil Sampling Locations**

Project:	Baseline Environmental Site Assessment
Location:	Perdaman Lateral Pipeline, Burrup Peninsula
Client:	Australian Gas Infrastructure Group



MW01		
Zinc	0.125	mg/L
Ammonia (as N)	0.49	mg/L
Total Nitrogen (as N)	1.4	mg/L
Chloride	54,000	mg/L
Sulfate (as SO4)	6,920	mg/L

MW02		
Zinc	0.113*	mg/L
Ammonia (as N)	1.7*	mg/L
Total Nitrogen (as N)	1.3*	mg/L
Chloride	72,800*	mg/L
Sulfate (as SO4)	13,000*	mg/L

MW03		
Total Nitrogen (as N)	1.3	mg/L
Phosphorus (as P)	0.24	mg/L
Chloride	96,000	mg/L
Sulfate (as SO4)	9,750	mg/L

MW04		
Ammonia (as N)	0.68	mg/L
Total Nitrogen (as N)	1.7	mg/L
Phosphorus (as P)	0.12	mg/L
Chloride	74,400	mg/L
Sulfate (as SO4)	8,760	mg/L

MW05		
Ammonia (as N)	0.44	mg/L
Total Nitrogen (as N)	0.80	mg/L
Phosphorus (as P)	0.16	mg/L
Chloride	88,800	mg/L
Sulfate (as SO4)	9,840	mg/L

Sample ID		
Analyte	*Result*	*Units*
NPUG (DWER 2021, HEPA 2020)		
MWG - 95% species protection (ANZG 2018)		
* Indicates Replicate Result Adopted		

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Legend

- ⌖ Piezometer
- 🟥 Boundary
- - - Proposed Pipeline
- ☐ Cadastre (LGATE-001)

Well ID
Reduced Water Level (m bgl)

Aerial Imagery © Landgate

Created:	A. Murray	Date:	6/08/2024
Reviewed:	E. Churchill-Gray	Revision:	0
Approved:	A. Betti	Scale:	1:1,500 (A3)
File:	P21705_002_F003 GW Contours		

0 5 10 20 30 40 50 Metres
Coordinate System: GDA2020 MGA Zone 50

Figure No: 3
Title: **Groundwater Sampling Locations**

Project: Baseline Environmental Site Assessment
Location: Perdaman Lateral Pipeline, Burrup Peninsula
Client: Australian Gas Infrastructure Group

Path: S:\01_Jobs\6.WA_Jobs\P21705_AGIG_BURRUP PIPELINE_BASELINE ASSESSMENT\APRX\P21705_002.aprx

Summary Tables

Table 1: Soil Analytical Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

						Metals								BTEX							Total Petroleum Hydrocarbons				
					pH (Lab)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total Xylene	Total BTEX	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
HIL D - Commercial/ Industrial (NEPC 1999)					-	3,000	900	3,600[#1]	240,000	1,500[#2]	730	6,000	400,000	3[#3]	99,000[#3]	27,000[#3]	-	-	230[#3]	-	-	-	-	-	-
Maintenance of Ecosystems - Commercial / Industrial					-	160[#7]	-	580[#8,9]	250[#9]	1,830[#7]	-	780[#9]	2,100[#9]	75[#10]	135[#10]	165[#10]	-	-	95[#11]	-	-	-	-	-	-
Ecological, direct exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological, indirect exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoR					0.1	2	0.1	1	1	1	0.02	1	5	0.1	0.1	0.1	0.2	0.1	0.3	0.2	10	20	50	50	50
Units					*pH Units*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
Soil Bore ID	**Field ID**	**Date**	**Depth**	**Lab Report No.**																					
SB01	SB01_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.6	7	<1	18	27	<5	<0.1	7	30	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB01_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.8	7	<1	19	<5	<5	<0.1	8	9	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB02	SB02_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.7	9	<1	97	17	6	<0.1	10	16	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB02_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	8.7	10	<1	25	6	<5	<0.1	10	12	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB03	SB03_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.7	8	<1	23	22	5	<0.1	10	40	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB03_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	8.6	8	<1	25	6	<5	<0.1	11	12	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB04	SB04_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.6	8	<1	21	14	<5	<0.1	9	23	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB04_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.7	9	<1	29	6	<5	<0.1	13	14	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB05	SB05_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.6	10	<1	27	17	<5	<0.1	12	27	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB05_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.4	12	<1	28	7	<5	<0.1	13	14	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB06	SB06_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.6	10	<1	20	5	<5	<0.1	8	8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB06_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.5	14	<1	33	6	<5	<0.1	13	14	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB07	SB07_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.7	11	<1	23	10	<5	<0.1	10	16	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB07_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	8.6	9	<1	22	5	<5	<0.1	9	8	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB08	SB08_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.7	10	<1	12	<5	<5	<0.1	5	6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB08_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	8.7	10	<1	20	<5	<5	<0.1	8	7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB09	SB09_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.6	8	<1	20	10	<5	<0.1	8	16	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB09_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.6	9	<1	34	8	<5	<0.1	14	13	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB10	SB10_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.7	10	<1	11	5	<5	<0.1	5	6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB10_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.6	7	<1	32	6	<5	<0.1	12	11	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB11	SB11_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.5	8	<1	15	<5	<5	<0.1	5	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB11_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.6	8	<1	35	7	<5	<0.1	13	11	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB12	SB12_0-0.1	4/07/2024	0 - 0.1	EP2409636	8.5	10	<1	17	6	<5	<0.1	7	10	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
	SB12_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	8.6	7	<1	27	<5	<5	<0.1	9	7	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50

Comments
#1 Value is for Chromium (VI).
#2 Assumes 50% bioavailability.
#3 Value sources from Friebel & Nadebaum (2011)- HSL-D.
#4 HSL based on vapour intrusion pathway (sand <1 m depth)
#5 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as vapour intrusion HSL is not limiting.
#6 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as fraction is not volatile.
#7 Value applies to aged arsenic (contamination present in soil for at least two years).
#8 Value is for chromium III.
#9 Site-specific EIL.
#10 Coarse soil value adopted for initial screening.
#11 Fine soil value (most conservative) adopted for initial screening.
#12 Value applies to both coarse and fine soil.
#13 Value applies to both fresh and aged contamination.

Table 1: Soil Analytical Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					Total Recoverable Hydrocarbons							PAHs																		
					C6-C10 Fraction	C6-C10 Fraction minus BTEX (F1)	>C10-C16 Fraction	>C10-C16 Fraction minus naphthalene (F2)	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Sum)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Naphthalene (VOC)	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ (Zero)	Sum of Polycyclic aromatic hydrocarbons (PAH)
HIL D - Commercial/ Industrial (NEPC 1999)					-	260$^{\#4}$	-	20,000$^{\#5}$	27,000$^{\#6}$	38,000$^{\#6}$	-	-	-	-	-	-	-	-	-	-	-	-	-	-	NL $^{\#3}$	-	-	-	40	4,000
Maintenance of Ecosystems - Commercial / Industrial					-	215	-	170	1,700$^{\#10}$	3,300$^{\#10}$	-	-	-	-	-	1.4$^{\#12}$	-	-	-	-	-	-	-	-	370$^{\#13}$	-	-	-	-	-
Ecological, direct exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological, indirect exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoR					10	10	50	50	100	100	50	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Units					*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
Soil Bore ID	**Field ID**	**Date**	**Depth**	**Lab Report No.**																										
SB01	SB01_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB01_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB02	SB02_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB02_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB03	SB03_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB03_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB04	SB04_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB04_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB05	SB05_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB05_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB06	SB06_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB06_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB07	SB07_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB07_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB08	SB08_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB08_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB09	SB09_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB09_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB10	SB10_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB10_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB11	SB11_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB11_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB12	SB12_0-0.1	4/07/2024	0 - 0.1	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
	SB12_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5

Comments

#1 Value is for Chromium (VI).
#2 Assumes 50% bioavailability.
#3 Value sources from Friebel & Nadebaum (2011)- HSL-D.
#4 HSL based on vapour intrusion pathway (sand <1 m depth)
#5 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as vapour intrusion HSL is not limiting.
#6 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as fraction is not volatile.
#7 Value applies to aged arsenic (contamination present in soil for at least two years).
#8 Value is for chromium III.
#9 Site-specific EIL.
#10 Coarse soil value adopted for initial screening.
#11 Fine soil value (most conservative) adopted for initial screening.
#12 Value applies to both coarse and fine soil.
#13 Value applies to both fresh and aged contamination.

Table 1: Soil Analytical Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkane Carboxylic Acids										
					4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FtS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorohexanoic acid (PFHxA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorooctanoic acid (PFOA)
HIL D - Commercial/ Industrial (NEPC 1999)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	50#10
Maintenance of Ecosystems - Commercial / Industrial					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological, direct exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	**10**
Ecological, indirect exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoR					0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.001	0.0002	0.0002	0.0002	0.0002
Units					*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
Soil Bore ID	**Field ID**	**Date**	**Depth**	**Lab Report No.**															
SB01	SB01_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB01_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB02	SB02_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB02_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB03	SB03_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB03_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB04	SB04_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB04_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB05	SB05_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB05_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB06	SB06_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB06_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB07	SB07_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB07_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB08	SB08_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB08_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB09	SB09_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB09_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB10	SB10_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB10_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB11	SB11_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB11_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB12	SB12_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
	SB12_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002

Comments
#1 Value is for Chromium (VI).
#2 Assumes 50% bioavailability.
#3 Value sources from Friebel & Nadebaum (2011)- HSL-D.
#4 HSL based on vapour intrusion pathway (sand <1 m depth)
#5 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as vapour intrusion HSL is not limiting.
#6 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as fraction is not volatile.
#7 Value applies to aged arsenic (contamination present in soil for at least two years).
#8 Value is for chromium III.
#9 Site-specific EIL.
#10 Coarse soil value adopted for initial screening.
#11 Fine soil value (most conservative) adopted for initial screening.
#12 Value applies to both coarse and fine soil.
#13 Value applies to both fresh and aged contamination.

Table 1: Soil Analytical Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					Perfluoroalkane Sulfonic Acids									Perfluoroalkyl Sulfonamides							
					Perfluorononane sulfonate (PFNS)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropropanesulfonic acid (PFPrS)	Sum of PFHxS and PFOS	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	Perfluorooctane sulfonamide (FOSA)	Sum of PFAS
HIL D - Commercial/ Industrial (NEPC 1999)					-	20[#11]	-	20[#11]	-	-	-	-	20[#10]	-	-	-	-	-	-	-	-
Maintenance of Ecosystems - Commercial / Industrial					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological, direct exposure (HEPA 2020)					-	**1**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological, indirect exposure (HEPA 2020)					-	0.01	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoR					0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0002	0.0002
Units					*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
Soil Bore ID	**Field ID**	**Date**	**Depth**	**Lab Report No.**																	
SB01	SB01_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB01_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB02	SB02_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB02_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB03	SB03_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB03_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB04	SB04_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB04_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB05	SB05_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB05_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB06	SB06_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB06_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB07	SB07_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB07_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB08	SB08_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB08_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB09	SB09_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB09_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB10	SB10_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB10_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB11	SB11_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB11_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB12	SB12_0-0.1	4/07/2024	0 - 0.1	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
	SB12_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002

Comments

#1 Value is for Chromium (VI).
#2 Assumes 50% bioavailability.
#3 Value sources from Friebel & Nadebaum (2011)- HSL-D.
#4 HSL based on vapour intrusion pathway (sand <1 m depth)
#5 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as vapour intrusion HSL is not limiting.
#6 HSL based on direct contact pathways (Friebel and Nadebaum, 2011) as fraction is not volatile.
#7 Value applies to aged arsenic (contamination present in soil for at least two years).
#8 Value is for chromium III.
#9 Site-specific EIL.
#10 Coarse soil value adopted for initial screening.
#11 Fine soil value (most conservative) adopted for initial screening.
#12 Value applies to both coarse and fine soil.
#13 Value applies to both fresh and aged contamination.

Table 1: Soil Analytical Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					Inorganics							Particle Size																
					Total Organic Carbon	Exchangeable Calcium	Exchangeable Magnesium	Exchangeable Potassium	Exchangeable Sodium	Exchangeable Sodium Percent	Cation Exchange Capacity	Clay in soils <2um	Sand (0.06-2.00 mm)	Silt (2-60 µm)	Gravel (>2mm)	Cobbles (>6cm)	+75µm	+150µm	+300µm	+425µm	+600µm	+1180µm	+2.36mm	+4.75mm	+9.5mm	+19.0mm	+37.5mm	+75.0mm
HIL D - Commercial/ Industrial (NEPC 1999)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Maintenance of Ecosystems - Commercial / Industrial					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological, direct exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological, indirect exposure (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoR					200	0.1	0.1	0.1	0.1	0.1	0.1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Units					*mg/kg*	*meq/100g*	*meq/100g*	*meq/100g*	*meq/100g*	*%*	*meq/100g*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*	*%*
Soil Bore ID	**Field ID**	**Date**	**Depth**	**Lab Report No.**																								
SB01	SB01_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB01_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB02	SB02_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB02_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB03	SB03_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB03_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB04	SB04_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB04_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB05	SB05_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB05_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB06	SB06_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB06_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB07	SB07_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB07_0.2-0.3	4/07/2024	0.2 - 0.3	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB08	SB08_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB08_0.3-0.4	4/07/2024	0.3 - 0.4	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB09	SB09_0-0.1	4/07/2024	0 - 0.1	EP2409636	1,400	33.8	9.2	0.4	0.6	1.4	44.1	6	67	11	16	<1	80	72	56	48	41	26	12	4	<1	<1	<1	<1
	SB09_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	2,900	22.1	7.3	1	1	3.2	31.4	12	60	24	4	<1	58	28	16	12	9	6	3	<1	<1	<1	<1	<1
SB10	SB10_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB10_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB11	SB11_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB11_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	SB12_0-0.1	4/07/2024	0 - 0.1	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	SB12_0.4-0.5	4/07/2024	0.4 - 0.5	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Comments

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#10 Coarse soil value adopted for initial screening.
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#12 Value applies to both coarse and fine soil.
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Table 2: Acid Sulfate Soil Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

						Field Test					**SPOCAS - pH**		**SPOCAS - sulfidic units**											
						pH (Lab)	pH-F (Field pH test)	pH-FOX (Field pH Peroxide test)	△ pH	Reaction Rate	pH (KCl)	pH (Ox)	Titratable Actual Acidity (TAA)	Titratable Sulfidic Acidity (TSA)	Titratable Peroxide Acidity (TPA)	KCl Extractable Sulfur (S KCL)	Sulfur in Peroxide (Sp)	Peroxide Oxidisable Sulfur (SPOS)	Acid Reacted Calcium	Acid Reacted Magnesium	Excess Acid Neutralising Capacity (ANCE)		Net Acidity	Net Acidity without ANCE
Indicators of PASS (DER 2015)						-	>4	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indicator of AASS (DER 2015)						-	<4	<3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Action Criteria for Net Acidity (DER 2015)						-	-	-	-	-	-	-	0.03	-	-	-	-	-	-	-	-	-	-	0.03
LoR						0.1	0.1	0.1	0.1	-	0.1	0.1	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.02	0.02	0.02	0.02
Units						*pH Units*	*pH Units*	*pH Units*	*pH Units*	-	*pH Units*	*pH Units*	*%S*	*%S*	*%S*	*%S*	*%S*	*%S*	*%S*	*%S*	*%CaCO3*	*%S*	*%S*	*%S*
Soil Bore ID	**Field ID**	**Date**	**Depth**	**Soil Type**	**Lab Report No.**																			
SB01	SB01_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.6	8.2	8.1	0.1	Slight	10	8.4	<0.005	<0.005	<0.005	0.085	0.143	0.059	9.06	0.951	29.5	9.45	<0.02	0.06
	SB01_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	8.8	8.4	7.0	1.4	Slight	10	8.5	<0.005	<0.005	<0.005	0.147	0.23	0.083	12.3	1.65	41	13.1	<0.02	0.08
SB02	SB02_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.7	8.3	7.3	1.0	Slight	10.1	8.7	<0.005	<0.005	<0.005	0.098	0.105	0.007	4.86	0.553	17.5	5.6	<0.02	<0.02
	SB02_0.2-0.3	4/07/2024	0.2 - 0.3	SS	EP2409636	8.7	8.3	7.0	1.3	Moderate	9.9	8.5	<0.005	<0.005	<0.005	0.109	0.183	0.074	10.4	1.54	37.7	12.1	<0.02	0.07
SB03	SB03_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.7	8.2	7.1	1.1	Moderate	9.8	8.3	<0.005	<0.005	<0.005	0.189	0.27	0.08	8.33	1.96	31.2	9.98	<0.02	0.08
	SB03_0.3-0.4	4/07/2024	0.3 - 0.4	SS	EP2409636	8.6	8.4	7.0	1.4	Moderate	9.9	8.5	<0.005	<0.005	<0.005	0.094	0.165	0.071	10.2	1.19	34.5	11	<0.02	0.07
SB04	SB04_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.6	8.3	7.3	1.0	Slight	10	8.3	<0.005	<0.005	<0.005	0.751	0.758	0.007	6.4	1.71	23.9	7.65	<0.02	<0.02
	SB04_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	8.7	8.4	7.3	1.1	Slight	9.8	8.6	<0.005	<0.005	<0.005	0.117	0.177	0.06	9.66	1.29	33.8	10.8	<0.02	0.06
SB05	SB05_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.6	8.3	7.3	1.0	Moderate	9.9	8.3	<0.005	<0.005	<0.005	0.51	0.58	0.07	6.98	2.21	26.2	8.38	<0.02	0.07
	SB05_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	8.4	8.3	7.1	1.2	Slight	9.8	8.5	<0.005	<0.005	<0.005	0.213	0.252	0.039	6.23	1.77	24.5	7.85	<0.02	0.04
SB06	SB06_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.6	8.4	7.2	1.2	Slight	9.9	8.3	<0.005	<0.005	<0.005	0.276	0.37	0.094	8.69	1.94	32.1	10.3	<0.02	0.09
	SB06_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	8.5	8.4	7.6	0.8	Moderate	9.7	8.4	<0.005	<0.005	<0.005	0.276	0.532	0.255	6.6	1.78	25.4	8.12	<0.02	0.26
SB07	SB07_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.7	8.4	7.0	1.4	Slight	9.8	8.3	<0.005	<0.005	<0.005	0.237	0.367	0.13	14	3.59	52.1	16.7	<0.02	0.13
	SB07_0.2-0.3	4/07/2024	0.2 - 0.3	SS	EP2409636	8.6	8.4	7.3	1.1	Moderate	9.9	8.4	<0.005	<0.005	<0.005	0.133	0.243	0.11	14	1.86	48.4	15.5	<0.02	0.11
SB08	SB08_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.7	8.4	7.0	1.4	Slight	10	8.4	<0.005	<0.005	<0.005	0.172	0.31	0.138	17	2.12	58.5	18.7	<0.02	0.14
	SB08_0.3-0.4	4/07/2024	0.3 - 0.4	SS	EP2409636	8.7	8.6	7.1	1.5	Slight	10	8.4	<0.005	<0.005	<0.005	0.104	0.232	0.128	16.5	2.26	59.7	19.1	<0.02	0.13
SB09	SB09_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.6	8.5	7.0	1.5	Slight	9.8	8.2	<0.005	<0.005	<0.005	0.385	0.508	0.123	14.6	2.38	49.1	15.7	<0.02	0.12
	SB09_0.4-0.5	4/07/2024	0.4 - 0.5	SS	EP2409636	8.6	8.4	6.9	1.5	Slight	9.8	8.3	<0.005	<0.005	<0.005	0.14	0.209	0.069	10.4	1.37	34.4	11	<0.02	0.07
SB10	SB10_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.7	8.5	6.9	1.6	Slight	10	8.3	<0.005	<0.005	<0.005	0.128	0.236	0.108	11.9	1.7	40.8	13	<0.02	0.11
	SB10_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	8.6	8.5	6.8	1.7	Slight	9.8	8.2	<0.005	<0.005	<0.005	0.157	0.248	0.09	12	2.1	42	13.4	<0.02	0.09
SB11	SB11_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.5	8.8	7.0	1.8	Slight	9.9	8.1	<0.005	<0.005	<0.005	0.077	0.214	0.137	18.7	1.78	60.8	19.5	<0.02	0.14
	SB11_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	8.6	8.4	6.8	1.6	Slight	9.7	8.2	<0.005	<0.005	<0.005	0.154	0.236	0.082	11.5	1.23	38.5	12.3	<0.02	0.08
SB12	SB12_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	8.5	8.5	6.9	1.6	Slight	9.8	8.2	<0.005	<0.005	<0.005	0.278	0.428	0.15	17.9	1.85	57.2	18.3	<0.02	0.15
	SB12_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	8.6	8.5	6.8	1.7	Slight	9.9	8.2	<0.005	<0.005	<0.005	0.165	0.253	0.088	14.4	1.32	48.4	15.5	<0.02	0.09

Table 2: Acid Sulfate Soil Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

						SPOCAS - acidity units									Liming rate		S_{CR} - pH	S_{CR} Suite - acidity units					S_{CR} Suite - sulfidic units					
						Titratable Actual Acidity (TAA)	Titratable Sulfidic Acidity (TSA)	Titratable Peroxide Acidity (TPA)	Peroxide Oxidisable Sulfur (POS)	Acid Reacted Calcium	Acid Reacted Magnesium	Excess Acid Neutralising Capacity (EANC)	Net Acidity	Net Acidity without ANCE	Liming rate without ANCE	Liming Rate	pH (KCl)	Titratable Actual Acidity (TAA)	Acid Neutralising Capacity (ANCBT)	Net Acidity (acidity units)	a-Net Acidity without ANCE	a-Chromium Reducible Sulfur (Scr)	Titratable Actual Acidity (TAA)	Chromium Reducible Sulfur (Scr)	Acid Neutralising Capacity	Acid Neutralising Capacity	Net Acidity	Net Acidity without ANCE
Indicators of PASS (DER 2015)						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Indicator of AASS (DER 2015)						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Action Criteria for Net Acidity (DER 2015)						-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.03
LoR						2	2	2	5	5	5	10	10	10	1	1	0.1	2	10	10	10	10	0.02	0.005	0.01	0.01	0.02	0.02
Units						*mole H+/t*									*kg CaCO3/t*		*pH Units*	*mole H+/t*					*%S*	*%S*	*%CaCO3*	*%S*	*%S*	*%S*
Soil Bore ID	**Field ID**	**Date**	**Depth**	**Soil Type**	**Lab Report No.**																							
SB01	SB01_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	37	5,650	593	5,900	<10	37	3	<1	10	<2	7,180	<10	<10	<10	<0.02	<0.005	36	11.5	<0.02	<0.02
	SB01_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	<2	<2	<2	52	7,660	1,030	8,190	<10	52	4	<1	10	<2	9,250	<10	<10	<10	<0.02	0.006	46.3	14.8	<0.02	<0.02
SB02	SB02_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	<5	3,030	345	3,500	<10	<10	<1	<1	10.1	<2	4,540	<10	<10	<10	<0.02	<0.005	22.7	7.27	<0.02	<0.02
	SB02_0.2-0.3	4/07/2024	0.2 - 0.3	SS	EP2409636	<2	<2	<2	46	6,520	958	7,530	<10	46	3	<1	9.9	<2	9,170	<10	<10	<10	<0.02	<0.005	45.9	14.7	<0.02	<0.02
SB03	SB03_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	50	5,200	1,220	6,230	<10	50	4	<1	9.8	<2	9,550	<10	<10	<10	<0.02	<0.005	47.8	15.3	<0.02	<0.02
	SB03_0.3-0.4	4/07/2024	0.3 - 0.4	SS	EP2409636	<2	<2	<2	44	6,340	743	6,900	<10	44	3	<1	9.9	<2	8,150	<10	<10	<10	<0.02	<0.005	40.8	13.1	<0.02	<0.02
SB04	SB04_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	<5	3,990	1,070	4,780	<10	<10	<1	<1	10	<2	7,210	<10	<10	<10	<0.02	0.007	36.1	11.6	<0.02	<0.02
	SB04_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	<2	<2	<2	38	6,020	805	6,760	<10	38	3	<1	9.8	<2	6,890	<10	<10	<10	<0.02	<0.005	34.5	11	<0.02	<0.02
SB05	SB05_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	44	4,360	1,380	5,230	<10	44	3	<1	9.9	<2	9,280	<10	<10	<10	<0.02	<0.005	46.4	14.9	<0.02	<0.02
	SB05_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	<2	<2	<2	24	3,880	1,100	4,900	<10	25	2	<1	9.8	<2	8,770	<10	<10	<10	<0.02	<0.005	43.9	14	<0.02	<0.02
SB06	SB06_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	58	5,420	1,210	6,410	<10	59	4	<1	9.9	<2	9,340	<10	<10	<10	<0.02	<0.005	46.8	15	<0.02	<0.02
	SB06_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	<2	<2	<2	159	4,120	1,110	5,070	<10	159	12	<1	9.7	<2	5,610	<10	122	122	<0.02	0.195	28.1	9	<0.02	0.20
SB07	SB07_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	81	8,740	2,240	10,400	<10	81	6	<1	9.8	<2	12,300	<10	<10	<10	<0.02	<0.005	61.6	19.7	<0.02	<0.02
	SB07_0.2-0.3	4/07/2024	0.2 - 0.3	SS	EP2409636	<2	<2	<2	68	8,750	1,160	9,670	<10	68	5	<1	9.9	<2	11,400	<10	<10	<10	<0.02	<0.005	57.1	18.3	<0.02	<0.02
SB08	SB08_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	86	10,600	1,320	11,700	<10	86	6	<1	10	<2	13,600	<10	<10	<10	<0.02	<0.005	68.3	21.9	<0.02	<0.02
	SB08_0.3-0.4	4/07/2024	0.3 - 0.4	SS	EP2409636	<2	<2	<2	80	10,300	1,410	11,900	<10	80	6	<1	10	<2	12,900	<10	<10	<10	<0.02	<0.005	64.6	20.7	<0.02	<0.02
SB09	SB09_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	76	9,130	1,480	9,810	<10	77	6	<1	9.8	<2	12,000	<10	<10	<10	<0.02	<0.005	59.8	19.2	<0.02	<0.02
	SB09_0.4-0.5	4/07/2024	0.4 - 0.5	SS	EP2409636	<2	<2	<2	43	6,520	854	6,880	<10	43	3	<1	9.8	<2	7,730	<10	<10	<10	<0.02	<0.005	38.7	12.4	<0.02	<0.02
SB10	SB10_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	67	7,440	1,060	8,140	<10	67	5	<1	10	<2	12,000	<10	<10	<10	<0.02	<0.005	59.8	19.2	<0.02	<0.02
	SB10_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	<2	<2	<2	56	7,470	1,310	8,400	<10	56	4	<1	9.8	<2	8,830	<10	<10	<10	<0.02	<0.005	44.2	14.2	<0.02	<0.02
SB11	SB11_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	85	11,600	1,110	12,200	<10	85	6	<1	9.9	<2	14,800	<10	<10	<10	<0.02	<0.005	74	23.7	<0.02	<0.02
	SB11_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	<2	<2	<2	51	7,160	767	7,690	<10	51	4	<1	9.7	<2	8,360	<10	<10	<10	<0.02	<0.005	41.9	13.4	<0.02	<0.02
SB12	SB12_0-0.1	4/07/2024	0 - 0.1	SS	EP2409636	<2	<2	<2	94	11,200	1,160	11,400	<10	94	7	<1	9.8	<2	13,400	<10	<10	<10	<0.02	0.005	67	21.5	<0.02	<0.02
	SB12_0.4-0.5	4/07/2024	0.4 - 0.5	SS(C)	EP2409636	<2	<2	<2	55	9,000	820	9,660	<10	55	4	<1	9.9	<2	9,340	<10	<10	<10	<0.02	<0.005	46.7	15	<0.02	<0.02

Table 3: RPDs (Soil)

Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

						Metals								BTEX							Total Petroleum Hydrocarbons				
					pH (Lab)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total Xylene	Total BTEX	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)
Units					*pH Units*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
LoR					0.1	2	0.1	1	1	1	0.02	1	5	0.1	0.1	0.1	0.2	0.1	0.3	0.2	10	20	50	50	50
Location ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																					
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	8.6	7	<1	**18**	27	<5	<0.1	**7**	**30**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB01	QC101	4/07/2024	Duplicate	EP2409636	8.9	6	<1	**10**	29	<5	<0.1	**5**	**20**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
RPD					3	15	0	**57**	7	0	0	**33**	**40**	0	0	0	0	0	0	0	0	0	0	0	0
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	8.6	7	<1	18	27	<5	<0.1	7	30	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-	<10	<50	<100	<100	<50
SB01	QC201	5/07/2024	Triplicate	1115574	9	7.4	<0.1	15	29	4.5	0.04	6.6	25	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	-	<20	<20	<50	<50	<50
RPD					5	6	0	18	7	0	0	6	18	0	0	0	0	0	0	-	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	8.7	10	<1	11	5	<5	<0.1	5	6	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
SB10	QC102	4/07/2024	Duplicate	EP2409636	8.7	9	<1	11	<5	<5	<0.1	4	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50
RPD					0	11	0	0	0	0	0	22	18	0	0	0	0	0	0	0	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	8.7	10	<1	**11**	**5**	<5	<0.1	**5**	**6**	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	-	<10	<50	<100	<100	<50
SB10	QC202	5/07/2024	Triplicate	1115574	8.9	7.7	<0.1	**6.8**	**1.5**	2.3	0.04	**2.9**	**17**	<0.1	<0.1	<0.1	<0.2	<0.1	<0.3	-	<20	<20	<50	<50	<50
RPD					2	26	0	**47**	**108**	0	0	**53**	**96**	0	0	0	0	0	0	-	0	0	0	0	0
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	QC103	4/07/2024	Duplicate	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	QC203	5/07/2024	Triplicate	1115574	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RPD acceptance criteria is as follows:

- Not limiting, where the maximum concentration of the two results is less than 10 times the LoR.
- 50%, where the maximum concentration of the two results is between 10 and 20 times the LoR.
- 30%, where the maximum concentration of the two results is greater than 20 times the LoR.

Table 3: RPDs (Soil)
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					Total Recoverable Hydrocarbons							PAHs																		
					C6-C10 Fraction	C6-C10 Fraction minus BTEX (F1)	>C10-C16 Fraction	>C10-C16 Fraction minus naphthalene (F2)	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Sum)	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Naphthalene (VOC)	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ (Zero)	Sum of Polycyclic aromatic hydrocarbons (PAH)
Units					*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
LoR					10	10	50	50	100	100	50	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Location ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																										
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB01	QC101	4/07/2024	Duplicate	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB01	QC201	5/07/2024	Triplicate	1115574	<20	<20	<50	<50	<100	<100	<100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB10	QC102	4/07/2024	Duplicate	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	<10	<10	<50	<50	<100	<100	<50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5
SB10	QC202	5/07/2024	Triplicate	1115574	<20	<20	<50	<50	<100	<100	<100	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	QC103	4/07/2024	Duplicate	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	QC203	5/07/2024	Triplicate	1115574	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RPD acceptance criteria is as follows:

- Not limiting, where the maximum concentration of the two results is less than 10 times the LoR.
- 50%, where the maximum concentration of the two results is between 10 and 20 times the LoR.
- 30%, where the maximum concentration of the two results is greater than 20 times the LoR.

					Acid Sulfate Soils - Field			Acid Sulfate Soils										Acid Sulfate Soils- Accounting						
					pH-F (Field pH test)	pH-FOX (Field pH Peroxide test)	Reaction Ratings	pH (KCl)	pH (Ox)	Titratable Actual Acidity	Titratable Sulfidic Acidity	acidity - Peroxide Oxidisable Sulfur	a-Chromium Reducible Sulfur (Scr)	TPA as moles H+/tonne	acidity - Acid Reacted Calcium	acidity - Acid Reacted Magnesium	ANC Fineness Factor	Acid Neutralising Capacity (ANCBT)	acidity - Excess Acid Neutralising Capacity	Net Acidity (acidity units)	a-Net Acidity without ANCE	Liming rate without ANCE	Liming Rate
Units					*pH Units*	*pH Units*	-	*pH Units*	*pH Units*	*mole H+/t*	*mole H+/t*	*mole H+/t*	*mole H+/t*	*moles H+/*	*mole H+/t*	*mole H+/t*	-	*mole H+/t*	*mole H+/t*	*mole H+/t*	*mole H+/t*	*g CaCO3/*	*g CaCO3/*
LoR					0.1	0.1	1	0.1	0.1	2	2	2	3	2	0.005	0.005	0.5	2	10	10	10	1	1
Location ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																			
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	8.2	8.1	1	10	8.4	<2	<2	37	<10	<2	5,650	**593**	1.5	7,180	**5,900**	<10	37	3	<1
SB01	QC101	4/07/2024	Duplicate	EP2409636	8.7	7	1	9.9	8.4	<2	<2	45	<10	<2	7,120	**906**	1.5	8,690	**8,160**	<10	45	3	<1
RPD					6	15	0	1	0	0	0	20	0	0	23	**42**	0	19	**32**	0	20	0	0
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	8.2	8.1	-	10	8.4	<2	<2	37	<10	<2	**5,650**	**593**	1.5	7,180	-	<10	-	-	<1
SB01	QC201	5/07/2024	Triplicate	1115574	8.7	8.4	-	9.5	7.8	<2	<2	49	3.7	-	**7,900**	**930**	1.5	8,600	-	<10	-	-	<1
RPD					6	4	-	5	7	0	0	28	0	-	**33**	**44**	0	18	-	0	-	-	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	8.5	6.9	1	10	8.3	<2	<2	67	<10	<2	7,440	**1,060**	1.5	12,000	8,140	<10	67	5	<1
SB10	QC102	4/07/2024	Duplicate	EP2409636	8.6	6.9	1	9.9	8.3	<2	<2	84	<10	<2	8,300	**1,530**	1.5	11,000	9,280	<10	84	6	<1
RPD					1	0	0	1	0	0	0	23	0	0	11	**36**	0	9	13	0	23	18	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	8.5	6.9	-	10	8.3	<2	<2	67	<10	<2	**7,440**	**1,060**	1.5	12,000	-	<10	-	-	<1
SB10	QC202	5/07/2024	Triplicate	1115574	8.7	8.3	-	9.6	7.9	<2	<2	79	<3	-	**11,000**	**2,900**	1.5	12,000	-	<10	-	-	<1
RPD					2	18	-	4	5	0	0	16	0	-	**39**	**93**	0	0	-	0	-	-	0
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	QC103	4/07/2024	Duplicate	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
SB12	QC203	5/07/2024	Triplicate	1115574	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
RPD					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

RPD acceptance criteria is as follows:

- Not limiting, where the maximum concentration of the two results is less than 10 times the LoR.
- 50%, where the maximum concentration of the two results is between 10 and 20 times the LoR.
- 30%, where the maximum concentration of the two results is greater than 20 times the LoR.

Table 3: RPDs (Soil)
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkane Carboxylic Acids										
					4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FtS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorohexanoic acid (PFHxA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorooctanoic acid (PFOA)
Units					*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
LoR					0.0005	0.0005	0.0005	0.0005	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.001	0.0002	0.0002	0.0002	0.0002
Location ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**															
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB01	QC101	4/07/2024	Duplicate	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB01	QC201	5/07/2024	Triplicate	1115574	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB10	QC102	4/07/2024	Duplicate	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB10	QC202	5/07/2024	Triplicate	1115574	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB12	QC103	4/07/2024	Duplicate	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.001	<0.0002	<0.0002	<0.0002	<0.0002
SB12	QC203	5/07/2024	Triplicate	1115574	<0.005	<0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RPD acceptance criteria is as follows:

- Not limiting, where the maximum concentration of the two results is less than 10 times the LoR.
- 50%, where the maximum concentration of the two results is between 10 and 20 times the LoR.
- 30%, where the maximum concentration of the two results is greater than 20 times the LoR.

Table 3: RPDs (Soil)
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					Perfluoroalkane Sulfonic Acids									**Perfluoroalkyl Sulfonamides**							PFAS
					Perfluorononane sulfonate (PFNS)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutane sulfonic acid (PFBS)	Perfluoropropanesulfonic acid (PFPrS)	Sum of PFHxS and PFOS	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	Perfluorooctane sulfonamide (FOSA)	Sum of PFAS
Units					*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
LoR					0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0002	0.0005	0.0002	0.0005	0.0002	0.0002	0.0005	0.0005	0.0005	0.0002	0.0002
Location ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																	
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB01	QC101	4/07/2024	Duplicate	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB01	SB01_0-0.1	4/07/2024	Primary	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB01	QC201	5/07/2024	Triplicate	1115574	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.05
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB10	QC102	4/07/2024	Duplicate	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB10	SB10_0-0.1	4/07/2024	Primary	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB10	QC202	5/07/2024	Triplicate	1115574	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.05
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB12	QC103	4/07/2024	Duplicate	EP2409636	-	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	-	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
RPD					-	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0
SB12	SB12_0-0.1	4/07/2024	Primary	EP2409636	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0005	<0.0002	<0.0005	<0.0002	<0.0002	<0.0005	<0.0005	<0.0005	<0.0002	<0.0002
SB12	QC203	5/07/2024	Triplicate	1115574	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.01	<0.01	<0.005	<0.005	<0.005	<0.005	<0.05
RPD					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RPD acceptance criteria is as follows:

- Not limiting, where the maximum concentration of the two results is less than 10 times the LoR.
- 50%, where the maximum concentration of the two results is between 10 and 20 times the LoR.
- 30%, where the maximum concentration of the two results is greater than 20 times the LoR.

Table 4: QAQC Results - Soil Blanks
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

				Metals								BTEX							Total Petroleum Hydrocarbons					Total Recoverable Hydrocarbons						
				Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total Xylene	Total BTEX	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	C6-C10 Fraction	C6-C10 Fraction minus BTEX (F1)	>C10-C16 Fraction	>C10-C16 Fraction minus naphthalene (F2)	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Sum)
Units				*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
LoR				5	1	2	5	5	0.1	2	5	0.2	0.5	0.5	0.5	0.5	0.5	0.2	10	50	100	100	50	10	10	50	50	100	100	50
Field ID	**Date**	**Sample Type**	**Lab Report No.**																											
QC401	4/07/2024	Trip Blank (soil)	EP2409636	<5	<1	<2	<5	<5	<0.1	<2	<5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<10	<50	<100	<100	<50	<10	<10	<50	<50	<100	<100	<50

				PAHs																		
				Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b+j)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Naphthalene (VOC)	Phenanthrene	Pyrene	Benzo(a)pyrene TEQ (Zero)	Sum of Polycyclic aromatic hydrocarbons (PAH)
Units				*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*	*mg/kg*
LoR				0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5
Field ID	**Date**	**Sample Type**	**Lab Report No.**																			
QC401	4/07/2024	Trip Blank (Soil)	EP2409636	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5

Table 5 - Groundwater Gauging and Field Parameters
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

Well ID	Survey Data		Gauging Results				
	Easting (MGA)	Northing (MGA)	Casing height (mAGL)	Date Gauged	Groundwater Depth (mBTOC)	Total Well Depth (mBTOC)	GW mBGL
MW01	476144	7718707	0.592	5/07/2024	0.968	2.16	0.376
MW02	476256	7718708	0.627	5/07/2024	0.956	2.13	0.329
MW03	476387	7718705	0.775	5/07/2024	1.051	2.03	0.276
MW04	476503	7718711	0.637	5/07/2024	0.925	2.11	0.288
MW05	476615	7718717	0.825	5/07/2024	1.144	2.36	0.319

Well ID	Stabilised Groundwater Field Parameters							Comments/Observations
	Date Sampled	DO (mg/L)	EC (µS/cm)	TDS # (mg/L)	pH (pH units)	Redox (mV)	Temperature (°C)	
MW01	5/07/2024	0.96	130858	85058	7.56	143	24.8	Colourless, no sheen, no odour, Moderately turbid
MW02	5/07/2024	0.38	146987	95542	7.24	139.4	25.3	Colourless, no sheen, no odour, Slightly turbid
MW03	5/07/2024	2.08	192065	124842	7.43	144.4	23	Light brown, no sheen, no odour, Slightly turbid
MW04	5/07/2024	2.59	173491	112769	7.4	119.9	23.6	Colourless, no sheen, sulphurous odour, Slightly turbid
MW05	5/07/2024	0.53	192348	125026	6.95	54.8	22.5	Colourless, no sheen, sulphurous odour, Slightly turbid

Notes:

TDS calculated based on a conversion factor of 0.65 i.e. TDS (ppm) = 0.65 x EC (µS/cm)

mg/L: miligram per litre

µS/cm: microsiemens per centimetre

mV: millivolts

°C: celsius

Table 6: Groundwater Analytical Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

						Metals (dissolved)								Inorganics								Major Ions								
					pH (Lab)	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Ammonia (as N)	Nitrate (as N)	Nitrite (as N)	Total Oxidised Nitrogen (as N)	Total Kjeldahl Nitrogen	Total Nitrogen (as N)	Phosphorus (as P)	Ortho-phosphate (as P)	Calcium (filtered)	Chloride	Magnesium (filtered)	Potassium (filtered)	Sulfate (as SO4) (filtered)	Sodium (filtered)	Anions Total	Cations Total	Ionic Balance
NPUG (DWER 2021, HEPA 2020)					-	-	0.02	-	20	0.1	0.01	0.2	3	0.388	113	9.12	-	-	-	-	-	-	250	-	-	1,000	-	-	-	-
MWG - 95% species protection (ANZG 2018) (99% for PFAS)					-	-	0.0007[#6]	0.0044[#7]	0.0013[#8]	0.0044[#8]	0.0001[#6]	0.007[#6]	0.008[#8]	0.91[#8]	2.4[#9]	-	-	-	0.1*	0.015*	-	-	-	-	-	-	-	-	-	-
HSL D - Vapour intrusion, sand (2m - 4m) (NEPC 1999)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DWG - Health (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoR					0.01	0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.005	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.5	1	0.5	0.5	1	0.5	0.01	0.01	1
Units					*pH Units*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*meq/L*	*meq/L*	*%*
Well ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																										
MW01	MW01	05/07/2024	Primary	EP2409638	7.56	<0.020	<0.0020	<0.020	<0.020	<0.020	<0.0005	<0.020	0.125	0.49	0.23	0.04	0.27	1.1	1.4	<0.05	0.02	1,320	54,000	3,600	1,100	6,920	32,400	1,670	1,800	3.74
MW02	MW02	05/07/2024	Primary	EP2409638	7.33	<0.020	<0.0020	<0.020	<0.020	<0.020	<0.0005	<0.020	<0.100	1.7*	0.02	<0.01	0.02	1.3*	1.3*	<0.05	0.04	1,510	71,800	4,070	1,310	13,000*	37,000	2,180	2,050	3.1
MW03	MW03	05/07/2024	Primary	EP2409638	7.3	<0.050	<0.0050	<0.050	<0.050	<0.050	<0.0005	<0.050	<0.250	0.32	0.31	0.01	0.32	1	1.3	0.24	0.02	1,410	96,000	6,270	1,960	9,750	55,400	2,910	3,050	2.25
MW04	MW04	05/07/2024	Primary	EP2409638	7.47	<0.020	<0.0020	<0.020	<0.020	<0.020	<0.0005	<0.020	<0.100	0.68	0.64	<0.01	0.64	1.1	1.7	0.12	0.05	1,280	74,400	5,310	1,610	8,760	48,100	2,280	2,630	7.12
MW05	MW05	05/07/2024	Primary	EP2409638	7.17	<0.050	<0.0050	<0.050	<0.050	<0.050	<0.0005	<0.050	<0.250	0.44	0.05	<0.01	0.05	0.8	0.8	0.16	0.04	1,230	88,800	6,120	2,010	9,840	55,700	2,710	3,040	5.69

Comments

#1 NHMRC (2011) - Health. Multiplied by a factor of x10

by a factor of x10

#3 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#4 To obtain F2 subtract napthalene from the >C10 - C16 fraction.

#5 PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand 2020.

#6 ANZG (2018). Higher species protection level adopted as recommended

#7 ANZG (2018). The more conservative value (Chromium CrVI) out of the available chromium species was adopted for initial screening purposes.

#8 ANZG (2018)

value was withdrawn due to calculation errors. Value is for freshwater but is used in

recommended.

hydrocarbons.

#12 CRWB (2019). Value for diesel (C8-C21) mixture.

#13 CRWB (2019). Value for diesel (C8-C21) mixture. No value derived for TPH >C21 as not considered soluble; diesel value used for screening.

#14 PFAS National Environmental Management Plan (HEPA 2020). Higher species protection level adopted as recommended

* Denotes physical and chemical stressor Environmental Assessment Level - Inshore Marine Ecosystem.

* indicates replicate value adopted.

Table 6: Groundwater Analytical Results
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					Alkalinity					BTEX							Total Petroleum Hydrocarbons					Total Recoverable Hydrocarbons							PAHs
					Bicarbonate Alkalinity (as CaCO3)	Carbonate Alkalinity (as CaCO3)	Hydroxide Alkalinity (as CaCO3)	Total Alkalinity (as CaCO3)	Acidity (as CaCO3)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total Xylene	Total BTEX	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	C6-C10 Fraction	C6-C10 Fraction minus BTEX (F1)	>C10-C16 Fraction	>C10-C16 Fraction minus naphthalene (F2)	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Sum)	Naphthalene
NPUG (DWER 2021, HEPA 2020)					-	-	-	-	-	10	25	3	-	-	20	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MWG - 95% species protection (ANZG 2018) (99% for PFAS)					-	-	-	-	-	$500^{\#6}$	$180^{\#8}$	$80^{\#8}$	-	$350^{\#10}$	-	-	-	-	-	-	-	-	$640^{\#11}$	-	$640^{\#11}$	$640^{\#12}$	$640^{\#13}$	-	$50^{\#6}$
HSL D - Vapour intrusion, sand (2m - 4m) (NEPC 1999)					-	-	-	-	-	*5,000*	*NL*	*NL*	-	-	*NL*	-	-	-	-	-	-	-	*6,000* $^{\#3}$	-	*NL* $^{\#4}$	-	-	-	*NL*
DWG - Health (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
LoR					1	1	1	1	1	1	1	1	2	1	2	1	20	20	40	40	40	20	20	20	20	50	50	50	5
Units					*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Well ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																									
MW01	MW01	05/07/2024	Primary	EP2409638	117	<1	<1	117	39	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5
MW02	MW02	05/07/2024	Primary	EP2409638	79	<1	<1	79	38	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5
MW03	MW03	05/07/2024	Primary	EP2409638	62	<1	<1	62	41	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5
MW04	MW04	05/07/2024	Primary	EP2409638	136	<1	<1	136	60	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5
MW05	MW05	05/07/2024	Primary	EP2409638	104	<1	<1	104	68	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5

Comments

#1 NHMRC (2011) - Health. Multiplied by a factor of x10
by a factor of x10

#3 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#4 To obtain F2 subtract napthalene from the >C10 - C16 fraction.

#5 PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand 2020.

#6 ANZG (2018). Higher species protection level adopted as recommended

#7 ANZG (2018). The more conservative value (Chromium CrVI) out of the available chromium species was adopted for initial screening purposes.

#8 ANZG (2018)
value was withdrawn due to calculation errors. Value is for freshwater but is used in
recommended.
hydrocarbons.

#12 CRWB (2019). Value for diesel (C8-C21) mixture.

#13 CRWB (2019). Value for diesel (C8-C21) mixture. No value derived for TPH >C21 as not considered soluble; diesel value used for screening.

#14 PFAS National Environmental Management Plan (HEPA 2020). Higher species protection level adopted as recommended

* Denotes physical and chemical stressor Environmental Assessment Level - Inshore Marine Ecosystem.

* indicates replicate value adopted.

					(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkane Carboxylic Acids										
					4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FtS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorohexanoic acid (PFHxA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorooctanoic acid (PFOA)
NPUG (DWER 2021, HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.6[#1]
MWG - 95% species protection (ANZG 2018) (99% for PFAS)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	19[#14]
HSL D - Vapour intrusion, sand (2m - 4m) (NEPC 1999)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DWG - Health (HEPA 2020)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	**0.56[#5]**
LoR					0.001	0.001	0.001	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0005
Units					*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Well ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**															
MW01	MW01	05/07/2024	Primary	EP2409638	<0.001	<0.001	<0.001	<0.001	0.0193	<0.0005	<0.0005	0.0414	<0.0005	0.0071	0.036	<0.0005	<0.0005	<0.0005	0.0008
MW02	MW02	05/07/2024	Primary	EP2409638	<0.001	<0.001	<0.001	<0.001	0.023	<0.0005	<0.0005	0.0515	<0.0005	0.005	0.031	<0.0005	<0.0005	<0.0005	<0.0005
MW03	MW03	05/07/2024	Primary	EP2409638	<0.001	<0.001	<0.001	<0.001	0.018	<0.0005	<0.0005	0.0523	<0.0005	0.0016	0.04	<0.0005	<0.0005	<0.0005	<0.0005
MW04	MW04	05/07/2024	Primary	EP2409638	<0.001	<0.001	<0.001	<0.001	0.0603	<0.0005	<0.0005	0.0984	<0.0005	0.0186	0.051	<0.0005	<0.0005	<0.0005	<0.0005
MW05	MW05	05/07/2024	Primary	EP2409638	<0.001	<0.001	<0.001	<0.001	0.0144	<0.0005	<0.0005	0.0954	<0.0005	<0.0005	0.058	<0.0005	<0.0005	<0.0005	<0.0005

Comments

#1 NHMRC (2011) - Health. Multiplied by a factor of x10
by a factor of x10

#3 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#4 To obtain F2 subtract napthalene from the >C10 - C16 fraction.

#5 PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand 2020.

#6 ANZG (2018). Higher species protection level adopted as recommended

#7 ANZG (2018). The more conservative value (Chromium CrVI) out of the available chromium species was adopted for initial screening purposes.

#8 ANZG (2018)
value was withdrawn due to calculation errors. Value is for freshwater but is used in
recommended.
hydrocarbons.

#12 CRWB (2019). Value for diesel (C8-C21) mixture.

#13 CRWB (2019). Value for diesel (C8-C21) mixture. No value derived for TPH >C21 as not considered soluble; diesel value used for screening.

#14 PFAS National Environmental Management Plan (HEPA 2020). Higher species protection level adopted as recommended

* Denotes physical and chemical stressor Environmental Assessment Level - Inshore Marine Ecosystem.

* indicates replicate value adopted.

					Perfluoroalkane Sulfonic Acids							Perfluoroalkyl Sulfonamides							
					Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutane sulfonic acid (PFBS)	Sum of PFHxS and PFOS	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	Perfluorooctane sulfonamide (FOSA)	Sum of PFAS
NPUG (DWER 2021, HEPA 2020)					0.7[#2]	-	0.7[#2]	-	-	-	0.7[#1]	-	-	-	-	-	-	-	-
MWG - 95% species protection (ANZG 2018) (99% for PFAS)					0.00023[#14]	-	-	-	-	-	-	-	-	-	-	-	-	-	-
HSL D - Vapour intrusion, sand (2m - 4m) (NEPC 1999)					-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DWG - Health (HEPA 2020)					-	-	-	-	-	-	**0.07[#5]**	-	-	-	-	-	-	-	-
LoR					0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.001	0.0005	0.0005	0.001	0.001	0.001	0.0005	0.0003
Units					*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
Well ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**															
MW01	MW01	05/07/2024	Primary	EP2409638	<0.0002	<0.0005	0.0006	<0.0005	<0.0005	0.001	0.0006	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.106
MW02	MW02	05/07/2024	Primary	EP2409638	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0003	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.111
MW03	MW03	05/07/2024	Primary	EP2409638	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.112
MW04	MW04	05/07/2024	Primary	EP2409638	<0.0002	<0.0010	<0.0010	<0.0005	<0.0005	0.0013	<0.0003	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.23
MW05	MW05	05/07/2024	Primary	EP2409638	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0003	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.168

Comments

#1 NHMRC (2011) - Health. Multiplied by a factor of x10
by a factor of x10

#3 To obtain F1 subtract the sum of BTEX concentrations from the C6 - C10 fraction.

#4 To obtain F2 subtract napthalene from the >C10 - C16 fraction.

#5 PFAS National Environmental Management Plan Version 2.0', Heads of EPA Australia and New Zealand 2020.

#6 ANZG (2018). Higher species protection level adopted as recommended

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#13 CRWB (2019). Value for diesel (C8-C21) mixture. No value derived for TPH >C21 as not considered soluble; diesel value used for screening.

#14 PFAS National Environmental Management Plan (HEPA 2020). Higher species protection level adopted as recommended

* Denotes physical and chemical stressor Environmental Assessment Level - Inshore Marine Ecosystem.

* indicates replicate value adopted.

Table 7: RPDs (Groundwater)
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

						Metals								Inorganics								Major Ions									(n:2) Fluorotelomer Sulfonic Acids			
					pH (Lab)	Arsenic (filtered)	Cadmium (filtered)	Chromium (filtered)	Copper (filtered)	Lead (filtered)	Mercury (filtered)	Nickel (filtered)	Zinc (filtered)	Ammonia (as N)	Nitrate (as N)	Nitrite (as N)	Total Oxidised Nitrogen (as N)	Total Kjeldahl Nitrogen	Total Nitrogen (as N)	Phosphorus (as P)	Ortho-phosphate (as P)	Calcium (filtered)	Chloride	Magnesium (filtered)	Potassium (filtered)	Sulfate (as SO4) (filtered)	Sodium (filtered)	Anions Total	Cations Total	Ionic Balance	4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FtS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)
Units					*pH Units*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*meq/L*	*meq/L*	*%*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
LoR					0.01	0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.005	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	0.5	1	0.5	0.5	1	0.5	0.01	0.01	0	0.001	0.001	0.001	0.001
Well ID	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																														
MW02	MW02	05/07/2024	Primary	EP2409638	7.33	<0.020	<0.0020	<0.020	<0.020	<0.020	<0.0005	<0.020	<0.100	0.11	**0.02**	<0.01	**0.02**	**0.3**	**0.3**	<0.05	0.04	1,510	71,800	4,070	1,310	7,570	37,000	2,180	2,050	**3.1**	<0.001	<0.001	<0.001	<0.001
MW02	QC104	05/07/2024	Duplicate	EP2409638	7.34	<0.020	<0.0020	<0.020	<0.020	<0.020	<0.0005	<0.020	0.113	0.1	**0.03**	<0.01	**0.03**	**0.5**	**0.5**	<0.05	0.03	1,480	72,800	4,140	1,310	7,420	39,100	2,210	2,150	**1.39**	<0.001	<0.001	<0.001	<0.001
RPD					0	0	0	0	0	0	0	0	12	10	**40**	0	**40**	**50**	**50**	0	29	2	1	2	0	2	6	1	5	**76**	0	0	0	0
MW02	MW02	05/07/2024	Primary	EP2409638	-	<0.020	<0.0020	<0.020	<0.020	<0.020	<0.0005	<0.020	<0.100	**0.11**	0.02	<0.01	0.02	**0.3**	**0.3**	<0.05	**0.04**	1,510	71,800	4,070	1,310	**7,570**	37,000	-	-	**3.1**	<0.001	<0.001	<0.001	<0.001
MW02	QC204	05/07/2024	Duplicate	1115822	-	0.011	<0.002	<0.01	<0.01	<0.01	<0.001	<0.01	<0.05	**1.7**	0.02	<0.01	0.02	**1.3**	**1.3**	<0.01	**0.02^**	1,200	65,000	3,800	1,200	**13,000**	35,000	-	-	**-4.5**	<0.001	<0.005	<0.001	<0.001
RPD					-	0	0	0	0	0	0	0	0	**176**	0	0	0	**125**	**125**	0	**67**	23	10	7	9	**53**	6	-	-	**200**	0	0	0	0

					Alkalinity					BTEX							Total Petroleum Hydrocarbons					Total Recoverable Hydrocarbons							PAHs
					Bicarbonate Alkalinity (as CaCO3)	Carbonate Alkalinity (as CaCO3)	Hydroxide Alkalinity (as CaCO3)	Total Alkalinity (as CaCO3)	Acidity (as CaCO3)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total Xylene	Total BTEX	C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	C6-C10 Fraction	C6-C10 Fraction minus BTEX (F1)	>C10-C16 Fraction	>C10-C16 Fraction minus naphthalene (F2)	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Sum)	Naphthalene
Units					*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
LoR					1	1	1	1	1	1	1	1	2	1	2	1	20	20	40	40	40	20	20	20	20	50	50	50	5
Location Cod	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																									
MW02	MW02	05/07/2024	Primary	EP2409638	79	<1	<1	79	38	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5
MW02	QC104	05/07/2024	Duplciate	EP2409638	77	<1	<1	77	37	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5
RPD					3	0	0	3	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MW02	MW02	05/07/2024	Primary	EP2409638	79	<1	<1	79	38	<1	<2	<2	<2	<2	<2	<1	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5
MW02	QC204	05/07/2024	Duplicate	1115822	100	<5	<5	100	43	<1	<1	<1	<2	<1	<3	-	<20	<20	<40	<40	<40	<20	<20	<20	<20	<50	<50	<50	<1
RPD					23	0	0	23	12	0	0	0	0	0	0	-	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 7: RPDs (Groundwater)
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

					Perfluoroalkane Carboxylic Acids											Perfluoroalkane Sulfonic Acids							Perfluoroalkyl Sulfonamides							
					Perfluorohexanoic acid (PFHxA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorooctanoic acid (PFOA)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutane sulfonic acid (PFBS)	Sum of PFHxS and PFOS	N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	Perfluorooctane sulfonamide (FOSA)	Sum of PFAS
Units					*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
LoR					0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0003	0.001	0.0005	0.0005	0.001	0.001	0.001	0.0005	0.0003
Location Cod	**Field ID**	**Date**	**Sample Type**	**Lab Report No.**																										
MW02	MW02	05/07/2024	Primary	EP2409638	0.023	<0.0005	<0.0005	0.0515	<0.0005	0.005	0.031	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0003	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.111
MW02	QC104	05/07/2024	Duplciate	EP2409638	0.0221	<0.0005	<0.0005	0.0553	<0.0005	0.005	0.032	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0006	<0.0003	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.115
RPD					4	0	0	7	0	0	3	0	0	0	0	0	0	0	0	0	18	0	0	0	0	0	0	0	0	4
MW02	MW02	05/07/2024	Primary	EP2409638	0.023	<0.0005	<0.0005	0.0515	<0.0005	0.005	0.031	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	0.0005	<0.0003	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	0.111
MW02	QC204	05/07/2024	Duplicate	1115822	0.022	<0.001	<0.001	0.054	<0.001	0.004	0.035	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.007	<0.001	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	0.122
RPD					4	0	0	5	0	22	12	0	0	0	0	0	0	0	0	0	173	0	0	0	0	0	0	0	0	9

RPD acceptance criteria is as follows:

- Not limiting, where the maximum concentration of the two results is less than 10 times the LoR.
- 50%, where the maximum concentration of the two results is between 10 and 20 times the LoR.
- 30%, where the maximum concentration of the two results is greater than 20 times the LoR.

^ conversion factor of 0.3261 applied to orthophosphate as PO4 value.

Table 8: QAQC Results - Water Blanks
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

				Metals (Dissolved)								Inorganics								BTEX						
				Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Zinc	Ammonia (as N)	Nitrate (as N)	Nitrite (as N)	Total Oxidised Nitrogen (as N)	Total Kjeldahl Nitrogen	Total Nitrogen (as N)	Phosphorus (as P)	Ortho-phosphate (as P)	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Total Xylene	Total BTEX
Units				*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*mg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
LoR				0.001	0.0001	0.001	0.001	0.001	0.0001	0.001	0.005	0.01	0.01	0.01	0.01	0.1	0.1	0.01	0.01	1	2	2	2	2	2	1
Field ID	**Date**	**Sample Type**	**Lab Report No.**																							
QC301	4/07/2024	Rinsate	EP2409636	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005	-	-	-	-	-	-	-	-	<1	<2	<2	<2	<2	<2	<1
QC302	5/07/2024	Rinsate	EP2409638	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.005	<0.01	<0.01	<0.01	<0.01	<0.1	<0.1	<0.01	<0.01	<1	<2	<2	<2	<2	<2	<1
QC402	5/07/2024	Trip Blank (W)	EP2409638	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<1	<2	<2	<2	<2	<2	<1
QC403	5/07/2024	Trip Blank(W)	EP2409638	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

				Total Petroleum Hydrocarbons					Total Recoverable Hydrocarbons							PAHs	
				C6-C9 Fraction	C10-C14 Fraction	C15-C28 Fraction	C29-C36 Fraction	C10-C36 Fraction (Sum)	C6-C10 Fraction	C6-C10 Fraction minus BTEX (F1)	>C10-C16 Fraction	>C10-C16 Fraction minus naphthalene (F2)	>C16-C34 Fraction	>C34-C40 Fraction	>C10-C40 Fraction (Sum)	Naphthalene	Naphthalene (VOC)
Units				*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
LoR				20	50	100	50	50	20	20	100	100	100	100	100	5	5
Field ID	**Date**	**Sample Type**	**Lab Report No.**														
QC301	4/07/2024	Rinsate	EP2409636	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	-	<5
QC302	5/07/2024	Rinsate	EP2409638	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<5	-
QC402	5/07/2024	Trip Blank (W)	EP2409638	<20	-	-	-	-	<20	<20	-	-	-	-	-	<5	-
QC403	5/07/2024	Trip Blank(W)	EP2409638	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 8: QAQC Results - Water Blanks
Baseline Assessment - Perdaman Burrup Lateral Pipeline,
Australian Gas Infrastructure Group

				(n:2) Fluorotelomer Sulfonic Acids				Perfluoroalkane Carboxylic Acids											Perfluoroalkane Sulfonic Acids						
				4:2 Fluorotelomer sulfonic acid (4:2 FTS)	6:2 Fluorotelomer Sulfonate (6:2 FtS)	8:2 Fluorotelomer sulfonic acid (8:2 FTS)	10:2 Fluorotelomer sulfonic acid (10:2 FTS)	Perfluorohexanoic acid (PFHxA)	Perfluorododecanoic acid (PFDoDA)	Perfluorononanoic acid (PFNA)	Perfluoropentanoic acid (PFPeA)	Perfluorotetradecanoic acid (PFTeDA)	Perfluoroheptanoic acid (PFHpA)	Perfluorobutanoic acid (PFBA)	Perfluorodecanoic acid (PFDA)	Perfluorotridecanoic acid (PFTrDA)	Perfluoroundecanoic acid (PFUnDA)	Perfluorooctanoic acid (PFOA)	Perfluorooctanesulfonic acid (PFOS)	Perfluoropentane sulfonic acid (PFPeS)	Perfluorohexane sulfonic acid (PFHxS)	Perfluoroheptane sulfonic acid (PFHpS)	Perfluorodecanesulfonic acid (PFDS)	Perfluorobutane sulfonic acid (PFBS)	Sum of PFHxS and PFOS
Units				*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
LoR				0.001	0.001	0.001	0.001	0.0005	0.0005	0.0005	0.0005	0.0005	0.0005	0.002	0.0005	0.0005	0.0005	0.0005	0.0002	0.0005	0.0005	0.0005	0.0005	0.0005	0.0002
Field ID	**Date**	**Sample Type**	**Lab Report No.**																						
QC301	4/07/2024	Rinsate	EP2409636	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0020	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0002
QC302	5/07/2024	Rinsate	EP2409638	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003
QC402	5/07/2024	Trip Blank (W)	EP2409638	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC403	5/07/2024	Trip Blank (W)	EP2409638	<0.001	<0.001	<0.001	<0.001	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.002	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005	<0.0003

				Perfluoroalkyl Sulfonamides							PFAS
				N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	N-methylperfluorooctane sulfonamidoacetic acid (NMeFOSAA)	N-ethyl-perfluorooctanesulfonamidoacetic acid (NEtFOSAA)	N-Ethyl perfluorooctane sulfonamide (EtFOSA)	N-Methyl perfluorooctane sulfonamide (MeFOSA)	N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	Perfluorooctane sulfonamide (FOSA)	Sum of PFAS
Units				*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*	*µg/L*
LoR				0.001	0.0005	0.0005	0.001	0.001	0.001	0.0005	0.0002
Field ID	**Date**	**Sample Type**	**Lab Report No.**								
QC301	4/07/2024	Rinsate	EP2409636	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0002
QC302	5/07/2024	Rinsate	EP2409638	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0003
QC402	5/07/2024	Trip Blank (W)	EP2409638	-	-	-	-	-	-	-	-
QC403	5/07/2024	Trip Blank (W)	EP2409638	<0.001	<0.0005	<0.0005	<0.001	<0.001	<0.001	<0.0005	<0.0003

Appendix A: Certificates of Title

TITLE NUMBER
Volume Folio
LR3122 50

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF CROWN LAND TITLE

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

The undermentioned land is Crown land in the name of the STATE OF WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts
REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 540 ON DEPOSITED PLAN 221364

STATUS ORDER AND PRIMARY INTEREST HOLDER:

(FIRST SCHEDULE)

STATUS ORDER/INTEREST: UNALLOCATED CROWN LAND

PRIMARY INTEREST HOLDER: STATE OF WESTERN AUSTRALIA

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:

(SECOND SCHEDULE)

1. H635745 SUNDRY. THE LAND HEREIN IS WITHIN THE DBNGP CORRIDOR PURSUANT TO THE DAMPIER TO BUNBURY PIPELINE ACT 1997. SEE LAND ADMINISTRATION PLAN 21364. REGISTERED 3/1/2001.
2. P474391 MEMORIAL. CONTAMINATED SITES ACT 2003 REGISTERED 9/3/2023.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.

--END OF CERTIFICATE OF CROWN LAND TITLE--

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	DP221364
PREVIOUS TITLE:	LR3121-860
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF KARRATHA
RESPONSIBLE AGENCY:	DEPARTMENT OF PLANNING, LANDS AND HERITAGE (SLSD)

NOTE 1: A000001A CORRESPONDENCE FILE 00564-2000-01RO.

END OF PAGE 1 - CONTINUED OVER

NOTE 2:	LAND PARCEL IDENTIFIER OF DE WITT LOCATION 540 ON SUPERSEDED PAPER CERTIFICATE OF CROWN LAND TITLE CHANGED TO LOT 540 ON DEPOSITED PLAN 221364 ON 18-SEP-02 TO ENABLE ISSUE OF A DIGITAL CERTIFICATE OF TITLE.
NOTE 3:	THE ABOVE NOTE MAY NOT BE SHOWN ON THE SUPERSEDED PAPER CERTIFICATE OF TITLE.

TITLE NUMBER
Volume Folio
LR3139 36

WESTERN AUSTRALIA

RECORD OF CERTIFICATE
OF
CROWN LAND TITLE

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

The undermentioned land is Crown land in the name of the STATE OF WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts
REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 3013 ON DEPOSITED PLAN 42282

STATUS ORDER AND PRIMARY INTEREST HOLDER:
(FIRST SCHEDULE)

STATUS ORDER/INTEREST: RESERVE WITHOUT MANAGEMENT ORDER

PRIMARY INTEREST HOLDER: STATE OF WESTERN AUSTRALIA

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:
(SECOND SCHEDULE)

1. H376396 AUTHORISATION ORDER FOR THE TAKING OF INTERESTS. AS TO PORTION ONLY. SEE DP220773. REGISTERED 29/2/2000.
2. K148618 RESERVE 49121 FOR THE PURPOSE OF INFRASTRUCTURE CORRIDOR REGISTERED 5/4/2007.
3. L596014 EASEMENT TO WATER CORPORATION FOR WATER PIPES WATER MAINS PURPOSES. SEE DEPOSITED PLAN 51731 REGISTERED 6/4/2011.
4. N441861 EASEMENT TO WATER CORPORATION FOR ACCESS PURPOSES. SEE DEPOSITED PLAN 409052. REGISTERED 23/9/2016.
5. N657873 LEASE TO WESTERN AUSTRALIAN LAND AUTHORITY OF LEVEL 6 40 THE ESPLANADE PERTH WA 6000 EXPIRES: SEE LEASE. AS TO PORTION ONLY - SEE DEPOSITED PLAN 410659. REGISTERED 27/6/2017.
    - N657896 SUB-LEASE OF LEASE N657873 TO YARA PILBARA FERTILISERS PTY LTD OF LEVEL 5 182-184 ST GEORGES TERRACE PERTH WA 6000 EXPIRES: SEE SUB LEASE. AS TO PORTION ONLY - SEE DEPOSITED PLAN 410663. REGISTERED 27/6/2017.
6. O604891 NOTIFICATION OF EASEMENT FOR PIPELINE PURPOSES PURSUANT TO SECTION 19(4) OF THE PETROLEUM PIPELINES ACT 1969 TO SANTOS WA NORTHWEST PTY LTD OF LEVEL 7 100 ST GEORGES TERRACE PERTH WA 6000, HARRIET (ONYX) PTY LTD OF LEVEL 9 191 ST GEORGES TERRACE PERTH WA 6000. AS TO PORTION ONLY - SEE DEPOSITED PLAN 51732 RECORDED 7/1/2021.
7. P167156 LEASE TO WESTERN AUSTRALIAN LAND AUTHORITY OF LEVEL 2 40 THE ESPLANADE PERTH WA 6000 EXPIRES: SEE LEASE. AS TO PORTION ONLY - SEE DEPOSITED PLAN 411761 REGISTERED 2/6/2022.

END OF PAGE 1 - CONTINUED OVER

8.	P474391	MEMORIAL. CONTAMINATED SITES ACT 2003 REGISTERED 9/3/2023.
9.	P517088	CAVEAT BY PERDAMAN CHEMICALS AND FERTILISERS PTY LTD AS TO PORTION ONLY LODGED 17/4/2023.
10.	P517173	CAVEAT BY NATIONAL AUSTRALIA BANK LIMITED AS TO PORTION ONLY LODGED 17/4/2023.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.

---------------------------------------END OF CERTIFICATE OF CROWN LAND TITLE---------------------------------------

STATEMENTS:

The statements set out below are not intended to be nor should they be relied on as substitutes for inspection of the land and the relevant documents or for local government, legal, surveying or other professional advice.

SKETCH OF LAND:	DP42282
PREVIOUS TITLE:	LR3125-423
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF KARRATHA
RESPONSIBLE AGENCY:	DEPARTMENT OF PLANNING, LANDS AND HERITAGE (SLSD)

NOTE 1:	J522939	DEPOSITED PLAN 49168 LODGED FOR INTEREST PURPOSES ONLY.
NOTE 2:	K148616	CORRESPONDENCE FILE 02024-1998-15RO
NOTE 3:	P725548	DEPOSITED PLAN 426199 LODGED
NOTE 4:	P741787	INTEREST ONLY DEPOSITED PLAN 422673 LODGED

TITLE NUMBER

Volume	Folio
LR3174	**529**

WESTERN AUSTRALIA

RECORD OF CERTIFICATE OF CROWN LAND TITLE

UNDER THE TRANSFER OF LAND ACT 1893
AND THE LAND ADMINISTRATION ACT 1997

The undermentioned land is Crown land in the name of the STATE OF WESTERN AUSTRALIA, subject to the interests and Status Orders shown in the first schedule which are in turn subject to the limitations, interests, encumbrances and notifications shown in the second schedule.

BGRoberts
REGISTRAR OF TITLES

LAND DESCRIPTION:

LOT 704 ON DEPOSITED PLAN 411759

STATUS ORDER AND PRIMARY INTEREST HOLDER:

(FIRST SCHEDULE)

STATUS ORDER/INTEREST: RESERVE WITHOUT MANAGEMENT ORDER

PRIMARY INTEREST HOLDER: WESTERN AUSTRALIAN LAND AUTHORITY OF LEVEL 2 40 THE ESPLANADE PERTH WA 6000

(L P167156) REGISTERED 2/6/2022

LIMITATIONS, INTERESTS, ENCUMBRANCES AND NOTIFICATIONS:

(SECOND SCHEDULE)

1. P081158 RESERVE 48609 FOR THE PURPOSE OF SERVICE CORRIDOR REGISTERED 18/3/2022.
2. L596014 EASEMENT TO WATER CORPORATION FOR WATER PIPES WATER MAINS PURPOSES. SEE DEPOSITED PLAN 411759. REGISTERED 6/4/2011.
3. O604891 NOTIFICATION OF EASEMENT FOR PIPELINE PURPOSES PURSUANT TO SECTION 19(4) OF THE PETROLEUM PIPELINES ACT 1969 TO SANTOS WA NORTHWEST PTY LTD OF LEVEL 7 100 ST GEORGES TERRACE PERTH WA 6000, HARRIET (ONYX) PTY LTD OF LEVEL 9 191 ST GEORGES TERRACE PERTH WA 6000. AS TO PORTION ONLY - SEE DEPOSITED PLAN 411759. RECORDED 7/1/2021.
4. P167156 LEASE. SUBJECT TO THE TERMS AND CONDITIONS AS SET OUT IN THE LEASE. REGISTERED 2/6/2022.
5. P474391 MEMORIAL. CONTAMINATED SITES ACT 2003 REGISTERED 9/3/2023.
6. P517088 CAVEAT BY PERDAMAN CHEMICALS AND FERTILISERS PTY LTD AS TO PORTION ONLY LODGED 17/4/2023.
7. P517173 CAVEAT BY NATIONAL AUSTRALIA BANK LIMITED AS TO PORTION ONLY LODGED 17/4/2023.

Warning: A current search of the sketch of the land should be obtained where detail of position, dimensions or area of the lot is required. Lot as described in the land description may be a lot or location.

END OF PAGE 1 - CONTINUED OVER

--END OF CERTIFICATE OF CROWN LAND TITLE--

STATEMENTS:

SKETCH OF LAND:	DP411759
PREVIOUS TITLE:	LR3139-38
PROPERTY STREET ADDRESS:	NO STREET ADDRESS INFORMATION AVAILABLE.
LOCAL GOVERNMENT AUTHORITY:	CITY OF KARRATHA
RESPONSIBLE AGENCY:	DEPARTMENT OF PLANNING, LANDS AND HERITAGE (SLSD)

NOTE 1:	M399633	CORRESPONDENCE FILE 00750-2003-01RO
NOTE 2:	N059155	DEPOSITED PLAN 406079 LODGED (INTEREST ONLY)
NOTE 3:	P741787	INTEREST ONLY DEPOSITED PLAN 422673 LODGED

Appendix B: Tetra Tech Coffey (2022a) Groundwater Well Installation Logs

TETRA TECH COFFEY

Environmental Log - Monitoring Well

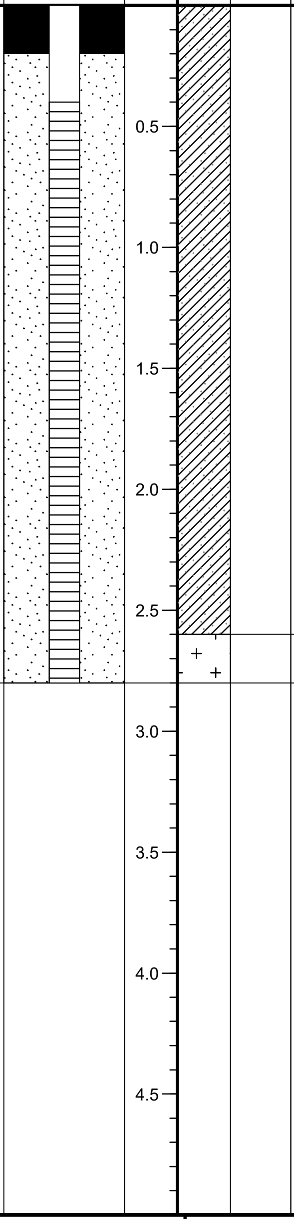
Hole ID. **MW02**
sheet: 1 of 1
project no. **754-PEREN296568**

client: **Clough**
principal: **Cameron Baldock**
project: **Perdaman Hydrological Drilling**
location: **The Perdaman site, Burrup Road, Burrup WA**

date started: **25 Jan 2022**
date completed: **25 Jan 2022**
logged by: **NT**
checked by: **BW**

position: Not Specified
surface elevation: Not Specified
angle from horizontal: 90°
equipment type:
drilling fluid:
hole diameter : 150 mm

drilling information				well details	material substance						
method & support	water	samples & field tests	photoionization detector (ppmv)	MW02	depth (m)	graphic log	classification symbol	**material description** **SOIL TYPE** plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	**structure and additional observations**
HS	25-01-22	E						**SAND CLAY**: medium grained, brown to pale brown, moderately sorted with cobbles of granophyre in places.			No visual or olfactory evidence of contamination
								GRANOPHYRE grey, staline and fresh in nature.			
								Monitoring Well MW02 terminated at 2.80 m			**backfill details:** 0.0-0.2m: Bentonite 0.2-2.8m: Sand **standpipe piezo. MW02 details:** 0.4-2.8m: screen



method

AD	auger drilling*
AS	auger screwing*
HA	hand auger
MR	mud rotary
W	washbore
AH	air hammer
HS	hand auger hollow stem flight auger
*	bit shown by suffix
e.g.	AD/T
B	blank bit
T	TC bit
V	V bit

support

M	mud
C	casing
N	nill

water

▽	10-Oct-12 water level on date shown
▶	water inflow
◀	water outflow

samples & field tests

ALT	air lift test
B	bulk disturbed sample
D	disturbed sample
E	environmental sample
SS	split spoon sample
U##	undisturbed sample ##mm diameter
WS	water sample
HB	hammer bouncing
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
PID	photoionization detector
R	refusal

classification symbol & soil description
based on Unified Classification System

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

TETRA TECH COFFEY

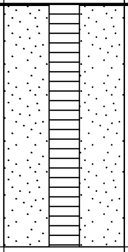
Environmental Log - Hand Auger

Hole ID.	***MW07***
sheet:	1 of 1
project no.	***754-PEREN296568***
date started:	***26 Jan 2022***
date completed:	***26 Jan 2022***
logged by:	***NT***
checked by:	***BW***

client: ***Clough***
principal: ***Cameron Baldock***
project: ***Perdaman Hydrological Drilling***
location: ***The Perdaman site, Burrup Road, Burrup WA***

position: Not Specified
surface elevation: Not Specified
angle from horizontal: 90°
equipment type: Hand Auger
drilling fluid:
hole diameter : 150 mm

drilling information | **well details** | **material substance**



method & support	water	samples & field tests	photoionization detector (ppmv)	depth (m)	graphic log	classification symbol	material description **SOIL TYPE** plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	structure and additional observations
HA N	26-01-22	E: SS12_0 E: SS12_0.5		0.5			**SAND CLAY**: fine grained, brown, very soft and saturated.			monitoring well slots surrounded by permeable sock, no gravel
		E: SS12_1.0		1.0			**CLAY**: grey black, granophyre fragments present.			monitoring well slots surrounded by permeable sock, no gravel
				1.5 2.0 2.5 3.0 3.5 4.0 4.5			Hand Auger MW07 terminated at 1.00 m			**backfill details:** 0.0-1.0m: Sand **standpipe piezo. MW07 details:** 0.0-1.0m: screen

method

AD	auger drilling*
AS	auger screwing*
HA	hand auger
MR	mud rotary
W	washbore
AH	air hammer
HS	hand auger hollow stem flight auger
*	bit shown by suffix
e.g.	AD/T
B	blank bit
T	TC bit
V	V bit

support

M	mud
C	casing
N	nill

water

▼ 10-Oct-12 water level on date shown
▶ water inflow
◀ water outflow

samples & field tests

ALT	air lift test
B	bulk disturbed sample
D	disturbed sample
E	environmental sample
SS	split spoon sample
U##	undisturbed sample ##mm diameter
WS	water sample
HB	hammer bouncing
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
PID	photoionization detector
R	refusal

classification symbol & soil description
based on Unified Classification System

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

TETRA TECH
COFFEY

Environmental Log - Hand Auger

Hole ID.	***MW08***
sheet:	1 of 1
project no.	***754-PEREN296568***

client:	***Clough***	date started:	***26 Jan 2022***
principal:	***Cameron Baldock***	date completed:	***26 Jan 2022***
project:	***Perdaman Hydrological Drilling***	logged by:	***NT***
location:	***The Perdaman site, Burrup Road, Burrup WA***	checked by:	***BW***

position: Not Specified
surface elevation: Not Specified
angle from horizontal: 90°
equipment type: Hand Auger
drilling fluid:
hole diameter : 150 mm

drilling information				**well details**	**material substance**						
method & support	water	samples & field tests	photoionization detector (ppmv)	MW08	depth (m)	graphic log	classification symbol	**material description** **SOIL TYPE** plasticity or particle characteristic, colour, secondary and minor components	moisture condition	consistency / relative density	**structure and additional observations**
HA N	26-01-22	E: SS13_0						**SAND GRAVEL**: sub-rounded to sub-angular, red brown, poorly graded, grains of granophyre, QTE and shell fragments.			no visual or olfactory evidence of contamination
		E: SS13_0.5			0.5			**CLAY**: brown, contains fragments of calcrete.			monitoring well slots surrounded by permeable sock, no gravel
		E: SS13_0.75						Hand Auger MW08 terminated at 0.75 m			**backfill details:** 0.0-0.75m: Sand **standpipe piezo. MW08 details:** 0.0-0.75m: screen
					1.0						
					1.5						
					2.0						
					2.5						
					3.0						
					3.5						
					4.0						
					4.5						

method

AD	auger drilling*
AS	auger screwing*
HA	hand auger
MR	mud rotary
W	washbore
AH	air hammer
HS	hand auger hollow stem flight auger
*	bit shown by suffix
e.g.	AD/T
B	blank bit
T	TC bit
V	V bit

support

M	mud
C	casing
N	nill

water

▽	10-Oct-12 water level on date shown
▶	water inflow
◀	water outflow

samples & field tests

ALT	air lift test
B	bulk disturbed sample
D	disturbed sample
E	environmental sample
SS	split spoon sample
U##	undisturbed sample ##mm diameter
WS	water sample
HB	hammer bouncing
N	standard penetration test (SPT)
N*	SPT - sample recovered
Nc	SPT with solid cone
PID	photoionization detector
R	refusal

classification symbol & soil description
based on Unified Classification System

moisture

D	dry
M	moist
W	wet
Wp	plastic limit
Wl	liquid limit

consistency / relative density

VS	very soft
S	soft
F	firm
St	stiff
VSt	very stiff
H	hard
Fb	friable
VL	very loose
L	loose
MD	medium dense
D	dense
VD	very dense

Appendix C: DWER Contaminted Sites Notice of Classification

Government of **Western Australia**
Department of **Water and Environmental Regulation**

Your ref:
Our ref: DMO 11605
Enquiries: Sharon Gray
Phone: 1300 762 982
Fax: (08) 6364 7001
Email: info@dwer.wa.gov.au

State Land Services
Department of Planning, Lands and Heritage
Locked Bag 2506
Perth WA 6001

Dear Sir/Madam

This letter is the formal notice of classification of a known or suspected contaminated site in which you have an interest. This constitutes the notice the Department of Water and Environmental Regulation (the department) is legally obliged to give under the *Contaminated Sites Act 2003* (the Act), which came into effect on 1 December 2006.

The Act was set up to record and manage contaminated sites in Western Australia, in order to protect people's health and the environment. Please note that contamination does not necessarily mean that an area is unsafe to live or work in – for example, it may be limited to groundwater, and only becomes an issue to be managed if a groundwater bore was being considered.

This notice explains why the site has been classified, what restrictions, if any, have been placed on the use of the site and how you can appeal the classification. In some cases, this notice may include other lots which also form part of the classified site, in addition to the lot in which you have an interest.

If, after reading this letter, you have any further queries, please contact the department on 1300 762 982 (Contaminated Sites Information Line).

NOTICE OF A CLASSIFICATION OF A KNOWN OR SUSPECTED CONTAMINATED SITE GIVEN UNDER SECTION 15 OF THE *CONTAMINATED SITES ACT 2003*

The site detailed below **(the site),** consisting of 8 parcel(s) of land, was reported to the CEO of the department as a known or suspected contaminated site and has been classified under the Act:

- LOT 3013 ON DEPOSITED PLAN 42282 as shown on certificate of title LR3139/36 known as Burrup WA 6714
- LOT 540 ON DEPOSITED PLAN 221364 as shown on certificate of title LR3122/50 known as Burrup WA 6714
- LOT 640 ON DEPOSITED PLAN 29300 as shown on certificate of title LR3003/200 known as Burrup WA 6714
- LOT 704 ON DEPOSITED PLAN 411759 as shown on certificate of title LR3174/529 known as Barrup WA 6714
- LOT 703 ON DEPOSITED PLAN 411759 as shown on certificate of title LR3174/528 known as Barrup WA 6714
- LOT 707 ON DEPOSITED PLAN 411759 as shown on certificate of title LR3174/531 known as Barrup WA 6714
- LOT 705 ON DEPOSITED PLAN 411759 as shown on certificate of title LR3174/530 known as Barrup WA 6714
- Approximate spatial representation of section of LOT 700 ON DEPOSITED PLAN 411759 (Landgate PIN 12574931) as shown on certificate of title 4017/305, Burrup WA 6714

This notification is being sent to you in accordance with section 15(1) of the Act on the grounds that you, as the recipient, are one or more of the following:

- (a) owner of the site (contact details sourced from the current certificate of title);
- (b) occupier of the site;
- (c) relevant public authority;
- (d) person who, in the CEO's opinion, there is particular reason to notify;
- (e) person who made the report under section 11 or 12; and
- (f) person who, in the CEO's opinion, may be responsible for remediation of a site classified as *contaminated – remediation required.*

Site Classification

Category of site classification: Possibly contaminated - investigation required

Date of site classification: 06/02/2023

Reasons for classification: This site was reported to the Department of Water and Environmental Regulation (the department) as per reporting obligations under section 11 of the 'Contaminated Sites Act 2003' (the Act), which commenced on 1 December 2006.

The site has been classified under section 13 of the Act based on information submitted to the department by November 2022.

A nearby site at Lot 3017 Village Road, Burrup has been used as an ammonium nitrate production facility (known as the TAN plant) since 2017. Contamination assessments carried out in 2017-2018 found ammonia, nitrates and nitrites at elevated concentrations in soil and groundwater at the TAN plant. The contamination assessments were undertaken following unauthorised releases in 2017 to 2018 of ammonium nitrate solution, cooling water containing corrosion inhibitor and process effluent containing ammonium and nitrate, into soils and groundwater at the TAN plant due to faulty infrastructure.

A series of groundwater investigations between 2017 and 2021 found that concentrations of nitrate and ammonia in groundwater at the TAN plant exceeded Water Quality Australia's default guideline values for the protection of aquatic ecosystems, and site-specific assessment criteria developed in accordance with ANZECC & ARMCANZ 2000 for aquatic ecosystems (for 90% and 99% species protection level i.e. moderate and high level of ecological protection [LEP]). Aquatic ecosystems criteria are relevant due to the location of the TAN plant upstream of marine and ephemeral supratidal flats and King Bay.

The investigations found that groundwater nutrient seepage was occurring via the toe of the TAN plant embankment into the adjacent supratidal flats at the site.

The receiving sediments of the adjacent 'upper' supratidal flats (moderate LEP) were found to be acting as a nutrient sink, with potential for migration to downstream areas in the 'lower' supratidal flats and King Bay (high LEP) during high rainfall events.

A Detailed Ecological Risk Assessment (DERA) was undertaken in 2020 to assess the level of environmental risk posed by substances present in surface waters and sediments. Site-specific risk assessment criteria were developed for the upper and lower supratidal flats, King Bay and Hearson Cove in accordance with ANZECC & ARMCANZ 2000.

Following a significant rainfall event 16-24 May 2021, environmental monitoring data indicated unacceptably high concentrations of nitrate in surface waters migrating from the TAN plant, with the potential to impact sensitive ecological receptors in the supratidal flats and King Bay. Nitrates were found to be present in surface waters and sediments of the supratidal flats exceeding Water Quality Australia's default guideline values for the protection of aquatic ecosystems and the developed site-specific assessment criteria developed for aquatic ecosystems (moderate and high LEP).

Chlorophyll-a in surface waters of the supratidal flats exceeded Water Quality Australia's default guideline values for the protection of aquatic ecosystems. Algal growth was detected within the mangrove intertidal zone of King Bay in July 2021, exceeding the developed site-specific environmental quality guidelines. Further environmental investigations are being undertaken to further determine the level of environmental impact and risk posed to off-site sensitive receptors.

A Remediation Action Plan has been in development for the TAN plant since mid-2021, including provision for active remediation comprising groundwater extraction/storage/treatment and in-situ enhanced bioremediation of groundwater beneath the plant. The active remediation works are aimed at reducing the nutrient loading in groundwater and surface water migrating from the site. Implementation of RAP drainage management provisions commenced in 2021, and groundwater remediation infrastructure works in 2022, with completion of all works expected by end of 2023.

An accredited contaminated sites auditor (the auditor) has reviewed the investigations and risk assessment to date. The auditor's findings are documented in mandatory auditor's report dated 3 December 2020. The department accepts the auditor's recommendation that active remediation is required at the TAN plant and that environmental investigations are progressing in accordance with the department's contaminated sites guidelines and the 'National Environment Protection (Assessment of Site Contamination) Measure 1999' (the NEPM) guidelines, to address data gaps and further assess the level of environmental risk posed to sensitive ecological receptors.

There are grounds to indicate possible contamination of the site and investigations and a risk assessment to determine the risk to human health, the environment, and environmental values has not been fully carried out. Therefore, the site is classified as 'possibly contaminated - investigation required'.

A memorial stating the site's classification will be placed on the certificate of title, and will notify any prospective owners of the contamination status of the site.

The department, in consultation with the Department of Health, has classified this site based on the information available to the department at the time of classification. It is acknowledged that the contamination status of the site may have changed since the information was collated and/or submitted to the department, and as such, the usefulness of this information may be limited.

In accordance with Department of Health advice, if groundwater is being, or is proposed to be abstracted, the department recommends that analytical testing should be carried out to determine whether the groundwater is suitable for its intended use.

Other Relevant Information:

Additional information included herein is relevant to the contamination status of the site and includes the department's expectations for action that should be taken to address potential or actual contamination described in the Reasons for Classification.

Based on the available information, contamination present on this site has originated from nearby land at Lot 3017, which has been classified separately under the Act. Therefore, this site is consistent with the definition of an "affected site" as specified in Part 1, Section 3 of the Act. Under the Act, the person responsible for the remediation of a source site is also responsible for remediation of any related affected sites.

Action Required:

Further soil, groundwater, sediment and surface water investigations, are required to determine the contamination status of the site. Investigations are to be carried out in accordance with the department's contaminated sites guidelines and the 'National Environment Protection (Assessment of Site Contamination) Measure 1999' (the NEPM).

General Information

The nature and extent of contamination and any restrictions on the use of the land, if applicable, are listed in Attachment A.

Information relating to the classification of the site is also available by submitting a request for a summary of records (using Form 2) to: Department of Water and Environmental Regulation, Locked Bag 10, Joondalup DC, WA 6919. A fee of $30 currently applies for a Basic Summary of Records. Forms are available from www.der.wa.gov.au/contaminatedsites.

In some instances the department has had to classify sites based on historical information. A site may be re-classified at any stage when additional information becomes available, for example where a new investigation or remediation report completed in accordance with the department's 'Contaminated Sites Guidelines' and the *National Environment Protection (Assessment of Site Contamination) Measure 1999*, is submitted to the department. The current site classification is the classification most recently conferred on the site.

Memorials

In accordance with section 58(1) of the Act, the department will lodge a memorial with the Registrar of Landgate, recording the classification against the site's Certificate(s) of Title. Parcel(s) without a registration number or certificate of title will not have a memorial lodged against them until a certificate of title has been created. Once complete, confirmation of the lodgement of the memorial(s) will be forwarded to the following people:

(a) each owner,
(b) Western Australian Planning Commission;
(c) CEO of the Department of Health;
(d) Local Government Authority;
(e) relevant scheme authority.

Given that memorial(s) will be lodged against the site, the Western Australian Planning Commission (WAPC) may not approve the subdivision of the land under Section 135 of the *Planning and Development Act 2005*, or the amalgamation of that land with any other land without seeking, and taking into account, the advice of the department as to the suitability of the land for subdivision or amalgamation. Furthermore, a responsible authority (e.g. Local Government Authorities) may not grant approval under a scheme for any proposed development of the land without seeking, and taking into account, advice from the department as to the suitability of the proposed development.

Appealing the Site Classification

All site classifications given by the department are appealable. However, only certain people can lodge a valid appeal. The people who can lodge a valid appeal varies, depending on the classification category, as detailed in Fact Sheet 4: *Site classifications and appeals*. Appeals need to be lodged in writing with the Contaminated Sites Committee at Forrest Centre, Level 22, 221 St Georges Terrace, Perth WA 6000, within **45 days** of being given this notification. The appeal should set out the appellant's relationship to the site, and must include the grounds and facts upon which it is based. An appeal fee (currently $45) applies.

To find out more about the appeal process, see the Contaminated Sites Committee website at www.csc.wa.gov.au or contact the office of the Committee on (08) 6364 7264.

For further information on all aspects of site classification, please refer to Fact Sheet 4 and the 'Contaminated Sites Guidelines', which are available from the department's website at www.der.wa.gov.au/contaminatedsites or by contacting the Contaminated Sites Information Line on 1300 762 982.

Yours sincerely

Penny Woodberry, Manager

CONTAMINATED SITES REGULATION
Delegated Officer under section 91
of the *Contaminated Sites Act 2003*

09/02/2023

Enc. Attachment A – Nature and Extent and Restrictions on Use.

Fact Sheet 4: *Site classifications and appeals*
Fact Sheet 5: *Buyer beware – buying and selling contaminated land*

ATTACHMENT A – Nature and Extent and Restrictions on Use

- LOT 3013 ON DEPOSITED PLAN 42282
- LOT 540 ON DEPOSITED PLAN 221364
- LOT 640 ON DEPOSITED PLAN 29300
- LOT 704 ON DEPOSITED PLAN 411759
- LOT 703 ON DEPOSITED PLAN 411759
- LOT 707 ON DEPOSITED PLAN 411759
- LOT 705 ON DEPOSITED PLAN 411759
- Approximate spatial representation of section of LOT 700 ON DEPOSITED PLAN 411759

Nature and Extent: Site investigations have found ammonia, nitrate and nitrite to be present in surface water and sediments at the site which originate from a nearby ammonium nitrate production facility.

Restriction on Use: Please refer to Reasons for Classification for further information on the potential contamination present at the site.

Appendix D: Site Photographs

Photograph 1.

[04 Jul 2024] – Soil bore location SB01

Photograph 2.

[04 Jul 2024] – Soil bore location SB02

Photograph 3.

[04 Jul 2024] – Soil bore location SB03

Photograph 4.

[04 Jul 2024] – Soil bore location SB04

Photograph 5.

[04 Jul 2024] – Soil bore location SB05

Photograph 6.

[04 Jul 2024] – Soil bore location SB06

Photograph 7.  **[04 Jul 2024]** – Soil bore location SB07	
Photograph 8.  **[04 Jul 2024]** – Soil bore location SB08	
Photograph 9.  **[04 Jul 2024]** – Soil bore location SB09	

Photograph 10.

[04 Jul 2024] – Soil bore location SB10

Photograph 11.

[04 Jul 2024] – Soil bore location SB11

Photograph 12.

[04 Jul 2024] – Soil bore location SB12

Photograph 13.

[05 Jul 2024] – Monitoring location MW01

Photograph 14.

[05 Jul 2024] – Monitoring location MW02

Photograph 15.

[05 Jul 2024] – Monitoring location MW03

Photograph 16.

[05 Jul 2024] – Monitoring location MW04

Photograph 17.

[05 Jul 2024] – Monitoring location MW05

Photograph 18.

[05 Jul 2024] – Causeway construction, east of site

Photograph 19.

[04 Jul 2024] – Monitoring well installation (MW02)

Photograph 20.

[04 Jul 2024] – Site conditions, looking east.

Photograph 21.

[04 Jul 2024] – Site conditions, looking north

Photograph 22.

[04 Jul 2024] – Site conditions, looking west

Photograph 23.

[04 Jul 2024] – Water pipeline north of the site

Photograph 24.

[04 Jul 2024] – Drainage line discharging north of the site.

Photograph 25.

[04 Jul 2024] – North-west of the site

Photograph 26.

[04 Jul 2024] – Active works area northwest of the site.

Photograph 27.

[04 Jul 2024] – Looking south across the central portion of the site.

Appendix E: EIL Calculation Spreadsheets

NEPC
National Environment Protection Council

Ecological Investigation Level Calculation Spreadsheet

Developed by CSIRO for the National Environment Protection Council

DISCLAIMER

Background information on the EIL Calculation Spreadsheet

This spreadsheet is to be used to calculate the Ecological Investigation Levels (EILs) that are to be used in the National Environment Protection (Assessment of Site Contamination) Measure when assessing a contaminated site. The EILs are numerical limits that are designed to protect soil and terrestrial flora and fauna (including pets and wildlife) and soil microbial processes from experiencing substantial deleterious effects caused by contaminants. Ecological Investigation Levels are the ecological equivalents of the investigation levels that aim to protect human health (HILs) and groundwater (GILs). Measured concentrations of contaminants in the soil at a site are compared to the appropriate EILs and if they exceed the EILs then further investigation in the form of an ecological risk assessment that conforms to Schedule B5a (NEPC, 2011) should be conducted.

This spreadsheet uses the methodology set out in Heemsbergen et al. (2008) and Schedule B(5)b (NEPC, 2011) to calculate EILs for contaminated sites that have three land-uses: (1) national parks and areas of high conservation value; (2) urban residential and open public space; and (3) commercial and industrial land.

The toxicity data used and the actual calculations of the EILs for arsenic, chromium III, copper, DDT, lead, naphthalene, nickel and zinc are presented in Warne et al (2009) and Schedule B(5)c (NEPC, 2010). However, it should be noted that the example EIL values presented in Warne et al. (2009) have been rounded off during their calculation and therefore the values presented in that report will not match exactly with those derived by the EIL calculation spreadsheet. The EIL values calculated by the spreadsheet ALWAYS take precedence over those presented in Warne et al. (2009).

The method for deriving the EILs was developed in order to overcome all of the major limitations of the previous EILs (NEPM, 1999). The exact method used to calculate each EIL varied according to

(1) the physicochemical properties of the contaminant – which modified the key exposure pathways that were considered;

(2) whether the toxicity data could be expressed in terms of added contaminant concentrations (obtained by subtracting the background concentration from the total contaminant concentration). When such data were available a limit of how much contaminant could be added to soil before ecotoxicological effects commenced was determined – termed the Added Contaminant Level (ACL). Either a measured or predicted ambient background concentration (ABC) was then added to the ACL to obtain the EIL (see below)

EIL = ACL + ABC

The advantage of this ‘added risk’ method is that the EILs can never be less than the ambient background concentration.

When the toxicity data could not be expressed in terms of added concentration then the EIL was expressed as a total concentration, and it does not consider the ambient background concentration at the site.

(3) whether high quality empirical relationships were available that could predict the toxicity of contaminants using soil physicochemical properties. When these were available soil-specific EILs could be derived (where soils with different properties will have their own unique EIL). When these relationships were not available generic EILs (where a single numerical EIL applies to all Australian soils of a particular land-use) were derived.

(4) whether an ageing leaching factor (ALF) was available. The vast majority of toxicity data is derived from laboratory-based experiments that use freshly spiked contaminants. The two characteristics that differ between such laboratory experiments and field-based experiments are ageing and leaching of contaminants. Toxicity data from laboratory-based experiments were used to derive EILs for fresh contamination (i.e. when the contaminant has been present in the soil for less than 2 years). When ALFs were available they were used to adjust laboratory-based toxicity data to field-based data that was combined with actual field data to derive EILs for aged contamination (i.e. where the contaminant has been present in the soil for 2 or more years).

References

Heemsbergen D, Warne MStJ, McLaughlin MJ, Kookana R. 2008. A Proposed Australian Methodology to Derive Ecological Investigation Levels in Contaminated Soils. CLW Science Report. Prepared for the NEPM Review Team. 76p.

NEPC (National Environment Protection Council). 1999. National Environment Protection (Assessment of Site Contamination) Measure 1999. Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater. NEPC, Adelaide, Australia.16p.

NEPC (National Environment Protection Council). 2011. National Environment Protection (Assessment of Site Contamination) Measure. Schedule B(5)a. Guideline on Risk Assessment. National Environment Protection Council, Adelaide, South Australia. 42p.

NEPC (National Environment Protection Council). 2011. National Environment Protection (Assessment of Site Contamination) Measure. Schedule B(5)b. Guidelines on the Australian methodology to derive Ecological Investigation Levels in contaminated soils. National Environment Protection Council, Adelaide, South Australia. 85p.

NEPC (National Environment Protection Council). 2011. National Environment Protection (Assessment of Site Contamination) Measure. Schedule B(5)c. Soil quality guidelines for arsenic, chromium III, copper, DDT, lead, naphthalene, nickel and zinc. National Environment Protection Council, Adelaide, South Australia. 185p.

Warne MStJ, Heemsbergen DA, McLaughlin MJ, Kookana RS. 2009. Proposed soil quality guidelines for arsenic, chromium (III), copper, DDT, lead, naphthalene, nickel and zinc. CSIRO Land and Water Science Report 44/09. 195p.

Inputs
Select contaminant from list below
Cr_III
Below needed to calculate fresh and aged ACLs
Enter % clay (values from 0 to 100%)
6
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method)
or for aged ABCs only
Enter State (or closest State)
SA
Enter traffic volume (high or low)
low

Outputs		
Land use	Cr III soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	#NUM!	120
Urban residential and open public spaces	#NUM!	350
Commercial and industrial	#NUM!	580

Inputs
Select contaminant from list below
Cu
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
44.1
Enter soil pH (calcium chloride method) (values from 1 to 14)
8.6
Enter organic carbon content (%OC) (values from 0 to 50%)
0.14
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method)
or for aged ABCs only
Enter State (or closest State)
SA
Enter traffic volume (high or low)
low

Outputs		
Land use	Cu soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	#NUM!	70
Urban residential and open public spaces	#NUM!	170
Commercial and industrial	#NUM!	250

Inputs
Select contaminant from list below
Ni
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
44.1
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method)
or for aged ABCs only
Enter State (or closest State)
SA
Enter traffic volume (high or low)
low

Outputs

Land use	Ni soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	#NUM!	85
Urban residential and open public spaces	#NUM!	460
Commercial and industrial	#NUM!	780

Inputs
Select contaminant from list below
Zn
Below needed to calculate fresh and aged ACLs
Enter cation exchange capacity (silver thiourea method) (values from 0 to 100 cmolc/kg dwt)
44.1
Enter soil pH (calcium chloride method) (values from 1 to 14)
8.6
Below needed to calculate fresh and aged ABCs
Measured background concentration (mg/kg). Leave blank if no measured value
or for fresh ABCs only
Enter iron content (aqua regia method)
or for aged ABCs only
Enter State (or closest State)
SA
Enter traffic volume (high or low)
low

Outputs		
Land use	Zn soil-specific EILs (mg contaminant/kg dry soil)	
	Fresh	Aged
National parks and areas of high conservation value	#NUM!	340
Urban residential and open public spaces	#NUM!	1400
Commercial and industrial	#NUM!	2100

Appendix F: Field Records

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BOREHOLE LOG

MW01

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION: E476144.000 N7718707.000 (GDA2020 / MGA zone 50)
RIG TYPE: Solid Flight Auger
DATE: 04 Jul 2024
GENERAL NOTES: Piezometre - constructed with gravel sleeve, backfilled with cuttings.

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 150 mm

FINAL DEPTH: 1.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	WELL INSTALLATION	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
SFA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).			
				SM	With clay, trace gravel, grey mottled brown.			
		0.5						
		1.0						
		1.5			Terminated at 1.50 m. Target Depth Achieved.			
		2.0						

These logs have been prepared for environmental and geotechnical purposes
For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

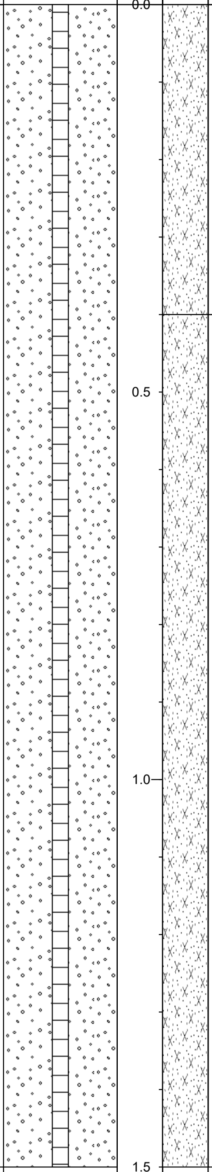
BOREHOLE LOG
MW02

Page1 of 1

PROJECT:	P21705: Pipeline Baseline Assessment		FINAL DEPTH: 1.50 m
LOCATION:	Burrup Road, Burrup, WA 6714	CLIENT: AGIG	INCLINATION: Vertical
POSITION:	E476256.000 N7718707.844 (GDA2020 / MGA zone 50)	SURFACE ELEVATION: Not measured	ORIENTATION: N/A
RIG TYPE:	Solid Flight Auger	CONTRACTOR: Karratha Building Company	CASING: Not cased
DATE:	04 Jul 2024	DIAMETER: 150 mm	DIMENSIONS: N/A

GENERAL NOTES: Piezometre - constructed with gravel sleeve, backfilled with cuttings.

LOGGED BY: ECG
CHECKED BY: AD



METHOD	WELL INSTALLATION	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
SFA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).			
		0.5		SM	With clay, trace gravel, grey mottled brown.			
		1.0						
		1.5			Terminated at 1.50 m. Target Depth Achieved.			
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

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BOREHOLE LOG
MW03

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION: E476387.360 N7718705.461 (GDA2020 / MGA zone 50)
RIG TYPE: Solid Flight Auger
DATE: 04 Jul 2024
GENERAL NOTES: Piezometre - constructed with gravel sleeve, backfilled with cuttings.

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 150 mm

FINAL DEPTH: 1.30 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	WELL INSTALLATION	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
SFA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).			
		0.5		SM	With clay, trace gravel, grey mottled brown.			
		1.0						
					Terminated at 1.30 m. Refusal on rock.			
		1.5						
		2.0						

These logs have been prepared for environmental and geotechnical purposes
For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

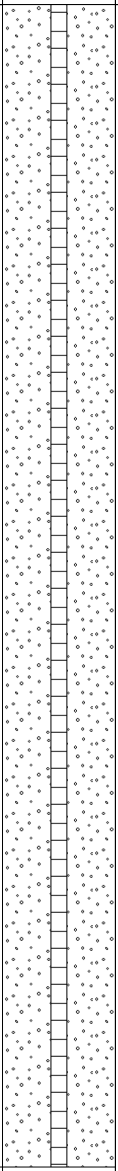
BOREHOLE LOG
MW04

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION: E476502.943 N7718711.243 (GDA2020 / MGA zone 50)
RIG TYPE: Solid Flight Auger
DATE: 04 Jul 2024
GENERAL NOTES: Piezometre - constructed with gravel sleeve, backfilled with cuttings.

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 150 mm

FINAL DEPTH: 1.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	WELL INSTALLATION	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
SFA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).			
		0.5		SM	With clay, trace gravel, grey mottled brown.			
		1.0						
		1.5			Terminated at 1.50 m. Target Depth Achieved.			
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

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BOREHOLE LOG

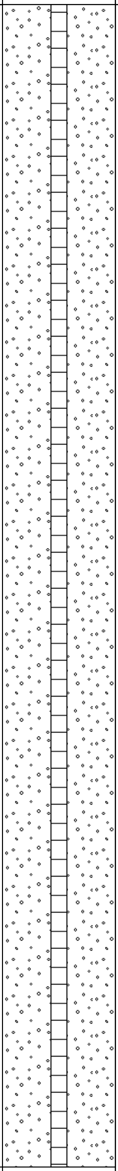
MW05

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION: E476615.234 N7718717.054 (GDA2020 / MGA zone 50)
RIG TYPE: Solid Flight Auger
DATE: 04 Jul 2024
GENERAL NOTES: Piezometre - constructed with gravel sleeve, backfilled with cuttings.

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 150 mm

FINAL DEPTH: 1.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	WELL INSTALLATION	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
SFA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).			
		0.5 1.0		SM	With clay, trace gravel, grey mottled brown.			
		1.5 2.0			Terminated at 1.50 m. Target Depth Achieved.			

These logs have been prepared for environmental and geotechnical purposes
For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG
SB01

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA	0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU EU	SB01_0-0.1 QC101, QC201 SB01_0.4-0.5	
			SM	With clay, trace cobbles, grey mottled brown, wet.			
	0.5			Terminated at 0.50 m. Target Depth Achieved.			
	1.0						
	1.5						
	2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG

SB02

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.30 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA	0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU EU	SB02_0-0.1 SB02_0.2-0.3	
				Terminated at 0.30 m. Refusal on rock.			
	0.5						
	1.0						
	1.5						
	2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG

SB03

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.40 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA	0.0	▨	SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU EU	SB03_0-0.1 SB03_0.3-0.4	
				Terminated at 0.40 m. Refusal on rock.			
	0.5						
	1.0						
	1.5						
	2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG

SB04

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A
WATER NOTE: Water observed at 0.40 m

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB04_0-0.1	
	▶			SM	With clay, wet.	EU	SB04_0.4-0.5	
		0.5			Terminated at 0.50 m. Target Depth Achieved.			
		1.0						
		1.5						
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

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BOREHOLE LOG
SB05

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A
WATER NOTE: Water observed at 0.30 m

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB05_0-0.1	
	▶			SM	Wet.	EU	SB05_0.4-0.5	
		0.5			Terminated at 0.50 m. Target Depth Achieved.			
		1.0						
		1.5						
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG
SB06

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA	0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB06_0-0.1	
			SM	With clay, mottled grey and brown.	EU	SB06_0.4-0.5	
	0.5			Terminated at 0.50 m. Target Depth Achieved.			
	1.0						
	1.5						
	2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG
SB07

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.30 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA	0.0	▨	SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU EU	SB07_0-0.1 SB07_0.2-0.3	
				Terminated at 0.30 m. Refusal on rock.			
	0.5						
	1.0						
	1.5						
	2.0						

These logs have been prepared for environmental and geotechnical purposes
For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

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BOREHOLE LOG

SB08

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.40 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA	0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, trace gravel shell fragments, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB08_0-0.1	
			SM	Without shell fragments.	EU	SB08_0.4-0.5	
				Terminated at 0.40 m. Refusal on rock.			
	0.5						
	1.0						
	1.5						
	2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG
SB09

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
FINAL DEPTH: 0.50 m
LOCATION: Burrup Road, Burrup, WA 6714
CLIENT: AGIG
INCLINATION: Vertical
POSITION:
SURFACE ELEVATION: Not measured
ORIENTATION: N/A
RIG TYPE: Hand Auger
CONTRACTOR: Karratha Building Company
CASING: Not cased
DATE: 04 Jul 2024
DIAMETER: 100 mm
DIMENSIONS: N/A
GENERAL NOTES: N/A
LOGGED BY: ECG
WATER NOTE: Water observed at 0.20 m
CHECKED BY: AD

METHOD	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA		0.0		SM	Silty SAND, poorly graded, fine to coarse, sub-rounded to sub-angular, non plastic silt, trace shell fragments, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB09_0-0.1	
	▶			SM	Without shell fragments, wet.	EU	SB09_0.4-0.5	
		0.5			Terminated at 0.50 m. Target Depth Achieved.			
		1.0						
		1.5						
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

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BOREHOLE LOG

SB10

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A
WATER NOTE: Water observed at 0.40 m

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA		0.0		SM	Silty SAND, poorly graded, medium to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB10_0-0.1 QC102, QC202	
				SM	Fine to coarse.			
	▶			SM	With clay, grey mottled brown, wet.	EU	SB10_0.4-0.5	
		0.5			Terminated at 0.50 m. Target Depth Achieved.			
		1.0						
		1.5						
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG

SB11

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PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A
WATER NOTE: Water observed at 0.40 m

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA		0.0		SM	Silty SAND, poorly graded, medium to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB11_0-0.1	
				SM	Fine to coarse.			
	▶			SM	With clay, grey mottled brown, wet.	EU	SB11-0.4-0.5	
		0.5			Terminated at 0.50 m. Target Depth Achieved.			
		1.0						
		1.5						
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

BOREHOLE LOG
SB12

Page1 of 1

PROJECT: P21705: Pipeline Baseline Assessment
LOCATION: Burrup Road, Burrup, WA 6714
POSITION:
RIG TYPE: Hand Auger
DATE: 04 Jul 2024
GENERAL NOTES: N/A
WATER NOTE: Water observed at 0.40 m

CLIENT: AGIG
SURFACE ELEVATION: Not measured
CONTRACTOR: Karratha Building Company
DIAMETER: 100 mm

FINAL DEPTH: 0.50 m
INCLINATION: Vertical
ORIENTATION: N/A
CASING: Not cased
DIMENSIONS: N/A
LOGGED BY: ECG
CHECKED BY: AD

METHOD	GROUND WATER LEVELS	DEPTH (m)	GRAPHIC LOG	MODIFIED GROUP SYMBOL	MATERIAL DESCRIPTION	SAMPLE TYPE	SAMPLE ID	FIELD TESTS
HA		0.0		SM	Silty SAND, poorly graded, medium to coarse, sub-rounded to sub-angular, non plastic silt, pale brown, inferred medium dense, moist (Quaternary muds).	EU	SB12_0-0.1	
				SM	Fine to coarse.			
	▶			SM	With clay, grey mottled brown, wet.	EU	SB12_0.4-0.5	
		0.5			Terminated at 0.50 m. Target Depth Achieved.			
		1.0						
		1.5						
		2.0						

These logs have been prepared for environmental and geotechnical purposes

For explanation and abbreviations and symbols, refer to Soil Description Notes & Abbreviations (SEN-TECH-051).

Monitoring Round: P21705_05 Jul 2024

Location Visit

Site ID	P21705	**Monitoring Zone**	
Location Code	MW05		
Arrival Date/Time	05/07/2024 08:41AM	**Departure Date/Time**	05/07/2024 09:10AM
Executed By	Egan Churchill-Gray		
Weather	Sunny		
Comments			

Well Information

Gatic Type	Stick up
Key Type	None
Well Condition	Good

Authorisation

Checked By	
Date Checked	

Groundwater Data

Well	-	**Date/Time**	05/07/2024 08:42AM
Measurement Method	Dip	**Dry**	No
Water Depth (mbTOC)	1.144	**Well Depth (mbTOC)**	2.36
Product Depth (mbTOC)			
Comments & Product Description	Stickup height: 0.825 magl		
Equipment ID			
Sediment Thickness (m)			
Depth to Water with Pump (m)	1.144		

gauging

Well Head PID (PPM)	
Product Confirmed by Bailer	No

Sample Data

Sampled Date/Time	05/07/2024 09:06AM
Well	
Matrix Type	Water
Equipment ID	
Sample Comments	
Field ID (Primary)	MW05

Purge Method	Low flow (peri)
Sample Method	Low flow (peri)
Waste Disposal	Surface

Purge Observations (purge start)

Purge Colour (Description)	colourless
Purge Odour (Description)	sulphurous odour
Purge Sheen (Description)	no sheen
Purge Turbidity (Description)	Slightly turbid

Sample Observations (purge end)

Sample Colour (Description)	colourless
Sample Odour (Description)	sulphurous odour
Sample Sheen (Description)	no sheen
Sample Turbidity (Description)	Slightly turbid

QA Samples

QA Sample ID (1)	
QA Sample ID (2)	
QA Sample ID (3)	
QA Sample ID (4)	

Purge/Sampling Comments

Air Bubbles in Vials	No
Headspace PID Reading(s)	
Reaction with Preservatives	No
Recharge-ability	Avg 0.1-0.4L/min
Water Depth at end of Sampling (m)	1.18

Field Chemistry

	Pump Inlet Depth	Standing Water Level	Purge rate (Field)	EC (Field)	pH (Field)	Redox (Field)	Dissolved Oxygen (Field)	Temp (Field)	Purge Volume
Time	m bTOC	m bTOC	L/min	uS/cm	pH Units	mV	mg/L	° C	L
08:43AM	1.6	1.22	0.1	192208	6.87	-46.6	1.04	24.1	0.1
08:52AM	1.6	1.215	0.1	192900	6.95	-142.2	0.51	23.9	0.6
08:58AM	1.6	1.215	0.1	187560	6.98	-149.9	0.53	24.2	1.1
09:03AM	1.6	1.225	0.1	192348	6.95	-150.2	0.53	22.5	1.6
Stabilisation *				±3% (3)	±0.05pH (3)	±10mV (3)	±10% (3)	±10% (3)	

Green indicates readings have stabilised according to the criteria shown, red indicates they haven't. The number in brackets indicates the number of readings that need to meet the criteria for the readings to be considered stable.

Monitoring Round: P21705_05 Jul 2024

Location Visit

Site ID	P21705	**Monitoring Zone**	
Location Code	MW04		
Arrival Date/Time	05/07/2024 09:22AM	**Departure Date/Time**	05/07/2024 09:53AM
Executed By	Egan Churchill-Gray		
Weather	Sunny		
Comments			

Well Information

Gatic Type	Stick up
Key Type	None
Well Condition	Good

Authorisation

Checked By	
Date Checked	

Groundwater Data

Well	-	**Date/Time**	05/07/2024 09:22AM
Measurement Method	Dip	**Dry**	No
Water Depth (mbTOC)	0.925	**Well Depth (mbTOC)**	2.11
Product Depth (mbTOC)			
Comments & Product Description	Stickup height: 0.637 magl		
Equipment ID			
Sediment Thickness (m)			
Depth to Water with Pump (m)	0.925		

gauging

Well Head PID (PPM)	
Product Confirmed by Bailer	No

Sample Data

Sampled Date/Time	05/07/2024 09:42AM
Well	
Matrix Type	Water
Equipment ID	
Sample Comments	
Field ID (Primary)	MW04

Purge Method	Low flow (peri)
Sample Method	Low flow (peri)
Waste Disposal	Surface

Purge Observations (purge start)

Purge Colour (Description)	colourless
Purge Odour (Description)	sulphurous odour
Purge Sheen (Description)	no sheen
Purge Turbidity (Description)	Slightly turbid

Sample Observations (purge end)

Sample Colour (Description)	colourless
Sample Odour (Description)	sulphurous odour
Sample Sheen (Description)	no sheen
Sample Turbidity (Description)	Slightly turbid

QA Samples

QA Sample ID (1)	
QA Sample ID (2)	
QA Sample ID (3)	
QA Sample ID (4)	

Purge/Sampling Comments

Air Bubbles in Vials	No
Headspace PID Reading(s)	
Reaction with Preservatives	No
Recharge-ability	Avg 0.1-0.4L/min
Water Depth at end of Sampling (m)	1.63

Field Chemistry

	Pump Inlet Depth	Standing Water Level	Purge rate (Field)	EC (Field)	pH (Field)	Redox (Field)	Dissolved Oxygen (Field)	Temp (Field)	Purge Volume
Time	m bTOC	m bTOC	L/min	uS/cm	pH Units	mV	mg/L	° C	L
09:26AM	1.5	1.05	0.1	172682	7.37	-92.6	2.58	23.4	0.1
09:36AM	1.5	1.23	0.1	173310	7.4	-86.4	2.55	23.7	0.6
09:40AM	1.5	1.35	0.1	173491	7.4	-85.1	2.59	23.6	1.1
Stabilisation *				±3% (3)	±0.05pH (3)	±10mV (3)	±10% (3)	±10% (3)	

Green indicates readings have stabilised according to the criteria shown, red indicates they haven't. The number in brackets indicates the number of readings that need to meet the criteria for the readings to be considered stable.

Monitoring Round: P21705_05 Jul 2024

Location Visit

Site ID	P21705	**Monitoring Zone**	
Location Code	MW03		
Arrival Date/Time	05/07/2024 10:20AM	**Departure Date/Time**	05/07/2024 10:48AM
Executed By	Egan Churchill-Gray		
Weather	Sunny		
Comments			

Well Information

Gatic Type	Stick up
Key Type	None
Well Condition	Good

Authorisation

Checked By	
Date Checked	

Groundwater Data

Well	-	**Date/Time**	05/07/2024 10:20AM
Measurement Method	Dip	**Dry**	No
Water Depth (mbTOC)	1.051	**Well Depth (mbTOC)**	2.03
Product Depth (mbTOC)			
Comments & Product Description	Stickup height: 0.775 magl		
Equipment ID			
Sediment Thickness (m)			
Depth to Water with Pump (m)	1.051		

gauging

Well Head PID (PPM)	
Product Confirmed by Bailer	No

Sample Data

Sampled Date/Time	05/07/2024 10:35AM
Well	
Matrix Type	Water
Equipment ID	
Sample Comments	
Field ID (Primary)	MW03

Purge Method	Low flow (peri)
Sample Method	Low flow (peri)
Waste Disposal	Surface

Purge Observations (purge start)

Purge Colour (Description)	light brown
Purge Odour (Description)	no odour
Purge Sheen (Description)	no sheen
Purge Turbidity (Description)	Slightly turbid

Sample Observations (purge end)

Sample Colour (Description)	light brown
Sample Odour (Description)	no odour
Sample Sheen (Description)	no sheen
Sample Turbidity (Description)	Slightly turbid

QA Samples

QA Sample ID (1)

QA Sample ID (2)

QA Sample ID (3)

QA Sample ID (4)

Purge/Sampling Comments

Air Bubbles in Vials	No
Headspace PID Reading(s)	
Reaction with Preservatives	No
Recharge-ability	Poor <0.1L/min
Water Depth at end of Sampling (m)	1.85

Field Chemistry

	Pump Inlet Depth	Standing Water Level	Purge rate (Field)	EC (Field)	pH (Field)	Redox (Field)	Dissolved Oxygen (Field)	Temp (Field)	Purge Volume
Time	**m bTOC**	**m bTOC**	**L/min**	**uS/cm**	**pH Units**	**mV**	**mg/L**	**° C**	**L**
10:22AM	1.5	1.304	0.1	190630	7.45	-61.5	2.95	23.4	0.2
10:31AM	1.7	1.59	0.1	193313	7.4	-60.8	2.17	22.7	0.8
10:34AM	1.7	1.69	0.1	192065	7.43	-60.6	2.08	23	1.1
Stabilisation *				±3% (3)	±0.05pH (3)	±10mV (3)	±10% (3)	±10% (3)	

Green indicates readings have stabilised according to the criteria shown, red indicates they haven't. The number in brackets indicates the number of readings that need to meet the criteria for the readings to be considered stable.

Monitoring Round: P21705_05 Jul 2024

Location Visit

Site ID	P21705	**Monitoring Zone**	
Location Code	MW02		
Arrival Date/Time	05/07/2024 11:17AM	**Departure Date/Time**	05/07/2024 11:52AM
Executed By	Egan Churchill-Gray		
Weather	Sunny		
Comments			

Well Information

Gatic Type	Stick up
Key Type	None
Well Condition	Good

Authorisation

Checked By	
Date Checked	

Groundwater Data

Well	-	**Date/Time**	05/07/2024 11:17AM
Measurement Method	Dip	**Dry**	No
Water Depth (mbTOC)	0.912	**Well Depth (mbTOC)**	2.13
Product Depth (mbTOC)			
Comments & Product Description	Stickup height: 0.583 magl 0.627m after collar install post gauging		
Equipment ID			
Sediment Thickness (m)			
Depth to Water with Pump (m)	0.912		

gauging

Well Head PID (PPM)	
Product Confirmed by Bailer	No

Sample Data

Sampled Date/Time	05/07/2024 11:38AM
Well	
Matrix Type	Water
Equipment ID	
Sample Comments	Extra amber botles for lab qc
Field ID (Primary)	MW02

Purge Method	Low flow (peri)
Sample Method	Low flow (peri)
Waste Disposal	Surface

Purge Observations (purge start)

Purge Colour (Description)	colourless
Purge Odour (Description)	no odour
Purge Sheen (Description)	no sheen
Purge Turbidity (Description)	Slightly turbid

Sample Observations (purge end)

Sample Colour (Description)	colourless
Sample Odour (Description)	no odour
Sample Sheen (Description)	no sheen
Sample Turbidity (Description)	Slightly turbid

QA Samples

QA Sample ID (1)	QC104
QA Sample ID (2)	QC204
QA Sample ID (3)	
QA Sample ID (4)	

Purge/Sampling Comments

Air Bubbles in Vials	No
Headspace PID Reading(s)	
Reaction with Preservatives	No
Recharge-ability	Avg 0.1-0.4L/min
Water Depth at end of Sampling (m)	0.96

Field Chemistry

	Pump Inlet Depth	Standing Water Level	Purge rate (Field)	EC (Field)	pH (Field)	Redox (Field)	Dissolved Oxygen (Field)	Temp (Field)	Purge Volume
Time	**m bTOC**	**m bTOC**	**L/min**	**uS/cm**	**pH Units**	**mV**	**mg/L**	**° C**	**L**
11:20AM	1.5	0.98	0.1	147639	7.33	-56.9	0.7	24.7	0.2
11:28AM	1.5	0.99	0.1	147226	7.29	-60.6	0.41	25.1	0.8
11:32AM	1.5	0.99	0.1	146825	7.27	-63.2	0.39	25.3	1.2
11:37AM	1.5	0.95	0.1	146987	7.24	-65.6	0.38	25.3	1.7
Stabilisation *				±3% (3)	±0.05pH (3)	±10mV (3)	±10% (3)	±10% (3)	

Green indicates readings have stabilised according to the criteria shown, red indicates they haven't. The number in brackets indicates the number of readings that need to meet the criteria for the readings to be considered stable.

Monitoring Round: P21705_05 Jul 2024

Location Visit

Site ID	P21705	**Monitoring Zone**	
Location Code	MW01		
Arrival Date/Time	05/07/2024 12:18PM	**Departure Date/Time**	05/07/2024 12:38PM
Executed By	Egan Churchill-Gray		
Weather	Sunny		
Comments			

Well Information

Gatic Type	Stick up
Key Type	None
Well Condition	Good

Authorisation

Checked By	
Date Checked	

Groundwater Data

Well	-	**Date/Time**	05/07/2024 12:18PM
Measurement Method	Dip	**Dry**	No
Water Depth (mbTOC)	0.968	**Well Depth (mbTOC)**	2.16
Product Depth (mbTOC)			
Comments & Product Description	Stickup height: 0.592 magl		
Equipment ID			
Sediment Thickness (m)			
Depth to Water with Pump (m)	0.968		

gauging

Well Head PID (PPM)	
Product Confirmed by Bailer	No

Sample Data

Sampled Date/Time	05/07/2024 12:30PM
Well	
Matrix Type	Water
Equipment ID	
Sample Comments	Extra pfas bottles for lab qc
Field ID (Primary)	MW01

Purge Method	Low flow (peri)
Sample Method	Low flow (peri)
Waste Disposal	Surface

Purge Observations (purge start)

Purge Colour (Description)	colourless
Purge Odour (Description)	no odour
Purge Sheen (Description)	no sheen
Purge Turbidity (Description)	Moderately turbid

Sample Observations (purge end)

Sample Colour (Description)	colourless
Sample Odour (Description)	no odour
Sample Sheen (Description)	no sheen
Sample Turbidity (Description)	Moderately turbid

QA Samples

QA Sample ID (1)

QA Sample ID (2)

QA Sample ID (3)

QA Sample ID (4)

Purge/Sampling Comments

Air Bubbles in Vials	No
Headspace PID Reading(s)	
Reaction with Preservatives	No
Recharge-ability	Avg 0.1-0.4L/min
Water Depth at end of Sampling (m)	1.2

Field Chemistry

	Pump Inlet Depth	Standing Water Level	Purge rate (Field)	EC (Field)	pH (Field)	Redox (Field)	Dissolved Oxygen (Field)	Temp (Field)	Purge Volume
Time	m bTOC	m bTOC	L/min	uS/cm	pH Units	mV	mg/L	° C	L
12:19PM	1.5	1.11	0.1	131422	7.56	-56.5	1.1	25	0.2
12:25PM	1.5	1.17	0.1	130733	7.56	-59.6	0.98	24.7	0.7
12:28PM	1.5	1.2	0.1	130858	7.56	-62	0.96	24.8	1
Stabilisation *				±3% (3)	±0.05pH (3)	±10mV (3)	±10% (3)	±10% (3)	

Green indicates readings have stabilised according to the criteria shown, red indicates they haven't. The number in brackets indicates the number of readings that need to meet the criteria for the readings to be considered stable.

Appendix G: Quality Assurance / Quality Control Assessment

Appendix G – Quality Assurance / Quality Control Assessment

1. Background

The data quality assurance (QA) and quality control (QC) procedures adopted by Senversa provide a consistent approach to evaluation of whether the data quality objectives (DQOs) required by the project have been achieved. The process focuses on assessment of the useability of the data in terms of accuracy and reliability in forming conclusions on the condition of the element of the environment being investigated. The approach is generally based on guidance from the following sources:

- National Environment Protection Council (NEPC) – *National Environment Protection (Assessment of Site Contamination) Amendment Measure No. 1 2013 (NEPM), Schedule B2: Guideline on Site Characterisation.*
- NEPC – *National Environment Protection (Assessment of Site Contamination) Amendment Measure No. 1 2013 (NEPM), Schedule B3: Guideline on Laboratory Analysis of Potentially Contaminated Soils.*
- United States Environmental Protection Agency (US EPA) – *Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA QA/G-4).*
- US EPA – *Guidance on Environmental Data Verification and Data Validation (EPA QA/G-8).*

2. Quality Assurance Procedure

The following data quality objectives, measures and acceptance criteria were adopted to verify compliance with the planned QA procedures:

Quality Assurance Process	**Data Quality Element**	**Objectives and Measure**	**Acceptance Criteria**
Standard Procedures	Comparability, Reproducibility, Representativeness	Standard field sampling procedures and forms used	No deviation from standard procedure and forms used
Equipment Calibration	Accuracy	All equipment calibrated in accordance with manufacturers specifications	All equipment calibrated in accordance with manufacturers specifications
Testing Method Accreditation	Accuracy and Comparability	National Association of Testing Authorities (NATA) accredited methods used for all analyses determined	Primary and secondary laboratories to use NATA accredited methods for all analytes determined
Quality Control Sampling Frequency	Precision and Repeatability	Field QC sampling frequency in accordance with AS4482.1-2005	Duplicates: ≥ 1 in 20 primary samples Triplicates: ≥ 1 in 20 primary samples Rinsate Blanks: ≥ 1 per day, per matrix per equipment Trip Blanks: ≥ 1 per esky containing samples for volatile analyses

Quality Assurance Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
Quality Control Sampling Frequency	Accuracy, Precision and Comparability	Laboratory QC analysis frequency in accordance with NEPC (2013), Schedule B3	Laboratory Duplicates – at least 1 in 10 analyses or one per process batch Method Blanks – at least 1 per process batch Surrogate Recoveries – all samples spiked where appropriate (e.g. chromatographic analysis of organics) Laboratory Control Samples – at least 1 per process batch Matrix Spikes – at least 1 per matrix type per process batch
Sample Preservation, Handling and Holding Times	Accuracy	Samples appropriately preserved upon collection , stored and transported, and analysed within holding times	Sample containers, holding times and preservation in accordance laboratory specific method requirements.
Data Management	Accuracy	No errors in data transcription	Entry of field data verified by peer.
Data Useability	Completeness	Limits of reporting (LOR) less than adopted beneficial use investigation levels. Sample volumes and analytical methods selected to enable required LOR to be achieved	LOR less than investigation levels.

3. Quality Control Sampling and Analysis

The following data quality objectives, measures and acceptance criteria were adopted to evaluate the validity of the analytical data produced.

Quality Control Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
Field Duplicate Sampling and Analysis	Precision and Field Repeatability	Field duplicate samples used assess the variability in analyte concentration between samples collected from the sample location and the reproducibility of the laboratory analysis. Where required, resubmission of previously analysed samples for chemicals within their holding times may be undertaken to further assess level of precision.	Analysed for same chemicals as primary sample RPD[1] <30% of mean concentration where both concentrations >20 x LOR RPD <50% of mean concentration where higher concentration 10 – 20 x LOR RPD - No limit where both concentrations < 10 x LOR

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[1] Relative Percent Difference (%): Calculated as: ([Result No.1 – Result No. 2] ÷ Mean Result) × 100

Quality Control Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
Triplicate Sampling and Analysis	Accuracy	Results are accurate and free from laboratory error. Triplicate samples sent to a secondary laboratory to assess the accuracy of the analyte concentrations reported by the primary laboratory	Analysed for same chemicals as primary sample RPD <30% of mean concentration where both concentrations >20 x LOR RPD <50% of mean concentration where higher concentration 10 – 20 x LOR RPD - No limit where both concentrations < 10 x LOR
Field Rinsate Blank Preparation and Analysis	Accuracy and Representativeness	Cross contamination of samples does not occur between sampling locations due to carry-over from sampling equipment. Rinsate blank samples prepared for each sampling procedure. Where possible the rinsate blanks are prepared immediately after sampling locations known to contain concentrations of the chemicals of concern above the LOR and / or before sampling locations where the chemicals being targeted in the laboratory analysis are to be compared to investigation levels near the LOR of the chemical.	Analyte concentrations below LOR
Trip Blank Sampling and Analysis	Accuracy and Representativeness	Cross contamination between samples does not occur in transit or as an artefact of the sample handling procedure. Trip blank samples prepared by the laboratory which accompany the empty sampling containers from the laboratory to the sampling site, and return with the samples to the laboratory to assess whether cross contamination occurs between samples or as an artefact of the sampling procedure.	Analyte concentrations below LOR
Laboratory QC Analysis	Laboratory Precision and Accuracy	Laboratory duplicates	As specified by the laboratory.
		Laboratory control spike	Dynamic recovery limits as specified by the laboratory.
		Certified reference material	As specified by the laboratory (generally dynamic recovery limits).
		Surrogate recovery	Dynamic recovery limits as specified by the laboratory.

Quality Control Process	Data Quality Element	Objectives and Measure	Acceptance Criteria
Laboratory QC Analysis		Matrix spike recovery	Recovery 70% – 130% or dynamic recovery limits specified by laboratory. However, note that recovery of phenols is generally significantly lower and a recovery in the range 20% to 130% is considered acceptable by most laboratories.
		Matrix spike recovery duplicate	RPD < 30%, or as specified by the laboratory.

4. Data Verification and Validation

The data validation process involved the checking of analytical procedure compliance with acceptance criteria and an assessment of the accuracy and precision of analytical data from the range of quality control indicators generated from both the sampling and analytical programmes.

RPDs results are provided in **Table 3** and **Table 7**, and blank results are provided in **Table 4** and **Table 8**.

4.1 Holding Times

Samples were generally analysed within recommended holding times, except for the following instances:

- EP2409638:
  - Analysis holding time overdue for: pH (8 days) in MW01 - MW05, and QC104.
  - Nitrite as N (1 day) in MW01 - MW05, QC104, QC302.
  - Reactive Phosphorus as P (1 day) in MW01 - MW05, QC104, QC302.

4.2 QC Frequencies

Laboratory duplicates were analysed at the required frequencies, except for the following instances:

- EP2409636:
  - Per- and Polyfluoroalkyl Substances (PFAS) (5.56 Actual/10.00 Expected)
  - TRH - Semivolatile Fraction (5.88 Actual/10.00 Expected)
- EP2409638:
  - TRH - Semivolatile Fraction (5.88 Actual/10.00 Expected)

Matrix spikes were analysed at the required frequencies, except for the following instances:

- EP2409638:
  - PFAS (0.00 Actual/10.00 Expected)

The above non-conformances are not considered to impact the quality of the data or data interpretation as additional laboratory tests (e.g. method blanks, surrogate recoveries, and laboratory control samples) were analysed over the entire sampling program at an acceptable frequency for these contaminants of potential concern (COPCs).

4.3 Matrix Spike Recoveries

Matrix spike recoveries were generally within the acceptable limits, except for the following instances:

- EP2409636 - Anonymous QC sample: Perfluorooctane sulfonic acid (PFOS) recovery not determined, background level greater than or equal to 4x spike level

- 1115574 - Low recovery for chromium (67%) below acceptance limit (75 - 125%)

There may be a low bias in reported results where matrix spike recoveries were below acceptable range. This was considered during data assessment. Laboratory report 1115574 present analysis of triplicates, and primary samples were used for final data assessment. Non-conformances did not affect the data interpretation as the results were generally consistent across all sampling events.

4.4 Laboratory Control Spike Recovery

Laboratory Control Spike Recoveries were generally within the acceptable limits, except for:

- EP2409636: recovery was greater than upper control limit in PAH: Acenaphthylene, Anthracene, and Pyrene.

Non-conformances in EP2409636 did not affect the data interpretation as all soil analytical results were below analyte LOR for PAHs.

4.5 Surrogate Recovery

Surrogate recoveries were generally within the acceptable limits, except for the following instances in EP2409636 (recovery greater than upper data quality objective):

- PAH: Anthracene-d10 in three samples,
- PAH: 4-Terphenyl-d14 in 14 samples,

Recoveries that are greater than the upper quality limit may have data biased to a greater concentration for associated primary sample. Non-conformances in Batch EP2409636 did not affect the data interpretation as all soil analytical results were below analyte LOR for PAHs.

4.6 Field RPDs and Blank Samples

Replicate and blank samples were collected during the investigation to confirm the repeatability and validity of the sample collection methods and resultant data. RPDs results are provided in **Table 5a**, and **Table 5b**, and blank results are provided in **Table 5c**.

All field blank results were below LOR

All RPDs were within the relevant acceptance criteria with exception of:

- Duplicate pair SB01_0-0.1 and QC101 for acidity - Acid Reacted Magnesium and acidity - Excess Acid Neutralising Capacity; between SB10_0-0.1 and QC102 for acidity - Acid Reacted Magnesium,
- Duplicate pair MW02 and QC104 for Ionic Balance,
- Triplicate pair SB01_0-0.1 and QC201 for acidity - Acid Reacted Calcium and acidity - Acid Reacted Magnesium; between SB10_0-0.1 and QC202 for acidity - Acid Reacted Calcium (39%) and acidity - Acid Reacted Magnesium,
- Triplicate pair MW02 and QC204 for Ammonia (as N), Sulfate (as SO4) (filtered), and Ionic Balance.

RPD exceedances may be associated with the heterogeneity of the soil. The other QC samples collected were all within quality limits and the soil analytical results are considered to be broadly reliable.

5. Data Suitability

While some laboratory QC non-conformances were reported, these were not considered to significantly impact on the quality or representativeness of the data, and the remainder of the QAQC results indicated that data quality was within acceptable limits. The overall results are therefore considered representative of the environmental condition of the site at the time of investigation and are suitable for their intended purpose.

Appendix H: Laboratory Reports

CERTIFICATE OF ANALYSIS

Work Order : **EP2409636**
Client : **SENVERSA PTY LTD**
Contact : MS ASHTON BETTI
Address : LEVEL 18, 140 ST GEORGES TERRACE
PERTH 6000
Telephone : +61 08 6557 8881
Project : P21705 Burrup - Baseline Assessment
Order number : PO023451
C-O-C number : ----
Sampler : Egan Churchill-Gray
Site : ----
Quote number : EN/000
No. of samples received : 29
No. of samples analysed : 29

Page : 1 of 57
Laboratory : Environmental Division Perth
Contact : Ashvini Wickramasinghe
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 08-Jul-2024 12:40
Date Analysis Commenced : 09-Jul-2024
Issue Date : 23-Jul-2024 19:38

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key :
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075(SIM): High surrogate recovery deemed acceptable as all associated analyte results are less than LOR.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(a)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.
- ASS: EA029 (SPOCAS): Analysis is performed as per the Acid Sulfate Soils Laboratory Methods Guidelines (2004) and the updated National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT (2018)
- ASS: EA033 (CRS Suite): Analysis is performed as per the Acid Sulfate Soils Laboratory Methods Guidelines (2004) and the updated National Acid Sulfate Soils Guidance: National acid sulfate soils identification and laboratory methods manual, Department of Agriculture and Water Resources, Canberra, ACT (2018)
- EP075(SIM): High LCS recovery deemed acceptable as all associated analyte results are less than LOR.
- ASS: EA029 (SPOCAS): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA033 (CRS Suite): Retained Acidity not required because pH KCl greater than or equal to 4.5
- ASS: EA029 (SPOCAS): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.
- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- ASS: EA029 (SPOCAS): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from kg/t dry weight to kg/m3 in-situ soil, multiply reported results x wet bulk density of soil in t/m3.
- ASS: EA003 (NATA Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- ED007 and ED008: When Exchangeable Al is reported from these methods, it should be noted that Rayment & Lyons (2011) suggests Exchange Acidity by 1M KCl - Method 15G1 (ED005) is a more suitable method for the determination of exchange acidity (H+ + Al3+).

- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration or as per USEPA 1633 limits where LISTED. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS and also conform to QSM 5.4 (US DoD) requirements.

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB01_0-0.1**	**SB01_0.4-0.5**	**SB02_0-0.1**	**SB02_0.2-0.3**	**SB03_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-001**	**EP2409636-002**	**EP2409636-003**	**EP2409636-004**	**EP2409636-005**
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.6**	**8.8**	**8.7**	**8.7**	**8.7**
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**8.2**	**8.4**	**8.3**	**8.3**	**8.2**
pH (Fox)	----	0.1	pH Unit	**8.1**	**7.0**	**7.3**	**7.0**	**7.1**
Reaction Rate	----	1	Reaction Unit	**1**	**1**	**1**	**2**	**2**
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**10.0**	**10.0**	**10.1**	**9.9**	**9.8**
pH OX (23B)	----	0.1	pH Unit	**8.4**	**8.5**	**8.7**	**8.5**	**8.3**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.005	% S	**0.085**	**0.147**	**0.098**	**0.109**	**0.189**
Peroxide Sulfur (23De)	----	0.005	% S	**0.143**	**0.230**	**0.105**	**0.183**	**0.270**
Peroxide Oxidisable Sulfur (23E)	----	0.005	% S	**0.059**	**0.083**	**0.007**	**0.074**	**0.080**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	5	mole H+ / t	**37**	**52**	<5	**46**	**50**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.005	% Ca	**0.244**	**0.300**	**0.240**	**0.286**	**0.304**
Peroxide Calcium (23Wh)	----	0.005	% Ca	**11.6**	**15.6**	**6.31**	**13.3**	**10.7**
Acid Reacted Calcium (23X)	----	0.005	% Ca	**11.3**	**15.3**	**6.07**	**13.0**	**10.4**
acidity - Acid Reacted Calcium (a-23X)	----	5	mole H+ / t	**5650**	**7660**	**3030**	**6520**	**5200**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.005	% S	**9.06**	**12.3**	**4.86**	**10.4**	**8.33**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB01_0-0.1**	**SB01_0.4-0.5**	**SB02_0-0.1**	**SB02_0.2-0.3**	**SB03_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-001**	**EP2409636-002**	**EP2409636-003**	**EP2409636-004**	**EP2409636-005**
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.005	% Mg	**0.098**	**0.108**	**0.097**	**0.139**	**0.149**
Peroxide Magnesium (23Tm)	----	0.005	% Mg	**0.818**	**1.36**	**0.516**	**1.30**	**1.64**
Acid Reacted Magnesium (23U)	----	0.005	% Mg	**0.721**	**1.25**	**0.419**	**1.16**	**1.49**
Acidity - Acid Reacted Magnesium (a-23U)	----	5	mole H+ / t	**593**	**1030**	**345**	**958**	**1220**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.005	% S	**0.951**	**1.65**	**0.553**	**1.54**	**1.96**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**29.5**	**41.0**	**17.5**	**37.7**	**31.2**
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**5900**	**8190**	**3500**	**7530**	**6230**
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**9.45**	**13.1**	**5.60**	**12.1**	**9.98**
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.06**	**0.08**	<0.02	**0.07**	**0.08**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**37**	**52**	<10	**46**	**50**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**3**	**4**	<1	**3**	**4**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**10.0**	**10.0**	**10.1**	**9.9**	**9.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	**0.006**	<0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			*Sample ID*	SB01_0-0.1	SB01_0.4-0.5	SB02_0-0.1	SB02_0.2-0.3	SB03_0-0.1
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	EP2409636-001	EP2409636-002	EP2409636-003	EP2409636-004	EP2409636-005
				Result	Result	Result	Result	Result
EA033-C: Acid Neutralising Capacity - Continued								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**36.0**	**46.3**	**22.7**	**45.9**	**47.8**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**7180**	**9250**	**4540**	**9170**	**9550**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**11.5**	**14.8**	**7.27**	**14.7**	**15.3**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**9.6**	**16.5**	**13.8**	**18.6**	**23.4**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**7**	**7**	**9**	**10**	**8**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**18**	**19**	**97**	**25**	**23**
Copper	7440-50-8	5	mg/kg	**27**	<5	**17**	**6**	**22**
Lead	7439-92-1	5	mg/kg	<5	<5	**6**	<5	**5**
Nickel	7440-02-0	2	mg/kg	**7**	**8**	**10**	**10**	**10**
Zinc	7440-66-6	5	mg/kg	**30**	**9**	**16**	**12**	**40**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB01_0-0.1**	**SB01_0.4-0.5**	**SB02_0-0.1**	**SB02_0.2-0.3**	**SB03_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-001**	**EP2409636-002**	**EP2409636-003**	**EP2409636-004**	**EP2409636-005**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB01_0-0.1**	**SB01_0.4-0.5**	**SB02_0-0.1**	**SB02_0.2-0.3**	**SB03_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409636-001**	**EP2409636-002**	**EP2409636-003**	**EP2409636-004**	**EP2409636-005**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB01_0-0.1**	**SB01_0.4-0.5**	**SB02_0-0.1**	**SB02_0.2-0.3**	**SB03_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409636-001**	**EP2409636-002**	**EP2409636-003**	**EP2409636-004**	**EP2409636-005**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB01_0-0.1	SB01_0.4-0.5	SB02_0-0.1	SB02_0.2-0.3	SB03_0-0.1
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-001	EP2409636-002	EP2409636-003	EP2409636-004	EP2409636-005
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**67.8**	**64.8**	**58.8**	**61.1**	**73.8**
2-Chlorophenol-D4	93951-73-6	0.5	%	**82.4**	**82.2**	**76.6**	**82.7**	**95.0**
2.4.6-Tribromophenol	118-79-6	0.5	%	**67.5**	**61.3**	**62.8**	**60.2**	**94.2**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**94.3**	**94.4**	**89.7**	**96.3**	**119**
Anthracene-d10	1719-06-8	0.5	%	**121**	**119**	**110**	**122**	**144**
4-Terphenyl-d14	1718-51-0	0.5	%	**143**	**139**	**134**	**144**	**197**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**91.2**	**86.4**	**77.2**	**82.3**	**77.2**
Toluene-D8	2037-26-5	0.2	%	**93.0**	**86.9**	**77.2**	**84.4**	**77.2**
4-Bromofluorobenzene	460-00-4	0.2	%	**90.0**	**87.3**	**77.9**	**84.6**	**77.8**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**112**	**110**	**113**	**111**	**112**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB01_0-0.1**	**SB01_0.4-0.5**	**SB02_0-0.1**	**SB02_0.2-0.3**	**SB03_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409636-001**	**EP2409636-002**	**EP2409636-003**	**EP2409636-004**	**EP2409636-005**
				Result	Result	Result	Result	Result
EP231S: PFAS Surrogate - Continued								
13C8-PFOA	----	0.0002	%	**110**	**113**	**116**	**108**	**108**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB03_0.3-0.4**	**SB04_0-0.1**	**SB04_0.4-0.5**	**SB05_0-0.1**	**SB05_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-006**	**EP2409636-007**	**EP2409636-008**	**EP2409636-009**	**EP2409636-010**
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.6**	**8.6**	**8.7**	**8.6**	**8.4**
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**8.4**	**8.3**	**8.4**	**8.3**	**8.3**
pH (Fox)	----	0.1	pH Unit	**7.0**	**7.3**	**7.3**	**7.3**	**7.1**
Reaction Rate	----	1	Reaction Unit	**2**	**1**	**1**	**2**	**1**
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**9.9**	**10.0**	**9.8**	**9.9**	**9.8**
pH OX (23B)	----	0.1	pH Unit	**8.5**	**8.3**	**8.6**	**8.3**	**8.5**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.005	% S	**0.094**	**0.751**	**0.117**	**0.510**	**0.213**
Peroxide Sulfur (23De)	----	0.005	% S	**0.165**	**0.758**	**0.177**	**0.580**	**0.252**
Peroxide Oxidisable Sulfur (23E)	----	0.005	% S	**0.071**	**0.007**	**0.060**	**0.070**	**0.039**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	5	mole H+ / t	**44**	<5	**38**	**44**	**24**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.005	% Ca	**0.284**	**0.804**	**0.356**	**0.588**	**0.373**
Peroxide Calcium (23Wh)	----	0.005	% Ca	**13.0**	**8.80**	**12.4**	**9.32**	**8.16**
Acid Reacted Calcium (23X)	----	0.005	% Ca	**12.7**	**8.00**	**12.1**	**8.73**	**7.78**
acidity - Acid Reacted Calcium (a-23X)	----	5	mole H+ / t	**6340**	**3990**	**6020**	**4360**	**3880**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.005	% S	**10.2**	**6.40**	**9.66**	**6.98**	**6.23**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB03_0.3-0.4**	**SB04_0-0.1**	**SB04_0.4-0.5**	**SB05_0-0.1**	**SB05_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-006**	**EP2409636-007**	**EP2409636-008**	**EP2409636-009**	**EP2409636-010**
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.005	% Mg	**0.110**	**0.257**	**0.143**	**0.246**	**0.148**
Peroxide Magnesium (23Tm)	----	0.005	% Mg	**1.01**	**1.55**	**1.12**	**1.92**	**1.49**
Acid Reacted Magnesium (23U)	----	0.005	% Mg	**0.904**	**1.30**	**0.978**	**1.68**	**1.34**
Acidity - Acid Reacted Magnesium (a-23U)	----	5	mole H+ / t	**743**	**1070**	**805**	**1380**	**1100**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.005	% S	**1.19**	**1.71**	**1.29**	**2.21**	**1.77**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**34.5**	**23.9**	**33.8**	**26.2**	**24.5**
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**6900**	**4780**	**6760**	**5230**	**4900**
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**11.0**	**7.65**	**10.8**	**8.38**	**7.85**
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.07**	<0.02	**0.06**	**0.07**	**0.04**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**44**	<10	**38**	**44**	**25**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**3**	<1	**3**	**3**	**2**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**9.9**	**10.0**	**9.8**	**9.9**	**9.8**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	**0.007**	<0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity								

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Sample ID	**SB03_0.3-0.4**	**SB04_0-0.1**	**SB04_0.4-0.5**	**SB05_0-0.1**	**SB05_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-006**	**EP2409636-007**	**EP2409636-008**	**EP2409636-009**	**EP2409636-010**
				Result	Result	Result	Result	Result
EA033-C: Acid Neutralising Capacity - Continued								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**40.8**	**36.1**	**34.5**	**46.4**	**43.9**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**8150**	**7210**	**6890**	**9280**	**8770**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**13.1**	**11.6**	**11.0**	**14.9**	**14.0**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**20.4**	**17.1**	**21.8**	**23.9**	**20.0**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**8**	**8**	**9**	**10**	**12**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**25**	**21**	**29**	**27**	**28**
Copper	7440-50-8	5	mg/kg	**6**	**14**	**6**	**17**	**7**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**11**	**9**	**13**	**12**	**13**
Zinc	7440-66-6	5	mg/kg	**12**	**23**	**14**	**27**	**14**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB03_0.3-0.4**	**SB04_0-0.1**	**SB04_0.4-0.5**	**SB05_0-0.1**	**SB05_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-006**	**EP2409636-007**	**EP2409636-008**	**EP2409636-009**	**EP2409636-010**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB03_0.3-0.4**	**SB04_0-0.1**	**SB04_0.4-0.5**	**SB05_0-0.1**	**SB05_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-006**	**EP2409636-007**	**EP2409636-008**	**EP2409636-009**	**EP2409636-010**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	----	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB03_0.3-0.4**	**SB04_0-0.1**	**SB04_0.4-0.5**	**SB05_0-0.1**	**SB05_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-006**	**EP2409636-007**	**EP2409636-008**	**EP2409636-009**	**EP2409636-010**
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			*Sample ID*	SB03_0.3-0.4	SB04_0-0.1	SB04_0.4-0.5	SB05_0-0.1	SB05_0.4-0.5
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	EP2409636-006	EP2409636-007	EP2409636-008	EP2409636-009	EP2409636-010
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**60.9**	**60.2**	**89.4**	**82.3**	**89.6**
2-Chlorophenol-D4	93951-73-6	0.5	%	**83.2**	**85.7**	**81.3**	**73.3**	**80.0**
2.4.6-Tribromophenol	118-79-6	0.5	%	**62.4**	**62.0**	**57.8**	**55.2**	**52.0**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**95.9**	**101**	**97.6**	**89.6**	**96.8**
Anthracene-d10	1719-06-8	0.5	%	**120**	**125**	**120**	**113**	**123**
4-Terphenyl-d14	1718-51-0	0.5	%	**147**	**152**	**147**	**135**	**148**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**90.1**	**89.1**	**94.0**	**97.0**	**97.4**
Toluene-D8	2037-26-5	0.2	%	**90.6**	**90.3**	**95.4**	**97.2**	**97.0**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB03_0.3-0.4**	**SB04_0-0.1**	**SB04_0.4-0.5**	**SB05_0-0.1**	**SB05_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-006**	**EP2409636-007**	**EP2409636-008**	**EP2409636-009**	**EP2409636-010**
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued								
4-Bromofluorobenzene	460-00-4	0.2	%	**91.5**	**90.1**	**93.6**	**95.6**	**94.4**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**110**	**112**	**120**	**108**	**129**
13C8-PFOA	----	0.0002	%	**102**	**112**	**93.5**	**114**	**118**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB06_0-0.1	SB06_0.4-0.5	SB07_0-0.1	SB07_0.2-0.3	SB08_0-0.1
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-011	EP2409636-012	EP2409636-013	EP2409636-014	EP2409636-015
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.6**	**8.5**	**8.7**	**8.6**	**8.7**
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**8.4**	**8.4**	**8.4**	**8.4**	**8.4**
pH (Fox)	----	0.1	pH Unit	**7.2**	**7.6**	**7.0**	**7.3**	**7.0**
Reaction Rate	----	1	Reaction Unit	**1**	**2**	**1**	**2**	**1**
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**9.9**	**9.7**	**9.8**	**9.9**	**10.0**
pH OX (23B)	----	0.1	pH Unit	**8.3**	**8.4**	**8.3**	**8.4**	**8.4**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.005	% S	**0.276**	**0.276**	**0.237**	**0.133**	**0.172**
Peroxide Sulfur (23De)	----	0.005	% S	**0.370**	**0.532**	**0.367**	**0.243**	**0.310**
Peroxide Oxidisable Sulfur (23E)	----	0.005	% S	**0.094**	**0.255**	**0.130**	**0.110**	**0.138**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	5	mole H+ / t	**58**	**159**	**81**	**68**	**86**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.005	% Ca	**0.389**	**0.370**	**0.348**	**0.289**	**0.302**
Peroxide Calcium (23Wh)	----	0.005	% Ca	**11.2**	**8.62**	**17.8**	**17.8**	**21.6**
Acid Reacted Calcium (23X)	----	0.005	% Ca	**10.8**	**8.25**	**17.5**	**17.5**	**21.3**
acidity - Acid Reacted Calcium (a-23X)	----	5	mole H+ / t	**5420**	**4120**	**8740**	**8750**	**10600**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.005	% S	**8.69**	**6.60**	**14.0**	**14.0**	**17.0**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB06_0-0.1**	**SB06_0.4-0.5**	**SB07_0-0.1**	**SB07_0.2-0.3**	**SB08_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-011**	**EP2409636-012**	**EP2409636-013**	**EP2409636-014**	**EP2409636-015**
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.005	% Mg	**0.174**	**0.180**	**0.233**	**0.171**	**0.152**
Peroxide Magnesium (23Tm)	----	0.005	% Mg	**1.64**	**1.53**	**2.96**	**1.58**	**1.76**
Acid Reacted Magnesium (23U)	----	0.005	% Mg	**1.47**	**1.35**	**2.72**	**1.41**	**1.61**
Acidity - Acid Reacted Magnesium (a-23U)	----	5	mole H+ / t	**1210**	**1110**	**2240**	**1160**	**1320**
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.005	% S	**1.94**	**1.78**	**3.59**	**1.86**	**2.12**
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**32.1**	**25.4**	**52.1**	**48.4**	**58.5**
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**6410**	**5070**	**10400**	**9670**	**11700**
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**10.3**	**8.12**	**16.7**	**15.5**	**18.7**
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.09**	**0.26**	**0.13**	**0.11**	**0.14**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**59**	**159**	**81**	**68**	**86**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**4**	**12**	**6**	**5**	**6**
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**9.9**	**9.7**	**9.8**	**9.9**	**10.0**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	**0.195**	<0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	**122**	<10	<10	<10
EA033-C: Acid Neutralising Capacity								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB06_0-0.1**	**SB06_0.4-0.5**	**SB07_0-0.1**	**SB07_0.2-0.3**	**SB08_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-011**	**EP2409636-012**	**EP2409636-013**	**EP2409636-014**	**EP2409636-015**
				Result	Result	Result	Result	Result
EA033-C: Acid Neutralising Capacity - Continued								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**46.8**	**28.1**	**61.6**	**57.1**	**68.3**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**9340**	**5610**	**12300**	**11400**	**13600**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**15.0**	**9.00**	**19.7**	**18.3**	**21.9**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	**0.20**	<0.02	<0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	**122**	<10	<10	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	**9**	<1	<1	<1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**19.3**	**21.3**	**17.4**	**19.6**	**14.6**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**10**	**14**	**11**	**9**	**10**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**20**	**33**	**23**	**22**	**12**
Copper	7440-50-8	5	mg/kg	**5**	**6**	**10**	**5**	<5
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**8**	**13**	**10**	**9**	**5**
Zinc	7440-66-6	5	mg/kg	**8**	**14**	**16**	**8**	**6**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB06_0-0.1**	**SB06_0.4-0.5**	**SB07_0-0.1**	**SB07_0.2-0.3**	**SB08_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-011**	**EP2409636-012**	**EP2409636-013**	**EP2409636-014**	**EP2409636-015**
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL)**			*Sample ID*	**SB06_0-0.1**	**SB06_0.4-0.5**	**SB07_0-0.1**	**SB07_0.2-0.3**	**SB08_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-011**	**EP2409636-012**	**EP2409636-013**	**EP2409636-014**	**EP2409636-015**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB06_0-0.1	SB06_0.4-0.5	SB07_0-0.1	SB07_0.2-0.3	SB08_0-0.1
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-011	EP2409636-012	EP2409636-013	EP2409636-014	EP2409636-015
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB06_0-0.1**	**SB06_0.4-0.5**	**SB07_0-0.1**	**SB07_0.2-0.3**	**SB08_0-0.1**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409636-011**	**EP2409636-012**	**EP2409636-013**	**EP2409636-014**	**EP2409636-015**
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**89.8**	**88.2**	**87.0**	**86.3**	**104**
2-Chlorophenol-D4	93951-73-6	0.5	%	**80.9**	**81.4**	**78.7**	**78.3**	**110**
2.4.6-Tribromophenol	118-79-6	0.5	%	**54.6**	**53.0**	**53.3**	**52.3**	**85.6**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**97.5**	**97.9**	**94.9**	**94.4**	**111**
Anthracene-d10	1719-06-8	0.5	%	**125**	**123**	**123**	**120**	**98.6**
4-Terphenyl-d14	1718-51-0	0.5	%	**150**	**149**	**147**	**142**	**126**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**89.6**	**98.2**	**93.0**	**91.5**	**81.7**
Toluene-D8	2037-26-5	0.2	%	**92.9**	**101**	**95.3**	**90.7**	**73.4**
4-Bromofluorobenzene	460-00-4	0.2	%	**93.1**	**99.2**	**95.9**	**88.8**	**81.8**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**112**	**114**	**110**	**101**	**118**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL)**

			Sample ID	SB06_0-0.1	SB06_0.4-0.5	SB07_0-0.1	SB07_0.2-0.3	SB08_0-0.1
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-011	EP2409636-012	EP2409636-013	EP2409636-014	EP2409636-015
				Result	Result	Result	Result	Result
EP231S: PFAS Surrogate - Continued								
13C8-PFOA	----	0.0002	%	**95.0**	**95.0**	**120**	**122**	**122**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB08_0.3-0.4**	**SB09_0-0.1**	**SB09_0.4-0.5**	**SB10_0-0.1**	**SB10_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-016**	**EP2409636-017**	**EP2409636-018**	**EP2409636-019**	**EP2409636-020**
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.7**	**8.6**	**8.6**	**8.7**	**8.6**
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**8.6**	**8.5**	**8.4**	**8.5**	**8.5**
pH (Fox)	----	0.1	pH Unit	**7.1**	**7.0**	**6.9**	**6.9**	**6.8**
Reaction Rate	----	1	Reaction Unit	**1**	**1**	**1**	**1**	**1**
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**10.0**	**9.8**	**9.8**	**10.0**	**9.8**
pH OX (23B)	----	0.1	pH Unit	**8.4**	**8.2**	**8.3**	**8.3**	**8.2**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.005	% S	**0.104**	**0.385**	**0.140**	**0.128**	**0.157**
Peroxide Sulfur (23De)	----	0.005	% S	**0.232**	**0.508**	**0.209**	**0.236**	**0.248**
Peroxide Oxidisable Sulfur (23E)	----	0.005	% S	**0.128**	**0.123**	**0.069**	**0.108**	**0.090**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	5	mole H+ / t	**80**	**76**	**43**	**67**	**56**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.005	% Ca	**0.259**	**0.468**	**0.341**	**0.274**	**0.341**
Peroxide Calcium (23Wh)	----	0.005	% Ca	**20.9**	**18.8**	**13.4**	**15.2**	**15.3**
Acid Reacted Calcium (23X)	----	0.005	% Ca	**20.6**	**18.3**	**13.1**	**14.9**	**15.0**
acidity - Acid Reacted Calcium (a-23X)	----	5	mole H+ / t	**10300**	**9130**	**6520**	**7440**	**7470**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.005	% S	**16.5**	**14.6**	**10.4**	**11.9**	**12.0**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB08_0.3-0.4	SB09_0-0.1	SB09_0.4-0.5	SB10_0-0.1	SB10_0.4-0.5
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-016	EP2409636-017	EP2409636-018	EP2409636-019	EP2409636-020
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.005	% Mg	0.125	0.188	0.170	0.140	0.186
Peroxide Magnesium (23Tm)	----	0.005	% Mg	1.84	1.99	1.21	1.43	1.78
Acid Reacted Magnesium (23U)	----	0.005	% Mg	1.71	1.80	1.04	1.29	1.59
Acidity - Acid Reacted Magnesium (a-23U)	----	5	mole H+ / t	1410	1480	854	1060	1310
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.005	% S	2.26	2.38	1.37	1.70	2.10
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	59.7	49.1	34.4	40.8	42.0
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	11900	9810	6880	8140	8400
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	19.1	15.7	11.0	13.0	13.4
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.13	0.12	0.07	0.11	0.09
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	80	77	43	67	56
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	6	3	5	4
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	10.0	9.8	9.8	10.0	9.8
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	<0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB08_0.3-0.4**	**SB09_0-0.1**	**SB09_0.4-0.5**	**SB10_0-0.1**	**SB10_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-016**	**EP2409636-017**	**EP2409636-018**	**EP2409636-019**	**EP2409636-020**
				Result	Result	Result	Result	Result
EA033-C: Acid Neutralising Capacity - Continued								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**64.6**	**59.8**	**38.7**	**59.8**	**44.2**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**12900**	**12000**	**7730**	**12000**	**8830**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**20.7**	**19.2**	**12.4**	**19.2**	**14.2**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**20.8**	**15.9**	**23.4**	**9.6**	**26.6**
EA150: Particle Sizing								
+75µm	----	1	%	----	**80**	**58**	----	----
+150µm	----	1	%	----	**72**	**28**	----	----
+300µm	----	1	%	----	**56**	**16**	----	----
+425µm	----	1	%	----	**48**	**12**	----	----
+600µm	----	1	%	----	**41**	**9**	----	----
+1180µm	----	1	%	----	**26**	**6**	----	----
+2.36mm	----	1	%	----	**12**	**3**	----	----
+4.75mm	----	1	%	----	**4**	<1	----	----
+9.5mm	----	1	%	----	<1	<1	----	----
+19.0mm	----	1	%	----	<1	<1	----	----
+37.5mm	----	1	%	----	<1	<1	----	----
+75.0mm	----	1	%	----	<1	<1	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**SB08_0.3-0.4**	**SB09_0-0.1**	**SB09_0.4-0.5**	**SB10_0-0.1**	**SB10_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-016**	**EP2409636-017**	**EP2409636-018**	**EP2409636-019**	**EP2409636-020**
				Result	Result	Result	Result	Result
EA150: Soil Classification based on Particle Size								
Clay (<2 µm)	----	1	%	----	**6**	**12**	----	----
Silt (2-60 µm)	----	1	%	----	**11**	**24**	----	----
Sand (0.06-2.00 mm)	----	1	%	----	**67**	**60**	----	----
Gravel (>2mm)	----	1	%	----	**16**	**4**	----	----
Cobbles (>6cm)	----	1	%	----	<1	<1	----	----
EA152: Soil Particle Density								
Soil Particle Density (Clay/Silt/Sand)	----	0.01	g/cm3	----	**2.66**	**2.52**	----	----
ED008: Exchangeable Cations								
Exchangeable Calcium	----	0.1	meq/100g	----	**33.8**	**22.1**	----	----
Exchangeable Magnesium	----	0.1	meq/100g	----	**9.2**	**7.3**	----	----
Exchangeable Potassium	----	0.1	meq/100g	----	**0.4**	**1.0**	----	----
Exchangeable Sodium	----	0.1	meq/100g	----	**0.6**	**1.0**	----	----
Cation Exchange Capacity	----	0.1	meq/100g	----	**44.1**	**31.4**	----	----
Exchangeable Sodium Percent	----	0.1	%	----	**1.4**	**3.2**	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**10**	**8**	**9**	**10**	**7**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**20**	**20**	**34**	**11**	**32**
Copper	7440-50-8	5	mg/kg	<5	**10**	**8**	**5**	**6**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**8**	**8**	**14**	**5**	**12**
Zinc	7440-66-6	5	mg/kg	**7**	**16**	**13**	**6**	**11**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP003: Total Organic Carbon (TOC) in Soil								
Total Organic Carbon	----	0.02	%	----	**0.14**	**0.29**	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB08_0.3-0.4	SB09_0-0.1	SB09_0.4-0.5	SB10_0-0.1	SB10_0.4-0.5
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-016	EP2409636-017	EP2409636-018	EP2409636-019	EP2409636-020
				Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB08_0.3-0.4	SB09_0-0.1	SB09_0.4-0.5	SB10_0-0.1	SB10_0.4-0.5
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-016	EP2409636-017	EP2409636-018	EP2409636-019	EP2409636-020
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB08_0.3-0.4	SB09_0-0.1	SB09_0.4-0.5	SB10_0-0.1	SB10_0.4-0.5
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-016	EP2409636-017	EP2409636-018	EP2409636-019	EP2409636-020
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**SB08_0.3-0.4**	**SB09_0-0.1**	**SB09_0.4-0.5**	**SB10_0-0.1**	**SB10_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-016**	**EP2409636-017**	**EP2409636-018**	**EP2409636-019**	**EP2409636-020**
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**101**	**92.2**	**81.0**	**93.9**	**92.7**
2-Chlorophenol-D4	93951-73-6	0.5	%	**102**	**96.0**	**81.4**	**101**	**96.8**
2.4.6-Tribromophenol	118-79-6	0.5	%	**85.7**	**82.9**	**68.4**	**75.3**	**71.1**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**103**	**118**	**99.2**	**112**	**110**
Anthracene-d10	1719-06-8	0.5	%	**113**	**115**	**98.0**	**110**	**95.7**
4-Terphenyl-d14	1718-51-0	0.5	%	**131**	**121**	**110**	**116**	**118**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**82.6**	**85.6**	**85.4**	**87.8**	**83.1**
Toluene-D8	2037-26-5	0.2	%	**75.7**	**80.0**	**76.4**	**80.9**	**75.0**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB08_0.3-0.4**	**SB09_0-0.1**	**SB09_0.4-0.5**	**SB10_0-0.1**	**SB10_0.4-0.5**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409636-016**	**EP2409636-017**	**EP2409636-018**	**EP2409636-019**	**EP2409636-020**
				Result	Result	Result	Result	Result
EP080S: TPH(V)/BTEX Surrogates - Continued								
4-Bromofluorobenzene	460-00-4	0.2	%	**83.6**	**87.1**	**87.5**	**88.4**	**85.7**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**97.5**	**118**	**106**	**104**	**106**
13C8-PFOA	----	0.0002	%	**129**	**114**	**117**	**114**	**118**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB11_0-0.1	SB11_0.4-0.5	SB12_0-0.1	SB12_0.4-0.5	QC101
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-021	EP2409636-022	EP2409636-023	EP2409636-024	EP2409636-025
				Result	Result	Result	Result	Result
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	8.5	8.6	8.5	8.6	8.9
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	8.8	8.4	8.5	8.5	8.7
pH (Fox)	----	0.1	pH Unit	7.0	6.8	6.9	6.8	7.0
Reaction Rate	----	1	Reaction Unit	1	1	1	1	1
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	9.9	9.7	9.8	9.9	9.9
pH OX (23B)	----	0.1	pH Unit	8.1	8.2	8.2	8.2	8.4
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	<2	<2	<2
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.005	% pyrite S	<0.005	<0.005	<0.005	<0.005	<0.005
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.005	% S	0.077	0.154	0.278	0.165	0.103
Peroxide Sulfur (23De)	----	0.005	% S	0.214	0.236	0.428	0.253	0.176
Peroxide Oxidisable Sulfur (23E)	----	0.005	% S	0.137	0.082	0.150	0.088	0.072
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	5	mole H+ / t	85	51	94	55	45
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.005	% Ca	0.250	0.336	0.380	0.330	0.251
Peroxide Calcium (23Wh)	----	0.005	% Ca	23.6	14.7	22.7	18.4	14.5
Acid Reacted Calcium (23X)	----	0.005	% Ca	23.4	14.4	22.4	18.0	14.3
acidity - Acid Reacted Calcium (a-23X)	----	5	mole H+ / t	11600	7160	11200	9000	7120
sulfidic - Acid Reacted Calcium (s-23X)	----	0.005	% S	18.7	11.5	17.9	14.4	11.4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB11_0-0.1	SB11_0.4-0.5	SB12_0-0.1	SB12_0.4-0.5	QC101
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-021	EP2409636-022	EP2409636-023	EP2409636-024	EP2409636-025
				Result	Result	Result	Result	Result
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.005	% Mg	0.126	0.199	0.159	0.188	0.108
Peroxide Magnesium (23Tm)	----	0.005	% Mg	1.47	1.13	1.56	1.18	1.21
Acid Reacted Magnesium (23U)	----	0.005	% Mg	1.35	0.932	1.40	0.997	1.10
Acidity - Acid Reacted Magnesium (a-23U)	----	5	mole H+ / t	1110	767	1160	820	906
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.005	% S	1.78	1.23	1.85	1.32	1.45
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	60.8	38.5	57.2	48.4	40.9
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	12200	7690	11400	9660	8160
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	19.5	12.3	18.3	15.5	13.1
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.14	0.08	0.15	0.09	0.07
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	85	51	94	55	45
Liming Rate excluding ANC	----	1	kg CaCO3/t	6	4	7	4	3
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	9.9	9.7	9.8	9.9	9.9
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	<2	<2	<2
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	<0.02	<0.02	<0.02
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	0.005	<0.005	<0.005
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	<10	<10	<10
EA033-C: Acid Neutralising Capacity								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB11_0-0.1**	**SB11_0.4-0.5**	**SB12_0-0.1**	**SB12_0.4-0.5**	**QC101**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-021**	**EP2409636-022**	**EP2409636-023**	**EP2409636-024**	**EP2409636-025**
				Result	Result	Result	Result	Result
EA033-C: Acid Neutralising Capacity - Continued								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**74.0**	**41.9**	**67.0**	**46.7**	**43.5**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**14800**	**8360**	**13400**	**9340**	**8690**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**23.7**	**13.4**	**21.5**	**15.0**	**13.9**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**1.5**	**1.5**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	<0.02	<0.02	<0.02
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	<10	<10	<10
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	<1	<1	<1
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	1.0	%	**10.7**	**27.4**	**13.9**	**25.9**	**11.9**
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**8**	**8**	**10**	**7**	**6**
Cadmium	7440-43-9	1	mg/kg	<1	<1	<1	<1	<1
Chromium	7440-47-3	2	mg/kg	**15**	**35**	**17**	**27**	**10**
Copper	7440-50-8	5	mg/kg	<5	**7**	**6**	<5	**29**
Lead	7439-92-1	5	mg/kg	<5	<5	<5	<5	<5
Nickel	7440-02-0	2	mg/kg	**5**	**13**	**7**	**9**	**5**
Zinc	7440-66-6	5	mg/kg	<5	**11**	**10**	**7**	**20**
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	SB11_0-0.1	SB11_0.4-0.5	SB12_0-0.1	SB12_0.4-0.5	QC101
				Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
	Compound	CAS Number	LOR	Unit	EP2409636-021	EP2409636-022	EP2409636-023	EP2409636-024	EP2409636-025
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
	Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
	Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^	**Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^	**Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^	**Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	**0.6**	**0.6**	**0.6**	**0.6**
^	**Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	**1.2**	**1.2**	**1.2**	**1.2**
EP080/071: Total Petroleum Hydrocarbons									
	C6 - C9 Fraction	----	10	mg/kg	<10	<10	<10	<10	<10
	C10 - C14 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
	C15 - C28 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
	C29 - C36 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^	**C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
	C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	<10	<10	<10

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB11_0-0.1**	**SB11_0.4-0.5**	**SB12_0-0.1**	**SB12_0.4-0.5**	**QC101**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409636-021**	**EP2409636-022**	**EP2409636-023**	**EP2409636-024**	**EP2409636-025**
				Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg	<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg	<100	<100	<100	<100	<100
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	<50	<50	<50	<50
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	<50	<50	<50	<50
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg	<1	<1	<1	<1	<1
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB11_0-0.1	SB11_0.4-0.5	SB12_0-0.1	SB12_0.4-0.5	QC101
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-021	EP2409636-022	EP2409636-023	EP2409636-024	EP2409636-025
				Result	Result	Result	Result	Result
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	<0.001	<0.001	<0.001
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	SB11_0-0.1	SB11_0.4-0.5	SB12_0-0.1	SB12_0.4-0.5	QC101
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409636-021	EP2409636-022	EP2409636-023	EP2409636-024	EP2409636-025
				Result	Result	Result	Result	Result
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**87.5**	**91.3**	**84.6**	**77.6**	**81.9**
2-Chlorophenol-D4	93951-73-6	0.5	%	**97.3**	**93.7**	**93.8**	**92.8**	**93.9**
2.4.6-Tribromophenol	118-79-6	0.5	%	**64.0**	**62.1**	**59.9**	**60.8**	**60.6**
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**108**	**101**	**107**	**113**	**96.1**
Anthracene-d10	1719-06-8	0.5	%	**99.1**	**103**	**105**	**104**	**100**
4-Terphenyl-d14	1718-51-0	0.5	%	**118**	**118**	**115**	**113**	**115**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**80.4**	**83.1**	**80.8**	**80.5**	**86.8**
Toluene-D8	2037-26-5	0.2	%	**71.7**	**76.6**	**72.5**	**71.9**	**76.8**
4-Bromofluorobenzene	460-00-4	0.2	%	**83.4**	**85.8**	**81.2**	**84.0**	**85.3**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**120**	**112**	**106**	**105**	**110**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**SB11_0-0.1**	**SB11_0.4-0.5**	**SB12_0-0.1**	**SB12_0.4-0.5**	**QC101**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409636-021**	**EP2409636-022**	**EP2409636-023**	**EP2409636-024**	**EP2409636-025**
				Result	Result	Result	Result	Result
EP231S: PFAS Surrogate - Continued								
13C8-PFOA	----	0.0002	%	**118**	**107**	**118**	**124**	**103**

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**QC102**	**QC103**	**QC401**	**----**	**----**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	**--------**	**--------**
				Result	Result	Result	----	----
EA002: pH 1:5 (Soils)								
pH Value	----	0.1	pH Unit	**8.7**	**----**	**----**	**----**	**----**
EA003 :pH (field/fox)								
pH (F)	----	0.1	pH Unit	**8.6**	**----**	**----**	**----**	**----**
pH (Fox)	----	0.1	pH Unit	**6.9**	**----**	**----**	**----**	**----**
Reaction Rate	----	1	Reaction Unit	**1**	**----**	**----**	**----**	**----**
EA029-A: pH Measurements								
pH KCl (23A)	----	0.1	pH Unit	**9.9**	**----**	**----**	**----**	**----**
pH OX (23B)	----	0.1	pH Unit	**8.3**	**----**	**----**	**----**	**----**
EA029-B: Acidity Trail								
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	**----**	**----**	**----**	**----**
Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	**----**	**----**	**----**	**----**
Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	**----**	**----**	**----**	**----**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.005	% pyrite S	<0.005	**----**	**----**	**----**	**----**
sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.005	% pyrite S	<0.005	**----**	**----**	**----**	**----**
sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.005	% pyrite S	<0.005	**----**	**----**	**----**	**----**
EA029-C: Sulfur Trail								
KCl Extractable Sulfur (23Ce)	----	0.005	% S	**0.162**	**----**	**----**	**----**	**----**
Peroxide Sulfur (23De)	----	0.005	% S	**0.296**	**----**	**----**	**----**	**----**
Peroxide Oxidisable Sulfur (23E)	----	0.005	% S	**0.134**	**----**	**----**	**----**	**----**
acidity - Peroxide Oxidisable Sulfur (a-23E)	----	5	mole H+ / t	**84**	**----**	**----**	**----**	**----**
EA029-D: Calcium Values								
KCl Extractable Calcium (23Vh)	----	0.005	% Ca	**0.275**	**----**	**----**	**----**	**----**
Peroxide Calcium (23Wh)	----	0.005	% Ca	**16.9**	**----**	**----**	**----**	**----**
Acid Reacted Calcium (23X)	----	0.005	% Ca	**16.6**	**----**	**----**	**----**	**----**
acidity - Acid Reacted Calcium (a-23X)	----	5	mole H+ / t	**8300**	**----**	**----**	**----**	**----**
sulfidic - Acid Reacted Calcium (s-23X)	----	0.005	% S	**13.3**	**----**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**QC102**	**QC103**	**QC401**	**----**	**----**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	**--------**	**--------**
				Result	Result	Result	----	----
EA029-E: Magnesium Values								
KCl Extractable Magnesium (23Sm)	----	0.005	% Mg	**0.135**	----	----	----	----
Peroxide Magnesium (23Tm)	----	0.005	% Mg	**2.00**	----	----	----	----
Acid Reacted Magnesium (23U)	----	0.005	% Mg	**1.86**	----	----	----	----
Acidity - Acid Reacted Magnesium (a-23U)	----	5	mole H+ / t	**1530**	----	----	----	----
sulfidic - Acid Reacted Magnesium (s-23U)	----	0.005	% S	**2.46**	----	----	----	----
EA029-F: Excess Acid Neutralising Capacity								
Excess Acid Neutralising Capacity (23Q)	----	0.020	% CaCO3	**46.4**	----	----	----	----
acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	**9280**	----	----	----	----
sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.020	% S	**14.8**	----	----	----	----
EA029-H: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.13**	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**84**	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	**6**	----	----	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**9.9**	----	----	----	----
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	----	----	----	----
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	----	----	----	----
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity								

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**QC102**	**QC103**	**QC401**	----	----
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	CAS Number	LOR	Unit	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	--------	--------
				Result	Result	Result	----	----
EA033-C: Acid Neutralising Capacity - Continued								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**55.3**	----	----	----	----
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**11000**	----	----	----	----
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**17.7**	----	----	----	----
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	----	----	----	----
Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	----	----	----	----
EA055: Moisture Content (Dried @ 105-110°C)								
Moisture Content	----	0.1	%	----	**12.6**	----	----	----
Moisture Content	----	1.0	%	**11.0**	----	<1.0	----	----
EG005(ED093)T: Total Metals by ICP-AES								
Arsenic	7440-38-2	5	mg/kg	**9**	----	<5	----	----
Cadmium	7440-43-9	1	mg/kg	<1	----	<1	----	----
Chromium	7440-47-3	2	mg/kg	**11**	----	<2	----	----
Copper	7440-50-8	5	mg/kg	<5	----	<5	----	----
Lead	7439-92-1	5	mg/kg	<5	----	<5	----	----
Nickel	7440-02-0	2	mg/kg	**4**	----	<2	----	----
Zinc	7440-66-6	5	mg/kg	<5	----	<5	----	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.1	mg/kg	<0.1	----	<0.1	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Naphthalene	91-20-3	0.5	mg/kg	<0.5	----	<0.5	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**QC102**	**QC103**	**QC401**	----	----
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	CAS Number	LOR	Unit	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	--------	--------
				Result	Result	Result	----	----
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued								
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	----	<0.5	----	----
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	----	<0.5	----	----
Fluorene	86-73-7	0.5	mg/kg	<0.5	----	<0.5	----	----
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	----	<0.5	----	----
Anthracene	120-12-7	0.5	mg/kg	<0.5	----	<0.5	----	----
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	----	<0.5	----	----
Pyrene	129-00-0	0.5	mg/kg	<0.5	----	<0.5	----	----
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Chrysene	218-01-9	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	----	<0.5	----	----
Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	----	<0.5	----	----
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	----	<0.5	----	----
^ **Sum of polycyclic aromatic hydrocarbons**	----	0.5	mg/kg	<0.5	----	<0.5	----	----
^ **Benzo(a)pyrene TEQ (zero)**	----	0.5	mg/kg	<0.5	----	<0.5	----	----
^ **Benzo(a)pyrene TEQ (half LOR)**	----	0.5	mg/kg	**0.6**	----	**0.6**	----	----
^ **Benzo(a)pyrene TEQ (LOR)**	----	0.5	mg/kg	**1.2**	----	**1.2**	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	10	mg/kg	<10	----	<10	----	----
C10 - C14 Fraction	----	50	mg/kg	<50	----	<50	----	----
C15 - C28 Fraction	----	100	mg/kg	<100	----	<100	----	----
C29 - C36 Fraction	----	100	mg/kg	<100	----	<100	----	----
^ **C10 - C36 Fraction (sum)**	----	50	mg/kg	<50	----	<50	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	----	<10	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**QC102**	**QC103**	**QC401**	----	----
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	--------	--------
				Result	Result	Result	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	10	mg/kg	<10	----	<10	----	----
>C10 - C16 Fraction	----	50	mg/kg	<50	----	<50	----	----
>C16 - C34 Fraction	----	100	mg/kg	<100	----	<100	----	----
>C34 - C40 Fraction	----	100	mg/kg	<100	----	<100	----	----
^ **>C10 - C40 Fraction (sum)**	----	50	mg/kg	<50	----	<50	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	50	mg/kg	<50	----	<50	----	----
EP080: BTEXN								
Benzene	71-43-2	0.2	mg/kg	<0.2	----	<0.2	----	----
Toluene	108-88-3	0.5	mg/kg	<0.5	----	<0.5	----	----
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	----	<0.5	----	----
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	----	<0.5	----	----
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	----	<0.5	----	----
^ **Sum of BTEX**	----	0.2	mg/kg	<0.2	----	<0.2	----	----
^ **Total Xylenes**	----	0.5	mg/kg	<0.5	----	<0.5	----	----
Naphthalene	91-20-3	1	mg/kg	<1	----	<1	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	----	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			Sample ID	**QC102**	**QC103**	**QC401**	----	----
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	CAS Number	LOR	Unit	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	--------	--------
				Result	Result	Result	----	----
EP231A: Perfluoroalkyl Sulfonic Acids - Continued								
Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	----	----	----

Analytical Results

Sub-Matrix: **SOIL**
(Matrix: **SOIL**)

			Sample ID	**QC102**	**QC103**	**QC401**	----	----
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	--------	--------
				Result	Result	Result	----	----
EP231C: Perfluoroalkyl Sulfonamides - Continued								
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	----	----	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	----	----	----
EP075(SIM)S: Phenolic Compound Surrogates								
Phenol-d6	13127-88-3	0.5	%	**85.7**	----	**76.5**	----	----
2-Chlorophenol-D4	93951-73-6	0.5	%	**97.1**	----	**90.4**	----	----
2.4.6-Tribromophenol	118-79-6	0.5	%	**66.4**	----	**50.4**	----	----
EP075(SIM)T: PAH Surrogates								
2-Fluorobiphenyl	321-60-8	0.5	%	**102**	----	**91.5**	----	----
Anthracene-d10	1719-06-8	0.5	%	**107**	----	**97.1**	----	----
4-Terphenyl-d14	1718-51-0	0.5	%	**118**	----	**112**	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	0.2	%	**86.2**	----	**92.3**	----	----
Toluene-D8	2037-26-5	0.2	%	**76.2**	----	**86.5**	----	----
4-Bromofluorobenzene	460-00-4	0.2	%	**87.3**	----	**94.1**	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0002	%	**110**	**112**	----	----	----

Analytical Results

Sub-Matrix: **SOIL** (Matrix: **SOIL**)			*Sample ID*	**QC102**	**QC103**	**QC401**	**----**	**----**
			Sampling date / time	04-Jul-2024 00:00	04-Jul-2024 00:00	04-Jul-2024 00:00	----	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-026**	**EP2409636-027**	**EP2409636-029**	**--------**	**--------**
				Result	Result	Result	----	----
EP231S: PFAS Surrogate - Continued								
13C8-PFOA	----	0.0002	%	**112**	**106**	**----**	**----**	**----**

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

				Sample ID	**QC301**	----	----	----	----
				Sampling date / time	04-Jul-2024 00:00	----	----	----	----
	Compound	*CAS Number*	*LOR*	*Unit*	**EP2409636-028**	--------	--------	--------	--------
					Result	----	----	----	----
EG020F: Dissolved Metals by ICP-MS									
	Arsenic	7440-38-2	0.001	mg/L	<0.001	----	----	----	----
	Cadmium	7440-43-9	0.0001	mg/L	<0.0001	----	----	----	----
	Chromium	7440-47-3	0.001	mg/L	<0.001	----	----	----	----
	Copper	7440-50-8	0.001	mg/L	<0.001	----	----	----	----
	Nickel	7440-02-0	0.001	mg/L	<0.001	----	----	----	----
	Lead	7439-92-1	0.001	mg/L	<0.001	----	----	----	----
	Zinc	7440-66-6	0.005	mg/L	<0.005	----	----	----	----
EG035F: Dissolved Mercury by FIMS									
	Mercury	7439-97-6	0.0001	mg/L	<0.0001	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons									
	C6 - C9 Fraction	----	20	µg/L	<20	----	----	----	----
	C10 - C14 Fraction	----	50	µg/L	<50	----	----	----	----
	C15 - C28 Fraction	----	100	µg/L	<100	----	----	----	----
	C29 - C36 Fraction	----	50	µg/L	<50	----	----	----	----
^	**C10 - C36 Fraction (sum)**	----	50	µg/L	<50	----	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
	C6 - C10 Fraction	C6_C10	20	µg/L	<20	----	----	----	----
^	**C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	----	----	----	----
	>C10 - C16 Fraction	----	100	µg/L	<100	----	----	----	----
	>C16 - C34 Fraction	----	100	µg/L	<100	----	----	----	----
	>C34 - C40 Fraction	----	100	µg/L	<100	----	----	----	----
^	**>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	----	----	----	----
^	**>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	----	----	----	----
EP080: BTEXN									
	Benzene	71-43-2	1	µg/L	<1	----	----	----	----
	Toluene	108-88-3	2	µg/L	<2	----	----	----	----

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	QC301	----	----	----	----
			Sampling date / time	04-Jul-2024 00:00	----	----	----	----
				EP2409636-028	--------	--------	--------	--------
				Result	----	----	----	----
EP080: BTEXN - Continued								
Ethylbenzene	100-41-4	2	µg/L	<2	----	----	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	----	----	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	----	----	----	----
^ **Total Xylenes**	----	2	µg/L	<2	----	----	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	----	----	----	----
Naphthalene	91-20-3	5	µg/L	<5	----	----	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0002	----	----	----	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids								
Perfluorobutanoic acid (PFBA)	375-22-4	0.0020	µg/L	<0.0020	----	----	----	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	----	----	----	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QC301**	----	----	----	----
			Sampling date / time	04-Jul-2024 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	**EP2409636-028**	--------	--------	--------	--------
				Result	----	----	----	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	----	----	----	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	----	----	----	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	----	----	----	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	----	----	----	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	----	----	----	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	----	----	----	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	----	----	----	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	----	----	----	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	----	----	----	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	----	----	----	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	----	----	----	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	----	----	----	----
EP231P: PFAS Sums								
^ **Sum of PFHxS and PFOS**	355-46-4/1763-23-1	0.0002	µg/L	<0.0002	----	----	----	----
^ **Sum of PFAS (WA DER List)**	----	0.0002	µg/L	<0.0002	----	----	----	----
^ **Sum of PFAS**	----	0.0002	µg/L	<0.0002	----	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QC301**	----	----	----	----
			Sampling date / time	04-Jul-2024 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	**EP2409636-028**	--------	--------	--------	--------
				Result	----	----	----	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**116**	----	----	----	----
Toluene-D8	2037-26-5	2	%	**104**	----	----	----	----
4-Bromofluorobenzene	460-00-4	2	%	**117**	----	----	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0005	%	**121**	----	----	----	----
13C8-PFOA	----	0.0005	%	**119**	----	----	----	----

Surrogate Control Limits

Sub-Matrix: **SOIL**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	57	119
2-Chlorophenol-D4	93951-73-6	52	130
2.4.6-Tribromophenol	118-79-6	40	132
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	53	139
Anthracene-d10	1719-06-8	68	124
4-Terphenyl-d14	1718-51-0	66	132
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	63	132
Toluene-D8	2037-26-5	66	125
4-Bromofluorobenzene	460-00-4	60	124
EP231S: PFAS Surrogate			
13C4-PFOS	----	76	136
13C8-PFOA	----	78	131

Sub-Matrix: **WATER**		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry / Biology).

(SOIL) EP003: Total Organic Carbon (TOC) in Soil

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry / Biology).

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA150: Particle Sizing

(SOIL) EA152: Soil Particle Density

QUALITY CONTROL REPORT

Work Order : **EP2409636**

Client : **SENVERSA PTY LTD**
Contact : MS ASHTON BETTI
Address : LEVEL 18, 140 ST GEORGES TERRACE
PERTH 6000
Telephone : +61 08 6557 8881
Project : P21705 Burrup - Baseline Assessment
Order number : PO023451
C-O-C number : ----
Sampler : Egan Churchill-Gray
Site : ----
Quote number : EN/000
No. of samples received : 29
No. of samples analysed : 29

Page : 1 of 38

Laboratory : Environmental Division Perth
Contact : Ashvini Wickramasinghe
Address : 26 Rigali Way Wangara WA Australia 6065
Telephone : +61-8-9406 1301
Date Samples Received : 08-Jul-2024
Date Analysis Commenced : 09-Jul-2024
Issue Date : 23-Jul-2024

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Aleksandar Vujkovic	Laboratory Technician	Newcastle - Inorganics, Mayfield West, NSW
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Daniel Fisher	Inorganics Analyst	Perth ASS, Wangara, WA
Efua Wilson	Metals Chemist	Perth Inorganics, Wangara, WA
Kim McCabe	Senior Inorganic Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key :
Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC
* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix**: SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	**Sample ID**	**Method: Compound**	**CAS Number**	**LOR**	**Unit**	**Original Result**	**Duplicate Result**	**RPD (%)**	**Acceptable RPD (%)**
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5924942)									
EP2409600-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	8	9	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	3	4	35.8	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	22	43	67.1	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	39	27	34.9	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	31	31	0.0	No Limit
EP2409600-011	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	<2	<2	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	<5	<5	0.0	No Limit
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5926544)									
EP2409636-005	SB03_0-0.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	23	24	6.2	0% - 50%
		EG005T: Nickel	7440-02-0	2	mg/kg	10	11	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	8	10	13.9	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	22	25	15.9	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	5	<5	0.0	No Limit

Sub-Matrix: **SOIL**				*Laboratory Duplicate (DUP) Report*					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5926544) - continued									
EP2409636-005	SB03_0-0.1	EG005T: Zinc	7440-66-6	5	mg/kg	40	40	0.0	No Limit
EP2409636-015	SB08_0-0.1	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	13	0.0	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	5	5	0.0	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	10	9	0.0	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	<5	<5	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	6	6	0.0	No Limit
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 5926558)									
EP2409647-001	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	62	58	6.4	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	17	16	8.2	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	15	13	10.6	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	16	14	9.4	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	7	7	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	10	8	12.7	No Limit
EP2409647-013	Anonymous	EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.0	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	49	46	5.6	0% - 20%
		EG005T: Nickel	7440-02-0	2	mg/kg	13	12	8.1	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	13	12	10.3	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	11	10	0.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	7	6	0.0	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	6	6	0.0	No Limit
EA002: pH 1:5 (Soils) (QC Lot: 5916582)									
EP2409636-001	SB01_0-0.1	EA002: pH Value	----	0.1	pH Unit	8.6	8.6	0.0	0% - 20%
EP2409636-010	SB05_0.4-0.5	EA002: pH Value	----	0.1	pH Unit	8.4	8.5	0.0	0% - 20%
EA002: pH 1:5 (Soils) (QC Lot: 5916583)									
EP2409636-021	SB11_0-0.1	EA002: pH Value	----	0.1	pH Unit	8.5	8.6	1.4	0% - 20%
EA003 :pH (field/fox) (QC Lot: 5921591)									
EP2409636-001	SB01_0-0.1	EA003: pH (F)	----	0.1	pH Unit	8.2	8.3	0.0	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	8.1	8.1	0.0	0% - 20%
		EA003: Reaction Rate	----	1	Reaction Unit	1	1	0.0	No Limit
EP2409636-010	SB05_0.4-0.5	EA003: pH (F)	----	0.1	pH Unit	8.3	8.4	0.0	0% - 20%
		EA003: pH (Fox)	----	0.1	pH Unit	7.1	7.2	0.0	0% - 20%
		EA003: Reaction Rate	----	1	Reaction Unit	1	1	0.0	No Limit
EA003 :pH (field/fox) (QC Lot: 5921592)									
EP2409636-021	SB11_0-0.1	EA003: pH (F)	----	0.1	pH Unit	8.8	8.8	0.0	0% - 20%

Sub-Matrix: **SOIL**				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA003 :pH (field/fox) (QC Lot: 5921592) - continued									
EP2409636-021	SB11_0-0.1	EA003: pH (Fox)	----	0.1	pH Unit	7.0	7.0	0.0	0% - 20%
		EA003: Reaction Rate	----	1	Reaction Unit	1	1	0.0	No Limit
EA029-A: pH Measurements (QC Lot: 5939796)									
EP2409636-001	SB01_0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	10.0	10.0	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	8.4	8.5	0.0	0% - 20%
EP2409636-011	SB06_0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	9.9	9.9	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	8.3	8.3	0.0	0% - 20%
EA029-A: pH Measurements (QC Lot: 5939798)									
EP2409636-021	SB11_0-0.1	EA029: pH KCl (23A)	----	0.1	pH Unit	9.9	9.9	0.0	0% - 20%
		EA029: pH OX (23B)	----	0.1	pH Unit	8.1	8.2	1.5	0% - 20%
EA029-B: Acidity Trail (QC Lot: 5939796)									
EP2409636-001	SB01_0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EP2409636-011	SB06_0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-B: Acidity Trail (QC Lot: 5939798)									
EP2409636-021	SB11_0-0.1	EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02 (0.005)*	% pyrite S	<0.005	<0.005	0.0	No Limit
		EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA029: Titratable Sulfidic Acidity (23H)	----	2	mole H+ / t	<2	<2	0.0	No Limit
EA029-C: Sulfur Trail (QC Lot: 5939796)									
EP2409636-001	SB01_0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02 (0.005)*	% S	0.085	0.090	5.5	0% - 50%

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-C: Sulfur Trail (QC Lot: 5939796) - continued									
EP2409636-001	SB01_0-0.1	EA029: Peroxide Sulfur (23De)	----	0.02 (0.005)*	% S	0.143	0.143	0.0	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02 (0.005)*	% S	0.059	0.054	8.5	0% - 50%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10 (5)*	mole H+ / t	37	34	8.5	No Limit
EP2409636-011	SB06_0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02 (0.005)*	% S	0.276	0.299	8.1	0% - 20%
		EA029: Peroxide Sulfur (23De)	----	0.02 (0.005)*	% S	0.370	0.373	0.9	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02 (0.005)*	% S	0.094	0.074	23.9	0% - 50%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10 (5)*	mole H+ / t	58	46	23.9	0% - 50%
EA029-C: Sulfur Trail (QC Lot: 5939798)									
EP2409636-021	SB11_0-0.1	EA029: KCl Extractable Sulfur (23Ce)	----	0.02 (0.005)*	% S	0.077	0.074	4.1	0% - 50%
		EA029: Peroxide Sulfur (23De)	----	0.02 (0.005)*	% S	0.214	0.211	1.1	0% - 20%
		EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02 (0.005)*	% S	0.137	0.137	0.0	0% - 20%
		EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10 (5)*	mole H+ / t	85	86	0.0	0% - 50%
EA029-D: Calcium Values (QC Lot: 5939796)									
EP2409636-001	SB01_0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02 (0.005)*	% Ca	0.244	0.260	6.6	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02 (0.005)*	% Ca	11.6	11.6	0.5	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02 (0.005)*	% Ca	11.3	11.4	0.4	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02 (0.005)*	% S	9.06	9.10	0.4	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10 (5)*	mole H+ / t	5650	5680	0.4	0% - 20%
EP2409636-011	SB06_0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02 (0.005)*	% Ca	0.389	0.395	1.6	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02 (0.005)*	% Ca	11.2	11.5	2.5	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02 (0.005)*	% Ca	10.8	11.1	2.5	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02 (0.005)*	% S	8.69	8.91	2.5	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10 (5)*	mole H+ / t	5420	5560	2.5	0% - 20%
EA029-D: Calcium Values (QC Lot: 5939798)									
EP2409636-021	SB11_0-0.1	EA029: KCl Extractable Calcium (23Vh)	----	0.02 (0.005)*	% Ca	0.250	0.244	2.1	0% - 20%
		EA029: Peroxide Calcium (23Wh)	----	0.02 (0.005)*	% Ca	23.6	23.5	0.4	0% - 20%
		EA029: Acid Reacted Calcium (23X)	----	0.02 (0.005)*	% Ca	23.4	23.2	0.4	0% - 20%
		EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02 (0.005)*	% S	18.7	18.6	0.4	0% - 20%
		EA029: acidity - Acid Reacted Calcium (a-23X)	----	10 (5)*	mole H+ / t	11600	11600	0.4	0% - 20%
EA029-E: Magnesium Values (QC Lot: 5939796)									
EP2409636-001	SB01_0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02 (0.005)*	% Mg	0.098	0.105	7.2	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02 (0.005)*	% Mg	0.818	0.806	1.5	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02 (0.005)*	% Mg	0.721	0.701	2.8	0% - 20%
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02 (0.005)*	% S	0.951	0.925	2.8	0% - 20%

Sub-Matrix: **SOIL**				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-E: Magnesium Values (QC Lot: 5939796) - continued									
EP2409636-001	SB01_0-0.1	EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10 (5)*	mole H+ / t	593	577	2.8	0% - 20%
EP2409636-011	SB06_0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02 (0.005)*	% Mg	0.174	0.180	3.2	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02 (0.005)*	% Mg	1.64	1.60	2.8	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02 (0.005)*	% Mg	1.47	1.42	3.5	0% - 20%
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02 (0.005)*	% S	1.94	1.87	3.5	0% - 20%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10 (5)*	mole H+ / t	1210	1160	3.5	0% - 20%
EA029-E: Magnesium Values (QC Lot: 5939798)									
EP2409636-021	SB11_0-0.1	EA029: KCl Extractable Magnesium (23Sm)	----	0.02 (0.005)*	% Mg	0.126	0.125	0.8	0% - 20%
		EA029: Peroxide Magnesium (23Tm)	----	0.02 (0.005)*	% Mg	1.47	1.41	4.4	0% - 20%
		EA029: Acid Reacted Magnesium (23U)	----	0.02 (0.005)*	% Mg	1.35	1.28	4.8	0% - 20%
		EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02 (0.005)*	% S	1.78	1.69	4.8	0% - 20%
		EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10 (5)*	mole H+ / t	1110	1060	4.8	0% - 20%
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 5939796)									
EP2409636-001	SB01_0-0.1	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	29.5	29.5	0.1	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	9.45	9.46	0.1	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	5900	5900	0.1	0% - 20%
EP2409636-011	SB06_0-0.1	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	32.1	31.9	0.4	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	10.3	10.2	0.4	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	6410	6380	0.4	0% - 20%
EA029-F: Excess Acid Neutralising Capacity (QC Lot: 5939798)									
EP2409636-021	SB11_0-0.1	EA029: Excess Acid Neutralising Capacity (23Q)	----	0.02	% CaCO3	60.8	60.9	0.1	0% - 20%
		EA029: sulfidic - Excess Acid Neutralising Capacity (s-23Q)	----	0.02	% S	19.5	19.5	0.1	0% - 20%
		EA029: acidity - Excess Acid Neutralising Capacity (a-23Q)	----	10	mole H+ / t	12200	12200	0.1	0% - 20%
EA029-H: Acid Base Accounting (QC Lot: 5939796)									
EP2409636-001	SB01_0-0.1	EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.06	0.05	18.2	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	3	3	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA029-H: Acid Base Accounting (QC Lot: 5939796) - continued									
EP2409636-001	SB01_0-0.1	EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	37	34	8.5	No Limit
EP2409636-011	SB06_0-0.1	EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.09	0.07	25.0	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	4	3	28.6	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	59	46	24.8	No Limit
EA029-H: Acid Base Accounting (QC Lot: 5939798)									
EP2409636-021	SB11_0-0.1	EA029: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA029: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	0.14	0.14	0.0	No Limit
		EA029: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA029: Liming Rate excluding ANC	----	1	kg CaCO3/t	6	6	0.0	No Limit
		EA029: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA029: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	85	86	1.2	No Limit
EA033-A: Actual Acidity (QC Lot: 5939797)									
EP2409636-001	SB01_0-0.1	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	10.0	10.0	0.0	0% - 20%
EP2409636-011	SB06_0-0.1	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.9	9.9	0.0	0% - 20%
EA033-A: Actual Acidity (QC Lot: 5939799)									
EP2409636-021	SB11_0-0.1	EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	0.0	No Limit
		EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	0.0	No Limit
		EA033: pH KCl (23A)	----	0.1	pH Unit	9.9	9.9	0.0	0% - 20%
EA033-B: Potential Acidity (QC Lot: 5939797)									
EP2409636-001	SB01_0-0.1	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EP2409636-011	SB06_0-0.1	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA033-B: Potential Acidity (QC Lot: 5939799)									
EP2409636-021	SB11_0-0.1	EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	<0.005	0.0	No Limit
		EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	<10	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA033-C: Acid Neutralising Capacity (QC Lot: 5939797)									
EP2409636-001	SB01_0-0.1	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	36.0	36.3	1.0	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	11.5	11.6	1.0	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	7180	7250	1.0	0% - 20%
EP2409636-011	SB06_0-0.1	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	46.8	47.0	0.4	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	15.0	15.0	0.4	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	9340	9380	0.4	0% - 20%
EA033-C: Acid Neutralising Capacity (QC Lot: 5939799)									
EP2409636-021	SB11_0-0.1	EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	74.0	74.1	0.1	0% - 20%
		EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	23.7	23.7	0.1	0% - 20%
		EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	14800	14800	0.1	0% - 20%
EA033-E: Acid Base Accounting (QC Lot: 5939797)									
EP2409636-001	SB01_0-0.1	EA033: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA033: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA033: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA033: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EP2409636-011	SB06_0-0.1	EA033: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA033: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA033: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA033: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA033-E: Acid Base Accounting (QC Lot: 5939799)									
EP2409636-021	SB11_0-0.1	EA033: Net Acidity (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: Net Acidity excluding ANC (sulfur units)	----	0.02	% S	<0.02	<0.02	0.0	No Limit
		EA033: Liming Rate	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA033: Liming Rate excluding ANC	----	1	kg CaCO3/t	<1	<1	0.0	No Limit
		EA033: Net Acidity (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
		EA033: Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	<10	<10	0.0	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5924944)									
EP2409600-001	Anonymous	EA055: Moisture Content	----	0.1 (1.0)*	%	6.9	6.6	4.1	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5924944) - continued									
EP2409600-011	Anonymous	EA055: Moisture Content	----	0.1 (1.0)*	%	1.5	1.6	7.8	No Limit
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5926547)									
EP2409636-005	SB03_0-0.1	EA055: Moisture Content	----	0.1 (1.0)*	%	23.4	22.9	2.5	0% - 20%
EP2409636-015	SB08_0-0.1	EA055: Moisture Content	----	0.1 (1.0)*	%	14.6	14.2	2.7	0% - 50%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 5926551)									
EP2409636-025	QC101	EA055: Moisture Content	----	0.1 (1.0)*	%	11.9	11.9	0.0	0% - 50%
ED008: Exchangeable Cations (QC Lot: 5929285)									
EP2409580-009	Anonymous	ED008: Exchangeable Sodium Percent	----	0.1	%	1.0	1.0	0.0	0% - 50%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	11.3	11.6	2.0	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	2.9	3.0	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	0.6	0.7	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	0.2	0.2	0.0	No Limit
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	15.0	15.3	1.9	0% - 20%
EP2409636-018	SB09_0.4-0.5	ED008: Exchangeable Sodium Percent	----	0.1	%	3.2	3.2	0.0	0% - 20%
		ED008: Exchangeable Calcium	----	0.1	meq/100g	22.1	22.0	0.6	0% - 20%
		ED008: Exchangeable Magnesium	----	0.1	meq/100g	7.3	7.2	0.0	0% - 20%
		ED008: Exchangeable Potassium	----	0.1	meq/100g	1.0	1.0	0.0	No Limit
		ED008: Exchangeable Sodium	----	0.1	meq/100g	1.0	1.0	0.0	0% - 50%
		ED008: Cation Exchange Capacity	----	0.1	meq/100g	31.4	31.2	0.7	0% - 20%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5924943)									
EP2409600-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP2409600-011	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5926545)									
EP2409636-005	SB03_0-0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP2409636-015	SB08_0-0.1	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 5926559)									
EP2409647-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP2409647-013	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.0	No Limit
EP003: Total Organic Carbon (TOC) in Soil (QC Lot: 5922626)									
EB2423495-004	Anonymous	EP003: Total Organic Carbon	----	0.02	%	1.53	1.54	0.0	0% - 20%
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5911444)									
EP2409604-002	Anonymous	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5911444) - continued									
EP2409604-002	Anonymous	EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP2409636-006	SB03_0.3-0.4	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5916379)									
EP2409636-015	SB08_0-0.1	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 5916379) - continued									
EP2409636-015	SB08_0-0.1	EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP2409636-025	QC101	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5911442)									
EP2409604-002	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP2409604-013	Anonymous	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5911443)									
EP2409604-002	Anonymous	EP071: C15 - C28 Fraction	----	100	mg/kg	130	150	12.4	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	100	110	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP2409636-006	SB03_0.3-0.4	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5916377)									
EP2409636-015	SB08_0-0.1	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5916377) - continued									
EP2409636-025	QC101	EP080: C6 - C9 Fraction	----	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5916378)									
EP2409636-015	SB08_0-0.1	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP2409636-025	QC101	EP071: C15 - C28 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C29 - C36 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5911442)									
EP2409604-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP2409604-013	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5911443)									
EP2409604-002	Anonymous	EP071: >C16 - C34 Fraction	----	100	mg/kg	210	240	10.8	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP2409636-006	SB03_0.3-0.4	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5916377)									
EP2409636-015	SB08_0-0.1	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP2409636-025	QC101	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5916378)									
EP2409636-015	SB08_0-0.1	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP2409636-025	QC101	EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	<100	0.0	No Limit
		EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	<50	0.0	No Limit
EP080: BTEXN (QC Lot: 5911442)									
EP2409604-002	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP2409604-013	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080: BTEXN (QC Lot: 5911442) - continued									
EP2409604-013	Anonymous	EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP080: BTEXN (QC Lot: 5916377)									
EP2409636-015	SB08_0-0.1	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP2409636-025	QC101	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.0	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.0	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5911733)									
EP2409487-001	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	0.0002	0.0002	0.0	No Limit
		EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2409511-006	Anonymous	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	0.0009	0.0008	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	0.0006	0.0006	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	0.0070	0.0061	13.3	0% - 20%
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	0.0015	0.0014	10.3	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002 (0.0004)*	mg/kg	0.126	0.118	6.2	0% - 20%
		EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	0.0004	0.0004	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5911733) - continued									
EP2409511-006	Anonymous	EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	0.0006	0.0006	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5911737)									
EP2409636-008	SB04_0.4-0.5	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2409636-018	SB09_0.4-0.5	EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5911733)									
EP2409487-001	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2409511-006	Anonymous	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	0.0022	0.0022	0.0	0% - 50%
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	0.0081	0.0075	7.4	0% - 20%
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	0.0009	0.0008	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	0.0069	0.0060	12.9	0% - 20%
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	0.0029	0.0026	8.8	0% - 50%
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5911733) - continued									
EP2409511-006	Anonymous	EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	0.001	0.001	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5911737)									
EP2409636-008	SB04_0.4-0.5	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP2409636-018	SB09_0.4-0.5	EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	<0.001	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5911733)									
EP2409487-001	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5911733) - continued									
EP2409487-001	Anonymous	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2409511-006	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	0.0005	0.0004	21.5	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5911737)									
EP2409636-008	SB04_0.4-0.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2409636-018	SB09_0.4-0.5	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5911737) - continued									
EP2409636-018	SB09_0.4-0.5	EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5911733)									
EP2409487-001	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2409511-006	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	0.0557	0.0529	5.1	0% - 20%
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	0.0566	0.0528	7.1	0% - 20%
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5911737)									
EP2409636-008	SB04_0.4-0.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP2409636-018	SB09_0.4-0.5	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	<0.0005	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 5911733)									
EP2409487-001	Anonymous	EP231X: Sum of PFAS	----	0.0002	mg/kg	0.0002	0.0002	0.0	No Limit

Sub-Matrix: **SOIL**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	***Sample ID***	***Method: Compound***	***CAS Number***	***LOR***	***Unit***	***Original Result***	***Duplicate Result***	***RPD (%)***	***Acceptable RPD (%)***
EP231P: PFAS Sums (QC Lot: 5911733) - continued									
EP2409487-001	Anonymous	EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	0.0002	0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	0.0002	0.0002	0.0	No Limit
EP2409511-006	Anonymous	EP231X: Sum of PFAS	----	0.0002 (0.0004)*	mg/kg	0.271	0.253	6.8	0% - 20%
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002 (0.0004)*	mg/kg	0.133	0.124	6.9	0% - 20%
		EP231X: Sum of PFAS (WA DER List)	----	0.0002 (0.0004)*	mg/kg	0.265	0.248	6.7	0% - 20%
EP231P: PFAS Sums (QC Lot: 5911737)									
EP2409636-008	SB04_0.4-0.5	EP231X: Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
EP2409636-018	SB09_0.4-0.5	EP231X: Sum of PFAS	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit
		EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	<0.0002	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	***Sample ID***	***Method: Compound***	***CAS Number***	***LOR***	***Unit***	***Original Result***	***Duplicate Result***	***RPD (%)***	***Acceptable RPD (%)***
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5923029)									
EP2409806-009	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0006	0.0006	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	0.002	0.002	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.048	0.048	0.0	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.028	0.027	0.0	No Limit
EP2409747-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.001	0.001	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.078	0.079	1.8	0% - 50%
EG035F: Dissolved Mercury by FIMS (QC Lot: 5923030)									
EP2409747-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5910331)									

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5910331) - continued									
EP2409636-028	QC301	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5913465)									
EP2408309-008	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP2409651-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5910331)									
EP2409636-028	QC301	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5913465)									
EP2408309-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP2409651-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5913465)									
EP2408309-008	Anonymous	EP080: Benzene	71-43-2	1	µg/L	3	3	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2409651-004	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5913583)									
EP2409501-003	Anonymous	EP231X-SUT: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	0.0032	0.0032	0.0	0% - 50%
		EP231X-SUT: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5913583) - continued									
EP2409501-003	Anonymous	EP231X-SUT: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5913583)									
EP2409501-003	Anonymous	EP231X-SUT: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	0.0013	0.0011	10.9	No Limit
		EP231X-SUT: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	0.0015	0.0014	0.0	No Limit
		EP231X-SUT: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	0.0024	0.0023	4.9	No Limit
		EP231X-SUT: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	0.0006	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	0.0053	0.0058	8.7	No Limit
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5913583)									
EP2409501-003	Anonymous	EP231X-SUT: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	<0.001	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5913583)									
EP2409501-003	Anonymous	EP231X-SUT: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-SUT: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	0.010	0.009	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5913583) - continued									
EP2409501-003	Anonymous	EP231X-SUT: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	0.028	0.027	0.0	0% - 20%
		EP231X-SUT: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	<0.001	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 5913583)									
EP2409501-003	Anonymous	EP231X-SUT: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	µg/L	0.0032	0.0032	0.0	0% - 50%
		EP231X-SUT: Sum of PFAS (WA DER List)	----	0.0002	µg/L	0.0483	0.0461	4.7	0% - 20%
		EP231X-SUT: Sum of PFAS	----	0.0002	µg/L	0.0528	0.0498	5.8	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5924942)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	77.39 mg/kg	111	70.0	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.93 mg/kg	72.5	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	18.67 mg/kg	99.9	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	46.13 mg/kg	103	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	58.42 mg/kg	97.6	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	14.48 mg/kg	98.4	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	190.4 mg/kg	93.9	70.0	130
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5926544)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	77.39 mg/kg	102	70.0	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.93 mg/kg	72.5	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	18.67 mg/kg	95.6	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	46.13 mg/kg	98.3	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	58.42 mg/kg	97.6	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	14.48 mg/kg	96.3	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	190.4 mg/kg	95.4	70.0	130
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5926558)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	77.39 mg/kg	104	70.0	130
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.93 mg/kg	72.5	70.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	18.67 mg/kg	101	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	46.13 mg/kg	99.4	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	58.42 mg/kg	92.2	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	14.48 mg/kg	98.4	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	190.4 mg/kg	91.8	70.0	130
EA002: pH 1:5 (Soils) (QCLot: 5916582)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.6	102
				----	7 pH Unit	100	98.6	102
EA002: pH 1:5 (Soils) (QCLot: 5916583)								
EA002: pH Value	----	----	pH Unit	----	4 pH Unit	101	98.6	102
				----	7 pH Unit	100	98.6	102
EA029-A: pH Measurements (QCLot: 5939796)								

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EA029-A: pH Measurements (QCLot: 5939796) - continued								
EA029: pH KCl (23A)	----	----	pH Unit	----	5.4 pH Unit	96.7	94.6	100
EA029: pH OX (23B)	----	----	pH Unit	----	4.3 pH Unit	103	93.0	112
EA029-A: pH Measurements (QCLot: 5939798)								
EA029: pH KCl (23A)	----	----	pH Unit	----	5.4 pH Unit	97.0	94.6	100
EA029: pH OX (23B)	----	----	pH Unit	----	4.3 pH Unit	105	93.0	112
EA029-B: Acidity Trail (QCLot: 5939796)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	18 mole H+ / t	102	83.4	112
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	29.2 mole H+ / t	100	89.0	123
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029-B: Acidity Trail (QCLot: 5939798)								
EA029: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	18 mole H+ / t	102	83.4	112
EA029: Titratable Peroxide Acidity (23G)	----	2	mole H+ / t	<2	29.2 mole H+ / t	113	89.0	123
EA029: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Peroxide Acidity (s-23G)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029: sulfidic - Titratable Sulfidic Acidity (s-23H)	----	0.02	% pyrite S	<0.020	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 5939796)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.157 % S	96.9	70.0	120
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.457 % S	103	72.2	110
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-C: Sulfur Trail (QCLot: 5939798)								
EA029: KCl Extractable Sulfur (23Ce)	----	0.02	% S	<0.020	0.157 % S	104	70.0	120
EA029: Peroxide Sulfur (23De)	----	0.02	% S	<0.020	0.457 % S	105	72.2	110
EA029: Peroxide Oxidisable Sulfur (23E)	----	0.02	% S	<0.020	----	----	----	----
EA029: acidity - Peroxide Oxidisable Sulfur (a-23E)	----	10	mole H+ / t	<10	----	----	----	----
EA029-D: Calcium Values (QCLot: 5939796)								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.020	0.417 % Ca	91.8	70.0	117
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.020	0.512 % Ca	109	70.0	118
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	----	----	----	----
EA029-D: Calcium Values (QCLot: 5939798)								

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA029-D: Calcium Values (QCLot: 5939798) - continued								
EA029: KCl Extractable Calcium (23Vh)	----	0.02	% Ca	<0.020	0.417 % Ca	95.4	70.0	117
EA029: Peroxide Calcium (23Wh)	----	0.02	% Ca	<0.020	0.512 % Ca	108	70.0	118
EA029: Acid Reacted Calcium (23X)	----	0.02	% Ca	<0.020	----	----	----	----
EA029: acidity - Acid Reacted Calcium (a-23X)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Calcium (s-23X)	----	0.02	% S	<0.020	----	----	----	----
EA029-E: Magnesium Values (QCLot: 5939796)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.020	0.083 % Mg	88.6	71.6	120
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.020	0.086 % Mg	99.1	70.0	117
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	----	----	----	----
EA029-E: Magnesium Values (QCLot: 5939798)								
EA029: KCl Extractable Magnesium (23Sm)	----	0.02	% Mg	<0.020	0.083 % Mg	92.9	71.6	120
EA029: Peroxide Magnesium (23Tm)	----	0.02	% Mg	<0.020	0.086 % Mg	97.3	70.0	117
EA029: Acid Reacted Magnesium (23U)	----	0.02	% Mg	<0.020	----	----	----	----
EA029: Acidity - Acid Reacted Magnesium (a-23U)	----	10	mole H+ / t	<10	----	----	----	----
EA029: sulfidic - Acid Reacted Magnesium (s-23U)	----	0.02	% S	<0.020	----	----	----	----
EA033-A: Actual Acidity (QCLot: 5939797)								
EA033: pH KCl (23A)	----	0.1	pH Unit	<0.1	----	----	----	----
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	18 mole H+ / t	102	83.3	112
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-A: Actual Acidity (QCLot: 5939799)								
EA033: pH KCl (23A)	----	0.1	pH Unit	<0.1	----	----	----	----
EA033: Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	18 mole H+ / t	102	83.3	112
EA033: sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	----	----	----	----
EA033-B: Potential Acidity (QCLot: 5939797)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.202 % S	94.0	79.0	109
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-B: Potential Acidity (QCLot: 5939799)								
EA033: Chromium Reducible Sulfur (22B)	----	0.005	% S	<0.005	0.202 % S	93.1	79.0	109
EA033: acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	<10	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 5939797)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	4.9 % CaCO3	102	98.7	105
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EA033-C: Acid Neutralising Capacity (QCLot: 5939797) - continued								
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-C: Acid Neutralising Capacity (QCLot: 5939799)								
EA033: Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	<0.01	4.9 % CaCO3	102	98.7	105
EA033: acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	<10	----	----	----	----
EA033: sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	<0.01	----	----	----	----
EA033-E: Acid Base Accounting (QCLot: 5939797)								
EA033: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA033: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA033: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
EA033-E: Acid Base Accounting (QCLot: 5939799)								
EA033: Net Acidity (sulfur units)	----	0.02	% S	<0.02	----	----	----	----
EA033: Net Acidity (acidity units)	----	10	mole H+ / t	<10	----	----	----	----
EA033: Liming Rate	----	1	kg CaCO3/t	<1	----	----	----	----
ED008: Exchangeable Cations (QCLot: 5929285)								
ED008: Exchangeable Calcium	----	0.1	meq/100g	<0.1	22.1 meq/100g	103	81.3	113
ED008: Exchangeable Magnesium	----	0.1	meq/100g	<0.1	1.56 meq/100g	94.9	78.5	106
ED008: Exchangeable Potassium	----	0.1	meq/100g	<0.1	0.91 meq/100g	105	86.8	115
ED008: Exchangeable Sodium	----	0.1	meq/100g	<0.1	0.38 meq/100g	105	79.2	129
ED008: Exchangeable Sodium Percent	----	0.1	%	<0.1	----	----	----	----
ED008: Cation Exchange Capacity	----	0.1	meq/100g	<0.1	24.95 meq/100g	103	81.8	113
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5924943)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.115 mg/kg	90.0	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5926545)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.115 mg/kg	110	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5926559)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.115 mg/kg	92.9	70.0	130
EP003: Total Organic Carbon (TOC) in Soil (QCLot: 5922626)								
EP003: Total Organic Carbon	----	0.02	%	<0.02 <0.02	0.55 % 32.3 %	99.5 99.9	80.0 80.0	120 120
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5911444)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	114	71.0	123
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	123	69.0	129
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	98.0	65.0	125
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	112	71.0	125

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5911444) - continued								
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	95.4	66.0	124
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	105	60.0	112
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	116	67.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	117	65.0	127
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	101	57.0	125
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	96.4	57.0	131
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	102	65.0	125
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	90.4	69.0	127
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	107	63.0	121
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	98.2	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	98.7	52.0	128
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	93.3	65.0	125
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5916379)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	106	71.0	123
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	# 137	69.0	129
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	108	65.0	125
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	119	71.0	125
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	107	66.0	124
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	# 116	60.0	112
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	114	67.0	127
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	# 131	65.0	127
EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	119	57.0	125
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	121	57.0	131
EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	116	65.0	125
EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	107	69.0	127
EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	116	63.0	121
EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	115	61.0	121
EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	110	52.0	128
EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	108	65.0	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5911442)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	35 mg/kg	94.7	66.0	122
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5911443)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	1666 mg/kg	89.8	70.0	111

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5911443) - continued								
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	2937 mg/kg	87.1	71.9	109
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	477 mg/kg	107	63.8	118
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5916377)								
EP080: C6 - C9 Fraction	----	10	mg/kg	<10	35 mg/kg	91.4	66.0	122
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5916378)								
EP071: C10 - C14 Fraction	----	50	mg/kg	<50	1666 mg/kg	104	70.0	111
EP071: C15 - C28 Fraction	----	100	mg/kg	<100	2937 mg/kg	94.7	71.9	109
EP071: C29 - C36 Fraction	----	100	mg/kg	<100	477 mg/kg	91.9	63.8	118
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5911442)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	91.3	66.0	122
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5911443)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	2315 mg/kg	88.4	72.8	110
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	2594 mg/kg	91.4	67.8	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	157 mg/kg	119	50.3	123
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5916377)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	89.2	66.0	122
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5916378)								
EP071: >C10 - C16 Fraction	----	50	mg/kg	<50	2315 mg/kg	102	72.8	110
EP071: >C16 - C34 Fraction	----	100	mg/kg	<100	2594 mg/kg	93.4	67.8	114
EP071: >C34 - C40 Fraction	----	100	mg/kg	<100	157 mg/kg	85.1	50.3	123
EP080: BTEXN (QCLot: 5911442)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	94.8	72.0	122
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	96.3	75.0	119
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	94.7	73.0	121
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	92.8	74.0	122
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	92.5	75.0	121
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	86.0	64.0	126
EP080: BTEXN (QCLot: 5916377)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	92.4	72.0	122
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	90.1	75.0	119
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	89.3	73.0	121
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	89.1	74.0	122
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	93.1	75.0	121

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080: BTEXN (QCLot: 5916377) - continued								
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	101	64.0	126
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5911733)								
EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	0.00114 mg/kg	111	70.0	130
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	96.8	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.8	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	93.6	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	102	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	98.3	68.0	136
EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	0.0012 mg/kg	99.6	70.0	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	103	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5911737)								
EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.0005	mg/kg	<0.0005	0.00114 mg/kg	103	70.0	130
EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0002	mg/kg	<0.0002	0.0011 mg/kg	89.1	72.0	128
EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	73.6	73.0	123
EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0002	mg/kg	<0.0002	0.00118 mg/kg	86.0	67.0	130
EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0002	mg/kg	<0.0002	0.00119 mg/kg	91.6	70.0	132
EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	mg/kg	<0.0002	0.00116 mg/kg	85.3	68.0	136
EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0002	mg/kg	<0.0002	0.0012 mg/kg	89.6	70.0	130
EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0002	mg/kg	<0.0002	0.0012 mg/kg	84.6	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5911733)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	95.9	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	69.0	132
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.4	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	102	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	98.4	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	106	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	95.6	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00125 mg/kg	109	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5911737)								
EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.001	mg/kg	<0.001	0.00625 mg/kg	87.8	71.0	135
EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.6	69.0	132

Sub-Matrix: **SOIL**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5911737) - continued								
EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.4	70.0	132
EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	82.8	71.0	131
EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	89.6	69.0	133
EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	72.0	129
EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.0002	mg/kg	<0.0002	0.00125 mg/kg	85.2	69.0	133
EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	87.6	64.0	136
EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0002	mg/kg	<0.0002	0.00125 mg/kg	90.4	69.0	135
EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0002	mg/kg	<0.0002	0.00125 mg/kg	92.8	66.0	139
EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	mg/kg	<0.0005	0.00125 mg/kg	88.0	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5911733)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	107	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	107	59.6	143
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	98.4	62.8	140
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	105	61.5	139
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	98.2	61.9	139
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	105	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	101	61.0	139
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5911737)								
EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	94.8	67.0	137
EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.0005	mg/kg	<0.0005	0.00312 mg/kg	121	59.6	143
EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	83.2	62.8	140
EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.0005	mg/kg	<0.0005	0.00312 mg/kg	99.2	61.5	139
EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.0005	mg/kg	<0.0005	0.00312 mg/kg	96.3	61.9	139
EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0002	mg/kg	<0.0002	0.00125 mg/kg	88.0	63.0	144
EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0002	mg/kg	<0.0002	0.00125 mg/kg	93.6	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5911733)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	103	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	113	64.0	140

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5911733) - continued								
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	115	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	87.5	54.8	124
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5911737)								
EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.0005	mg/kg	<0.0005	0.00117 mg/kg	95.7	62.0	145
EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0005	mg/kg	<0.0005	0.00118 mg/kg	97.0	64.0	140
EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0005	mg/kg	<0.0005	0.0012 mg/kg	110	65.0	137
EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0005	mg/kg	<0.0005	0.0012 mg/kg	72.9	54.8	124
EP231P: PFAS Sums (QCLot: 5911733)								
EP231X: Sum of PFAS	----	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----
EP231P: PFAS Sums (QCLot: 5911737)								
EP231X: Sum of PFAS	----	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	mg/kg	<0.0002	----	----	----	----
EP231X: Sum of PFAS (WA DER List)	----	0.0002	mg/kg	<0.0002	----	----	----	----

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 5923029)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	98.2	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	95.6	89.7	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.3	87.3	107
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	94.8	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	94.6	89.4	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	95.9	87.2	108
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	100	89.5	112
EG035F: Dissolved Mercury by FIMS (QCLot: 5923030)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	103	85.6	120
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5910331)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	81.5	39.3	103
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	92.6	47.2	122
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	97.2	42.5	119
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5913465)								

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5913465) - continued								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	90.9	73.6	113
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5910331)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	84.1	47.0	100
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	97.4	46.2	116
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	78.5	24.7	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5913465)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	92.0	73.9	115
EP080: BTEXN (QCLot: 5913465)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	89.3	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	97.6	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	97.6	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	103	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	101	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	108	77.0	118
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5913583)								
EP231X-SUT: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	0.00354 µg/L	107	72.0	130
EP231X-SUT: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.00376 µg/L	105	71.0	127
EP231X-SUT: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.00381 µg/L	103	68.0	131
EP231X-SUT: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	0.00381 µg/L	115	69.0	134
EP231X-SUT: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0002	0.00371 µg/L	105	65.0	140
EP231X-SUT: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	0.00385 µg/L	104	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5913583)								
EP231X-SUT: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.0020	0.02 µg/L	106	73.0	129
EP231X-SUT: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	0.004 µg/L	114	72.0	129
EP231X-SUT: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	0.004 µg/L	102	72.0	129
EP231X-SUT: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	0.004 µg/L	110	72.0	130
EP231X-SUT: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.004 µg/L	110	71.0	133
EP231X-SUT: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	0.004 µg/L	110	69.0	130
EP231X-SUT: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	0.004 µg/L	108	71.0	129
EP231X-SUT: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	107	69.0	133
EP231X-SUT: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	0.004 µg/L	110	72.0	134
EP231X-SUT: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	123	65.0	144
EP231X-SUT: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	0.004 µg/L	115	71.0	132

Sub-Matrix: **WATER**

Method: Compound	*CAS Number*	*LOR*	*Unit*	*Method Blank (MB) Report*	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
				Result	*Concentration*	*LCS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5913583)								
EP231X-SUT: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	0.004 µg/L	120	67.0	137
EP231X-SUT: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	0.01 µg/L	95.0	68.0	141
EP231X-SUT: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	0.01 µg/L	90.2	57.9	141
EP231X-SUT: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	0.01 µg/L	101	63.3	134
EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	0.01 µg/L	115	60.0	136
EP231X-SUT: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	0.004 µg/L	112	65.0	136
EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	0.004 µg/L	104	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5913583)								
EP231X-SUT: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	0.00374 µg/L	112	63.0	143
EP231X-SUT: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	0.0038 µg/L	116	64.0	140
EP231X-SUT: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	0.00384 µg/L	110	67.0	138
EP231X-SUT: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	0.00386 µg/L	107	53.1	133

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Matrix Spike (MS) Report*			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
				Concentration	*MS*	*Low*	*High*
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5924942)							
EP2409600-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	100	70.0	130
		EG005T: Cadmium	7440-43-9	12.5 mg/kg	87.6	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	91.2	70.0	130
		EG005T: Copper	7440-50-8	50 mg/kg	111	70.0	130
		EG005T: Lead	7439-92-1	50 mg/kg	76.3	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	88.8	70.0	130
		EG005T: Zinc	7440-66-6	50 mg/kg	85.4	70.0	130
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5926544)							
EP2409636-005	SB03_0-0.1	EG005T: Arsenic	7440-38-2	50 mg/kg	104	70.0	130
		EG005T: Cadmium	7440-43-9	12.5 mg/kg	83.6	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	89.4	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5926544) - continued							
EP2409636-005	SB03_0-0.1	EG005T: Copper	7440-50-8	50 mg/kg	107	70.0	130
		EG005T: Lead	7439-92-1	50 mg/kg	89.6	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	84.2	70.0	130
		EG005T: Zinc	7440-66-6	50 mg/kg	73.1	70.0	130
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 5926558)							
EP2409647-001	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	99.0	70.0	130
		EG005T: Cadmium	7440-43-9	12.5 mg/kg	86.4	70.0	130
		EG005T: Chromium	7440-47-3	50 mg/kg	99.0	70.0	130
		EG005T: Copper	7440-50-8	50 mg/kg	107	70.0	130
		EG005T: Lead	7439-92-1	50 mg/kg	89.8	70.0	130
		EG005T: Nickel	7440-02-0	50 mg/kg	89.8	70.0	130
		EG005T: Zinc	7440-66-6	50 mg/kg	82.5	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5924943)							
EP2409600-001	Anonymous	EG035T: Mercury	7439-97-6	1 mg/kg	95.7	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5926545)							
EP2409636-005	SB03_0-0.1	EG035T: Mercury	7439-97-6	1 mg/kg	102	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 5926559)							
EP2409647-001	Anonymous	EG035T: Mercury	7439-97-6	1 mg/kg	90.0	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5911444)							
EP2409604-003	Anonymous	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	99.2	73.5	125
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	120	70.8	125
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 5916379)							
EP2409636-016	SB08_0.3-0.4	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	101	73.5	125
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	120	70.8	125
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5911442)							
EP2409604-003	Anonymous	EP080: C6 - C9 Fraction	----	24 mg/kg	96.6	69.1	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5911443)							
EP2409604-003	Anonymous	EP071: C10 - C14 Fraction	----	1666 mg/kg	92.1	64.7	126
		EP071: C15 - C28 Fraction	----	2937 mg/kg	90.6	61.7	124
		EP071: C29 - C36 Fraction	----	477 mg/kg	99.7	64.6	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5916377)							
EP2409636-016	SB08_0.3-0.4	EP080: C6 - C9 Fraction	----	24 mg/kg	87.6	69.1	135
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5916378)							
EP2409636-016	SB08_0.3-0.4	EP071: C10 - C14 Fraction	----	1666 mg/kg	103	64.7	126
		EP071: C15 - C28 Fraction	----	2937 mg/kg	94.3	61.7	124

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5916378) - continued							
EP2409636-016	SB08_0.3-0.4	EP071: C29 - C36 Fraction	----	477 mg/kg	92.6	64.6	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5911442)							
EP2409604-003	Anonymous	EP080: C6 - C10 Fraction	C6_C10	29 mg/kg	89.5	69.1	135
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5911443)							
EP2409604-003	Anonymous	EP071: >C10 - C16 Fraction	----	2315 mg/kg	90.5	64.7	126
		EP071: >C16 - C34 Fraction	----	2594 mg/kg	94.0	61.7	124
		EP071: >C34 - C40 Fraction	----	157 mg/kg	105	64.6	131
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5916377)							
EP2409636-016	SB08_0.3-0.4	EP080: C6 - C10 Fraction	C6_C10	29 mg/kg	85.4	69.1	135
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5916378)							
EP2409636-016	SB08_0.3-0.4	EP071: >C10 - C16 Fraction	----	2315 mg/kg	101	64.7	126
		EP071: >C16 - C34 Fraction	----	2594 mg/kg	93.3	61.7	124
		EP071: >C34 - C40 Fraction	----	157 mg/kg	87.1	64.6	131
EP080: BTEXN (QCLot: 5911442)							
EP2409604-003	Anonymous	EP080: Benzene	71-43-2	2 mg/kg	94.4	76.4	118
		EP080: Toluene	108-88-3	2 mg/kg	94.4	67.4	112
EP080: BTEXN (QCLot: 5916377)							
EP2409636-016	SB08_0.3-0.4	EP080: Benzene	71-43-2	2 mg/kg	84.6	76.4	118
		EP080: Toluene	108-88-3	2 mg/kg	80.1	67.4	112
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5911733)							
EP2409487-003	Anonymous	EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.00114 mg/kg	119	70.0	130
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0011 mg/kg	96.7	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00117 mg/kg	92.7	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00118 mg/kg	92.6	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00119 mg/kg	107	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	102	68.0	136
		EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0012 mg/kg	110	70.0	130
		EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0012 mg/kg	111	59.0	134
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5911737)							
EP2409636-009	SB05_0-0.1	EP231X: Perfluoropropane sulfonic acid (PFPrS)	423-41-6	0.00114 mg/kg	74.1	70.0	130
		EP231X: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0011 mg/kg	107	72.0	128
		EP231X: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00117 mg/kg	105	73.0	123
		EP231X: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00118 mg/kg	97.9	67.0	130
		EP231X: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00119 mg/kg	96.7	70.0	132
		EP231X: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00116 mg/kg	93.3	68.0	136
		EP231X: Perfluorononane sulfonic acid (PFNS)	68259-12-1	0.0012 mg/kg	99.3	70.0	130

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5911737) - continued							
EP2409636-009	SB05_0-0.1	EP231X: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0012 mg/kg	92.5	59.0	134
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5911733)							
EP2409487-003	Anonymous	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	101	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	102	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	112	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	100	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	108	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	102	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	102	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	109	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	100	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	91.2	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00125 mg/kg	112	69.0	133
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5911737)							
EP2409636-009	SB05_0-0.1	EP231X: Perfluorobutanoic acid (PFBA)	375-22-4	0.00625 mg/kg	92.2	71.0	135
		EP231X: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.00125 mg/kg	107	69.0	132
		EP231X: Perfluorohexanoic acid (PFHxA)	307-24-4	0.00125 mg/kg	99.2	70.0	132
		EP231X: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.00125 mg/kg	97.3	71.0	131
		EP231X: Perfluorooctanoic acid (PFOA)	335-67-1	0.00125 mg/kg	123	69.0	133
		EP231X: Perfluorononanoic acid (PFNA)	375-95-1	0.00125 mg/kg	120	72.0	129
		EP231X: Perfluorodecanoic acid (PFDA)	335-76-2	0.00125 mg/kg	99.7	69.0	133
		EP231X: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.00125 mg/kg	126	64.0	136
		EP231X: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.00125 mg/kg	109	69.0	135
		EP231X: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.00125 mg/kg	100	66.0	139
		EP231X: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.00125 mg/kg	104	69.0	133
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5911733)							
EP2409487-003	Anonymous	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	112	48.0	128
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	112	60.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	107	60.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	99.4	60.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	110	60.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	113	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	107	61.0	139

Sub-Matrix: **SOIL**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5911737)							
EP2409636-009	SB05_0-0.1	EP231X: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.00125 mg/kg	98.0	48.0	128
		EP231X: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.00312 mg/kg	99.7	60.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.00312 mg/kg	105	60.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.00312 mg/kg	93.0	60.0	130
		EP231X: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.00312 mg/kg	103	60.0	130
		EP231X: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.00125 mg/kg	93.5	63.0	144
		EP231X: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.00125 mg/kg	106	61.0	139
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5911733)							
EP2409487-003	Anonymous	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	116	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00118 mg/kg	113	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	113	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0012 mg/kg	80.0	60.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5911737)							
EP2409636-009	SB05_0-0.1	EP231X: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00117 mg/kg	102	62.0	145
		EP231X: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.00118 mg/kg	110	64.0	140
		EP231X: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.0012 mg/kg	108	65.0	137
		EP231X: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.0012 mg/kg	91.9	60.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 5923029)							
EP2409806-002	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	99.2	70.0	130
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	96.9	70.0	130
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	96.7	70.0	130
		EG020A-F: Copper	7440-50-8	0.2 mg/L	97.3	70.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	94.4	70.0	130
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	96.0	70.0	130
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	104	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5923030)							
EP2409636-028	QC301	EG035F: Mercury	7439-97-6	0.005 mg/L	111	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5910331)							
EP2409638-002	Anonymous	EP071: C10 - C14 Fraction	----	400 µg/L	82.7	44.5	122

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5910331) - continued							
EP2409638-002	Anonymous	EP071: C15 - C28 Fraction	----	600 µg/L	94.8	55.1	143
		EP071: C29 - C36 Fraction	----	400 µg/L	99.6	53.6	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5913465)							
EP2409610-001	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	80.6	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5910331)							
EP2409638-002	Anonymous	EP071: >C10 - C16 Fraction	----	500 µg/L	84.1	44.5	122
		EP071: >C16 - C34 Fraction	----	700 µg/L	101	55.1	143
		EP071: >C34 - C40 Fraction	----	300 µg/L	74.8	53.6	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5913465)							
EP2409610-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	78.4	77.0	137
EP080: BTEXN (QCLot: 5913465)							
EP2409610-001	Anonymous	EP080: Benzene	71-43-2	20 µg/L	100	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	96.2	73.5	126
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5913583)							
EP2409601-001	Anonymous	EP231X-SUT: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.00355 µg/L	112	70.0	130
		EP231X-SUT: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.00376 µg/L	121	70.0	130
		EP231X-SUT: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.00379 µg/L	105	70.0	130
		EP231X-SUT: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.00381 µg/L	110	70.0	130
		EP231X-SUT: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.00371 µg/L	# Not Determined	70.0	130
		EP231X-SUT: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.00385 µg/L	99.7	70.0	130
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5913583)							
EP2409601-001	Anonymous	EP231X-SUT: Perfluorobutanoic acid (PFBA)	375-22-4	0.02 µg/L	99.6	70.0	130
		EP231X-SUT: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.004 µg/L	92.4	70.0	130
		EP231X-SUT: Perfluorohexanoic acid (PFHxA)	307-24-4	0.004 µg/L	104	70.0	130
		EP231X-SUT: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.004 µg/L	102	70.0	130
		EP231X-SUT: Perfluorooctanoic acid (PFOA)	335-67-1	0.004 µg/L	90.1	70.0	130
		EP231X-SUT: Perfluorononanoic acid (PFNA)	375-95-1	0.004 µg/L	102	70.0	130
		EP231X-SUT: Perfluorodecanoic acid (PFDA)	335-76-2	0.004 µg/L	108	70.0	130
		EP231X-SUT: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.004 µg/L	103	70.0	130
		EP231X-SUT: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.004 µg/L	100	70.0	130
		EP231X-SUT: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.004 µg/L	118	70.0	130
		EP231X-SUT: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.004 µg/L	110	70.0	130
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5913583)							
EP2409601-001	Anonymous	EP231X-SUT: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.004 µg/L	114	70.0	130
		EP231X-SUT: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.01 µg/L	106	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5913583) - continued							
EP2409601-001	Anonymous	EP231X-SUT: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.01 µg/L	101	70.0	130
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.01 µg/L	101	70.0	130
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.01 µg/L	109	70.0	130
		EP231X-SUT: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.004 µg/L	104	70.0	130
		EP231X-SUT: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.004 µg/L	122	70.0	130
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5913583)							
EP2409601-001	Anonymous	EP231X-SUT: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.00374 µg/L	100	70.0	130
		EP231X-SUT: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.0038 µg/L	107	70.0	130
		EP231X-SUT: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.00384 µg/L	107	70.0	130
		EP231X-SUT: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.00386 µg/L	110	70.0	130

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: **EP2409636**	Page	: 1 of 24
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Telephone	: +61-8-9406 1301
Project	: P21705 Burrup - Baseline Assessment	Date Samples Received	: 08-Jul-2024
Site	: ----	Issue Date	: 23-Jul-2024
Sampler	: Egan Churchill-Gray	No. of samples received	: 29
Order number	: PO023451	No. of samples analysed	: 29

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **Laboratory Control outliers exist - please see following pages for full details.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **Surrogate recovery outliers exist for all regular sample matrices - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Quality Control Samples

Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes

Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Laboratory Control Spike (LCS) Recoveries							
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	QC-5916379-001	----	**Acenaphthylene**	208-96-8	137 %	69.0-129%	**Recovery greater than upper control limit**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	QC-5916379-001	----	**Anthracene**	120-12-7	116 %	60.0-112%	**Recovery greater than upper control limit**
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons	QC-5916379-001	----	**Pyrene**	129-00-0	131 %	65.0-127%	**Recovery greater than upper control limit**

Matrix: **WATER**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Matrix Spike (MS) Recoveries							
EP231A: Perfluoroalkyl Sulfonic Acids	EP2409601--001	Anonymous	**Perfluorooctane sulfonic acid (PFOS)**	1763-23-1	Not Determined	----	**MS recovery not determined, background level greater than or equal to 4x spike level.**

Regular Sample Surrogates

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Samples Submitted							
EP075(SIM)T: PAH Surrogates	EP2409636-005	SB03_0-0.1	**Anthracene-d10**	1719-06-8	144 %	68.0-124 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-007	SB04_0-0.1	**Anthracene-d10**	1719-06-8	125 %	68.0-124 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-011	SB06_0-0.1	**Anthracene-d10**	1719-06-8	125 %	68.0-124 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-001	SB01_0-0.1	**4-Terphenyl-d14**	1718-51-0	143 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-002	SB01_0.4-0.5	**4-Terphenyl-d14**	1718-51-0	139 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-003	SB02_0-0.1	**4-Terphenyl-d14**	1718-51-0	134 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-004	SB02_0.2-0.3	**4-Terphenyl-d14**	1718-51-0	144 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-005	SB03_0-0.1	**4-Terphenyl-d14**	1718-51-0	197 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-006	SB03_0.3-0.4	**4-Terphenyl-d14**	1718-51-0	147 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-007	SB04_0-0.1	**4-Terphenyl-d14**	1718-51-0	152 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-008	SB04_0.4-0.5	**4-Terphenyl-d14**	1718-51-0	147 %	66.0-132 %	**Recovery greater than upper data quality objective**

Sub-Matrix: **SOIL**

Compound Group Name	Laboratory Sample ID	Client Sample ID	**Analyte**	CAS Number	Data	Limits	**Comment**
Samples Submitted - Continued							
EP075(SIM)T: PAH Surrogates	EP2409636-009	SB05_0-0.1	**4-Terphenyl-d14**	1718-51-0	135 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-010	SB05_0.4-0.5	**4-Terphenyl-d14**	1718-51-0	148 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-011	SB06_0-0.1	**4-Terphenyl-d14**	1718-51-0	150 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-012	SB06_0.4-0.5	**4-Terphenyl-d14**	1718-51-0	149 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-013	SB07_0-0.1	**4-Terphenyl-d14**	1718-51-0	147 %	66.0-132 %	**Recovery greater than upper data quality objective**
EP075(SIM)T: PAH Surrogates	EP2409636-014	SB07_0.2-0.3	**4-Terphenyl-d14**	1718-51-0	142 %	66.0-132 %	**Recovery greater than upper data quality objective**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	18	5.56	10.00	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	10.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA002: pH 1:5 (Soils)							
Soil Glass Jar - Unpreserved (EA002) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**11-Jul-2024**	11-Jul-2024	✓	**11-Jul-2024**	11-Jul-2024	✓
EA003 :pH (field/fox)							
Snap Lock Bag - frozen on receipt at ALS (EA003) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**11-Jul-2024**	30-Mar-2027	✓	**11-Jul-2024**	09-Oct-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EA029-A: pH Measurements							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓
EA029-B: Acidity Trail							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA029-C: Sulfur Trail							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓
EA029-D: Calcium Values							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA029-E: Magnesium Values							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓
EA029-F: Excess Acid Neutralising Capacity							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA029-G: Retained Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓
EA029-H: Acid Base Accounting							
Snap Lock Bag - frozen on receipt at ALS (EA029) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	30-Mar-2027	✓	**22-Jul-2024**	10-Oct-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA033-A: Actual Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	04-Jul-2025	✓	**22-Jul-2024**	10-Oct-2024	✓
EA033-B: Potential Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	04-Jul-2025	✓	**22-Jul-2024**	10-Oct-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA033-C: Acid Neutralising Capacity							
Snap Lock Bag - frozen on receipt at ALS (EA033) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	04-Jul-2025	✓	**22-Jul-2024**	10-Oct-2024	✓
EA033-D: Retained Acidity							
Snap Lock Bag - frozen on receipt at ALS (EA033) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	04-Jul-2025	✓	**22-Jul-2024**	10-Oct-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	*Sample Date*	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)		*Date extracted*	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EA033-E: Acid Base Accounting							
Snap Lock Bag - frozen on receipt at ALS (EA033) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102	**04-Jul-2024**	**12-Jul-2024**	04-Jul-2025	✓	**22-Jul-2024**	10-Oct-2024	✓
EA055: Moisture Content (Dried @ 105-110°C)							
HDPE Soil Jar (EA055) QC103	**04-Jul-2024**	**----**	----	----	**16-Jul-2024**	18-Jul-2024	✓
Soil Glass Jar - Unpreserved (EA055) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102, QC401	**04-Jul-2024**	**----**	----	----	**16-Jul-2024**	18-Jul-2024	✓
EA150: Particle Sizing							
Soil Glass Jar - Unpreserved (EA150H) SB09_0-0.1, SB09_0.4-0.5	**04-Jul-2024**	**----**	----	----	**17-Jul-2024**	31-Dec-2024	✓
EA150: Soil Classification based on Particle Size							
Soil Glass Jar - Unpreserved (EA150H) SB09_0-0.1, SB09_0.4-0.5	**04-Jul-2024**	**----**	----	----	**17-Jul-2024**	31-Dec-2024	✓
EA152: Soil Particle Density							
Soil Glass Jar - Unpreserved (EA152) SB09_0-0.1, SB09_0.4-0.5	**04-Jul-2024**	**----**	----	----	**17-Jul-2024**	31-Dec-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
ED008: Exchangeable Cations							
Soil Glass Jar - Unpreserved (ED008) SB09_0-0.1, SB09_0.4-0.5	**04-Jul-2024**	**17-Jul-2024**	01-Aug-2024	✓	**17-Jul-2024**	01-Aug-2024	✓
EG005(ED093)T: Total Metals by ICP-AES							
Soil Glass Jar - Unpreserved (EG005T) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102, QC401	**04-Jul-2024**	**16-Jul-2024**	31-Dec-2024	✓	**18-Jul-2024**	31-Dec-2024	✓
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102, QC401	**04-Jul-2024**	**16-Jul-2024**	01-Aug-2024	✓	**17-Jul-2024**	01-Aug-2024	✓
EP003: Total Organic Carbon (TOC) in Soil							
Soil Glass Jar - Unpreserved (EP003) SB09_0-0.1, SB09_0.4-0.5	**04-Jul-2024**	**15-Jul-2024**	01-Aug-2024	✓	**15-Jul-2024**	01-Aug-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method **Container** / Client Sample ID(s)		**Sample Date**	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons								
Soil Glass Jar - Unpreserved (EP075(SIM))								
SB01_0-0.1, SB02_0-0.1, SB03_0-0.1, SB04_0-0.1, SB05_0-0.1, SB06_0-0.1, SB07_0-0.1,	SB01_0.4-0.5, SB02_0.2-0.3, SB03_0.3-0.4, SB04_0.4-0.5, SB05_0.4-0.5, SB06_0.4-0.5, SB07_0.2-0.3	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Aug-2024	✓
Soil Glass Jar - Unpreserved (EP075(SIM))								
SB08_0-0.1, SB09_0-0.1, SB10_0-0.1, SB11_0-0.1, SB12_0-0.1, QC101, QC401	SB08_0.3-0.4, SB09_0.4-0.5, SB10_0.4-0.5, SB11_0.4-0.5, SB12_0.4-0.5, QC102,	**04-Jul-2024**	**15-Jul-2024**	18-Jul-2024	✓	**17-Jul-2024**	24-Aug-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**10-Jul-2024**	18-Jul-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**11-Jul-2024**	18-Aug-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Aug-2024	✓
Soil Glass Jar - Unpreserved (EP080) SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC101, QC102, QC401	**04-Jul-2024**	**11-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Jul-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB08_0-0.1, SB08_0.3-0.4	**04-Jul-2024**	**15-Jul-2024**	18-Jul-2024	✓	**17-Jul-2024**	24-Aug-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC101, QC102, QC401	**04-Jul-2024**	**15-Jul-2024**	18-Jul-2024	✓	**18-Jul-2024**	24-Aug-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method **Container** / Client Sample ID(s)		**Sample Date**	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	**Date analysed**	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
Soil Glass Jar - Unpreserved (EP080) SB01_0-0.1, SB02_0-0.1, SB03_0-0.1, SB04_0-0.1, SB05_0-0.1, SB06_0-0.1, SB07_0-0.1,	SB01_0.4-0.5, SB02_0.2-0.3, SB03_0.3-0.4, SB04_0.4-0.5, SB05_0.4-0.5, SB06_0.4-0.5, SB07_0.2-0.3	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**10-Jul-2024**	18-Jul-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB01_0-0.1, SB02_0-0.1, SB03_0-0.1, SB04_0-0.1, SB05_0-0.1,	SB01_0.4-0.5, SB02_0.2-0.3, SB03_0.3-0.4, SB04_0.4-0.5, SB05_0.4-0.5	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**11-Jul-2024**	18-Aug-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB06_0-0.1, SB07_0-0.1,	SB06_0.4-0.5, SB07_0.2-0.3	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Aug-2024	✓
Soil Glass Jar - Unpreserved (EP080) SB08_0-0.1, SB09_0-0.1, SB10_0-0.1, SB11_0-0.1, SB12_0-0.1, QC101, QC401	SB08_0.3-0.4, SB09_0.4-0.5, SB10_0.4-0.5, SB11_0.4-0.5, SB12_0.4-0.5, QC102,	**04-Jul-2024**	**11-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Jul-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB08_0-0.1,	SB08_0.3-0.4	**04-Jul-2024**	**15-Jul-2024**	18-Jul-2024	✓	**17-Jul-2024**	24-Aug-2024	✓
Soil Glass Jar - Unpreserved (EP071) SB09_0-0.1, SB10_0-0.1, SB11_0-0.1, SB12_0-0.1, QC101, QC401	SB09_0.4-0.5, SB10_0.4-0.5, SB11_0.4-0.5, SB12_0.4-0.5, QC102,	**04-Jul-2024**	**15-Jul-2024**	18-Jul-2024	✓	**18-Jul-2024**	24-Aug-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3	**04-Jul-2024**	**09-Jul-2024**	18-Jul-2024	✓	**10-Jul-2024**	18-Jul-2024	✓
Soil Glass Jar - Unpreserved (EP080) SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC101, QC102, QC401	**04-Jul-2024**	**11-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Jul-2024	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE Soil Jar (EP231X) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102, QC103	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	19-Aug-2024	✓

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*			***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE Soil Jar (EP231X)								
SB01_0-0.1,	SB01_0.4-0.5,	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	19-Aug-2024	✓
SB02_0-0.1,	SB02_0.2-0.3,							
SB03_0-0.1,	SB03_0.3-0.4,							
SB04_0-0.1,	SB04_0.4-0.5,							
SB05_0-0.1,	SB05_0.4-0.5,							
SB06_0-0.1,	SB06_0.4-0.5,							
SB07_0-0.1,	SB07_0.2-0.3,							
SB08_0-0.1,	SB08_0.3-0.4,							
SB09_0-0.1,	SB09_0.4-0.5,							
SB10_0-0.1,	QC101, SB10_0.4-0.5,							
SB11_0-0.1,	SB11_0.4-0.5,							
SB12_0-0.1,	SB12_0.4-0.5,							
QC102,								
QC103								
EP231C: Perfluoroalkyl Sulfonamides								
HDPE Soil Jar (EP231X)								
SB01_0-0.1,	SB01_0.4-0.5,	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	19-Aug-2024	✓
SB02_0-0.1,	SB02_0.2-0.3,							
SB03_0-0.1,	SB03_0.3-0.4,							
SB04_0-0.1,	SB04_0.4-0.5,							
SB05_0-0.1,	SB05_0.4-0.5,							
SB06_0-0.1,	SB06_0.4-0.5,							
SB07_0-0.1,	SB07_0.2-0.3,							
SB08_0-0.1,	SB08_0.3-0.4,							
SB09_0-0.1,	SB09_0.4-0.5,							
SB10_0-0.1,	QC101, SB10_0.4-0.5,							
SB11_0-0.1,	SB11_0.4-0.5,							
SB12_0-0.1,	SB12_0.4-0.5,							
QC102,								
QC103								

Matrix: **SOIL**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE Soil Jar (EP231X) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102, QC103	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	19-Aug-2024	✓
EP231P: PFAS Sums							
HDPE Soil Jar (EP231X) SB01_0-0.1, SB01_0.4-0.5, SB02_0-0.1, SB02_0.2-0.3, SB03_0-0.1, SB03_0.3-0.4, SB04_0-0.1, SB04_0.4-0.5, SB05_0-0.1, SB05_0.4-0.5, SB06_0-0.1, SB06_0.4-0.5, SB07_0-0.1, SB07_0.2-0.3, SB08_0-0.1, SB08_0.3-0.4, SB09_0-0.1, SB09_0.4-0.5, SB10_0-0.1, QC101, SB10_0.4-0.5, SB11_0-0.1, SB11_0.4-0.5, SB12_0-0.1, SB12_0.4-0.5, QC102, QC103	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	19-Aug-2024	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method *Container / Client Sample ID(s)*	*Sample Date*	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	*Date analysed*	*Due for analysis*	*Evaluation*
EG020F: Dissolved Metals by ICP-MS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F) QC301	**04-Jul-2024**	**----**	----	----	**15-Jul-2024**	31-Dec-2024	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F) QC301	**04-Jul-2024**	**----**	----	----	**15-Jul-2024**	01-Aug-2024	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) QC301	**04-Jul-2024**	**10-Jul-2024**	11-Jul-2024	✓	**12-Jul-2024**	19-Aug-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) QC301	**04-Jul-2024**	**11-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Jul-2024	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) QC301	**04-Jul-2024**	**10-Jul-2024**	11-Jul-2024	✓	**12-Jul-2024**	19-Aug-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) QC301	**04-Jul-2024**	**11-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Jul-2024	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) QC301	**04-Jul-2024**	**11-Jul-2024**	18-Jul-2024	✓	**12-Jul-2024**	18-Jul-2024	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X-SUT) QC301	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	31-Dec-2024	✓
EP231B: Perfluoroalkyl Carboxylic Acids							
HDPE (no PTFE) (EP231X-SUT) QC301	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	31-Dec-2024	✓
EP231C: Perfluoroalkyl Sulfonamides							
HDPE (no PTFE) (EP231X-SUT) QC301	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	31-Dec-2024	✓
EP231D: (n:2) Fluorotelomer Sulfonic Acids							
HDPE (no PTFE) (EP231X-SUT) QC301	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	31-Dec-2024	✓
EP231P: PFAS Sums							
HDPE (no PTFE) (EP231X-SUT) QC301	**04-Jul-2024**	**10-Jul-2024**	31-Dec-2024	✓	**10-Jul-2024**	31-Dec-2024	✓

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Chromium Suite for Acid Sulphate Soils	EA033	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	2	10	**20.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Moisture Content	EA055	5	44	**11.36**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH field/fox	EA003	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	3	26	**11.54**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	6	60	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	6	60	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	1	7	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	4	36	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	39	**10.26**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Chromium Suite for Acid Sulphate Soils	EA033	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH (1:5)	EA002	4	26	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Organic Carbon	EP003	2	7	**28.57**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Chromium Suite for Acid Sulphate Soils	EA033	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Exchangeable Cations with pre-treatment	ED008	1	10	**10.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	2	26	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **SOIL**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Total Organic Carbon	EP003	1	7	**14.29**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	3	60	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	36	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	39	**5.13**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		*Count*		*Rate (%)*			*Quality Control Specification*
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	1	3	**33.33**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	18	**5.56**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Dissolved Mercury by FIMS	EG035F	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	3	**33.33**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH (1:5)	EA002	SOIL	In house: Referenced to Rayment and Lyons 4A1 and APHA 4500H+. pH is determined on soil samples after a 1:5 soil/water leach. This method is compliant with NEPM Schedule B(3).
pH field/fox	EA003	SOIL	In house: Referenced to Ahern et al 1998 - determined on a 1:5 soil/water extract designed to simulate field measured pH and pH after the extract has been oxidised with peroxide.
Suspension Peroxide Oxidation-Combined Acidity and Sulphate	EA029	SOIL	In house: Referenced to Ahern et al 2004 - a suspension peroxide oxidation method following the 'sulfur trail' by determining the level of 1M KCL extractable sulfur and the sulfur level after oxidation of soil sulphides. The 'acidity trail' is followed by measurement of TAA, TPA and TSA. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Chromium Suite for Acid Sulphate Soils	EA033	SOIL	In house: Referenced to Ahern et al 2004. This method covers the determination of Chromium Reducible Sulfur (SCR); pHKCl; titratable actual acidity (TAA); acid neutralising capacity by back titration (ANC); and net acid soluble sulfur (SNAS) which incorporates peroxide sulfur. It applies to soils and sediments (including sands) derived from coastal regions. Liming Rate is based on results for samples as submitted and incorporates a minimum safety factor of 1.5.
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Particle Size Analysis by Hydrometer	EA150H	SOIL	Particle Size Analysis by Hydrometer according to AS1289.3.6.3
Soil Particle Density	EA152	SOIL	Soil Particle Density by AS 1289.3.5.1: Methods of testing soils for engineering purposes - Soil classification tests - Determination of the soil particle density of a soil - Standard method
Exchangeable Cations with pre-treatment	ED008	SOIL	In house: Referenced to Rayment & Lyons Method 15A2. Soluble salts are removed from the sample prior to analysis. Cations are exchanged from the sample by contact with Ammonium Chloride. They are then quantitated in the final solution by ICPAES and reported as meq/100g of original soil. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICPAES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
Total Organic Carbon	EP003	SOIL	In house C-IR17. Dried and pulverised sample is reacted with acid to remove inorganic Carbonates, then combusted in a furnace in the presence of strong oxidants / catalysts. The evolved (Organic) Carbon (as CO2) is automatically measured by infra-red detector.
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X	SOIL	In-house: Analysis of soils by solvent extraction followed by LC-Electrospray-MS-MS, Negative Mode using MRM using internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to a portion of soil which is then extracted with MTBE and an ion pairing reagent. A portion of extract is exchanged into the analytical solvent mixture, combined with an equal volume reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.4, table B-15 requirements.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-SUT	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is concentrated, combined with an equal volume of reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.4, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Exchangeable Cations Preparation Method	ED007PR	SOIL	In house: Referenced to Rayment & Lyons method 15A1. A 1M NH4Cl extraction by end over end tumbling at a ratio of 1:20. There is no pretreatment for soluble salts. Extracts can be run by ICP for cations.
Drying only	EN020D	SOIL	In house

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Drying at 85 degrees, bagging and labelling (ASS)	EN020PR	SOIL	In house
1:5 solid / water leach for soluble analytes	EN34	SOIL	10 g of soil is mixed with 50 mL of reagent grade water and tumbled end over end for 1 hour. Water soluble salts are leached from the soil by the continuous suspension. Samples are settled and the water filtered off for analysis.
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Dry and Pulverise (up to 100g)	GEO30	SOIL	#
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
QuECheRS Extraction of Solids	* ORG71	SOIL	In house: Sequential extractions with Acetonitrile/Methanol by shaking. Extraction efficiency aided by the addition of salts under acidic conditions. Where relevant, interferences from co-extracted organics are removed with dispersive clean-up media (dSPE). The extract is either diluted or concentrated and exchanged into the analytical solvent.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.
Solid Phase Extraction (SPE) for PFAS in water	* ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2409636**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Ashvini Wickramasinghe
Address	: LEVEL 18, 140 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: Ashton.Betti@senversa.com.au	E-mail	: ashvini.wickramasinghe@alsglobal.com
Telephone	: +61 08 6557 8881	Telephone	: +61-8-9406 1301
Facsimile	: +61 03 9606 0074	Facsimile	: +61-8-9406 1399
Project	: P21705 Burrup - Baseline Assessment	Page	: 1 of 4
Order number	: PO023451	Quote number	: EB2023SENVER0001 (EN/000)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Egan Churchill-Gray		

Dates

Date Samples Received	: 08-Jul-2024 12:40	Issue Date	: 09-Jul-2024
Client Requested Due Date	: 18-Jul-2024	Scheduled Reporting Date	: **18-Jul-2024**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 3.3 - Ice present
Receipt Detail	:	No. of samples received / analysed	: 29 / 29

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Please be advised that no analysis has been requested on the provided Chain of Custody (COC) for all samples listed with the SAMPLE-HANDLING task. The Samples Handling Fee will be charged per sample without analysis requested unless analysis is scheduled on the sample prior to the release of this workorder. Standard disposal timeframes apply from receipt of samples. For further information please contact your local Client Services team.
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **pH analysis should be conducted within 6 hours of sampling.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.

If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - EA002 pH (1:5)	SOIL - EA003 pH field/fox	SOIL - EA029 SPOCAS	SOIL - EA033 Chromium Suite for Acid Sulphate Soils	SOIL - EA055-103 Moisture Content	SOIL - EP231X (solids) PFAS - Full Suite (30 analytes)	SOIL - S-26 8 metals/TRH/BTEXN/PAH
EP2409636-001	04-Jul-2024 00:00	SB01_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-002	04-Jul-2024 00:00	SB01_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-003	04-Jul-2024 00:00	SB02_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-004	04-Jul-2024 00:00	SB02_0.2-0.3	✓	✓	✓	✓	✓	✓	✓
EP2409636-005	04-Jul-2024 00:00	SB03_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-006	04-Jul-2024 00:00	SB03_0.3-0.4	✓	✓	✓	✓	✓	✓	✓
EP2409636-007	04-Jul-2024 00:00	SB04_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-008	04-Jul-2024 00:00	SB04_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-009	04-Jul-2024 00:00	SB05_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-010	04-Jul-2024 00:00	SB05_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-011	04-Jul-2024 00:00	SB06_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-012	04-Jul-2024 00:00	SB06_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-013	04-Jul-2024 00:00	SB07_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-014	04-Jul-2024 00:00	SB07_0.2-0.3	✓	✓	✓	✓	✓	✓	✓
EP2409636-015	04-Jul-2024 00:00	SB08_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-016	04-Jul-2024 00:00	SB08_0.3-0.4	✓	✓	✓	✓	✓	✓	✓
EP2409636-017	04-Jul-2024 00:00	SB09_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-018	04-Jul-2024 00:00	SB09_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-019	04-Jul-2024 00:00	SB10_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-020	04-Jul-2024 00:00	SB10_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-021	04-Jul-2024 00:00	SB11_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-022	04-Jul-2024 00:00	SB11_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-023	04-Jul-2024 00:00	SB12_0-0.1	✓	✓	✓	✓	✓	✓	✓
EP2409636-024	04-Jul-2024 00:00	SB12_0.4-0.5	✓	✓	✓	✓	✓	✓	✓
EP2409636-025	04-Jul-2024 00:00	QC101	✓	✓	✓	✓	✓	✓	✓
EP2409636-026	04-Jul-2024 00:00	QC102	✓	✓	✓	✓	✓	✓	✓
EP2409636-027	04-Jul-2024 00:00	QC103					✓	✓	
EP2409636-029	04-Jul-2024 00:00	QC401					✓		✓

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	SOIL - EA150H/EA152 Particle Sizing with Hydrometer + Soil Particle	SOIL - ED008 Def Exchangeable Cations with pre-treatment -	SOIL - EP003 Total Organic Carbon (TOC) in Soil
EP2409636-017	04-Jul-2024 00:00	SB09_0-0.1	✓	✓	✓
EP2409636-018	04-Jul-2024 00:00	SB09_0.4-0.5	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - EP231X-SUT PFAS - Super Ultra Trace Waters Long Suite (30	WATER - W-05 TRH/BTEXN/8 Metals
EP2409636-028	04-Jul-2024 00:00	QC301	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Requested Deliverables

ASHTON BETTI		
- *AU Certificate of Analysis - NATA (COA)	Email	Ashton.Betti@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Ashton.Betti@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Ashton.Betti@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Ashton.Betti@senversa.com.au
- A4 - AU Tax Invoice (INV)	Email	Ashton.Betti@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	Ashton.Betti@senversa.com.au
Egan Churchill-Gray		
- *AU Certificate of Analysis - NATA (COA)	Email	egan.churchill-gray@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	egan.churchill-gray@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	egan.churchill-gray@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	egan.churchill-gray@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	egan.churchill-gray@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	egan.churchill-gray@senversa.com.au
PERTH LAB REPORTS		
- *AU Certificate of Analysis - NATA (COA)	Email	perth.labreports@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	perth.labreports@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	perth.labreports@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	perth.labreports@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	perth.labreports@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	perth.labreports@senversa.com.au
SUPPLIER ACCOUNTS		
- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

Inter-Laboratory Testing

Analysis conducted by ALS Brisbane, NATA accreditation no. 825, site no. 818 (Chemistry) 18958 (Biology).

(SOIL) EP003: Total Organic Carbon (TOC) in Soil

Analysis conducted by ALS Newcastle, NATA accreditation no. 825, site no. 1656 (Chemistry and Biology).

(SOIL) EA150: Soil Classification based on Particle Size

(SOIL) EA150: Particle Sizing

(SOIL) EA152: Soil Particle Density

Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory:	ALS WA
Address:	26 Rigali Way, Wangara WA 6065
Contact:	Sample Receipt
Phone:	08 9406 1301

Job Number:	P21705	**Purchase Order:**	PO023451
Project Name:	Burrup - Baseline Assesment	**Quote No:**	Senversa
Sampled By:	Egan Churchill-Gray	**Turn Around Time:**	Standard
Project Manager:	Ashton Betti	**Page:**	1 of 1
Email Report To:	ashton.betti@senversa.com.au egan.churchill-gray@senversa.com.au perth.labreports@senversa.com.au	**Phone/Mobile:**	0421 473 219

	Sample Information				Container Information		Analysis Required											
Lab ID	Sample ID	Matrix *	Date	Time	Type / Code	Total Containers	TRH(C6-C40)/BTEXN/PAH/8 metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn) **[S-26]**	PFAS – Full Suite (28 analytes)**[EP231X]**	pHF and pHFOX **[EA003]**	SPOCAS Suite- Complete **[EA029]**	CRS Suite - Complete **[EA033]**	pH 1:5 **[EA002]**	TRH (C6-C40), BTEXN, 8 Dissolved Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) **[W-5]**	PFAS – Super Trace Full Suite (28 analytes) **[EP231X-ST]**			HOLD	Comments: e.g. Highly contaminated sample; hazardous materials present; trace LORs etc.
1	SB01_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
2	SB01_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
3	SB02_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
4	SB02_0.2-0.3	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
5	SB03_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
6	SB03_0.3-0.4	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
7	SB04_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
8	SB04_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
9	SB05_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
10	SB05_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
11	SB06_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
12	SB06_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
13	SB07_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
14	SB07_0.2-0.3	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
15	SB08_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
16	SB08_0.3-0.4	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
17	SB09_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
18	SB09_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
19	SB10_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
20	SB10_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
21	SB11_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
22	SB11_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
23	SB12_0-0.1	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
24	SB12_0.4-0.5	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
25	QC101	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
26	QC102	Soil	4/07/2024		1x glass jar, 1x HDPE jar, 1x ASS bag	3	X	X	X	X	X	X						
27	QC103	Soil	4/07/2024		1x HDPE jar	1		X										
28	QC301	Water	4/07/2024		2x VS, 1x UA, 4x P, 1x N	8							X	X				
29	QC401	Soil	4/07/2024		1x glass jar	1	X											Lab ID: TBS325
30	QC201	Soil	4/7/24															
31	QC202	Soil	4/7/24															
Total						88												

Environmental Division
Perth
Work Order Reference
EP2409636

Telephone -- 61-8-9406 1301

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	**Sampler Name:** Egan Churchill-Gray	**Signature:** ECG	**Date:** 8/07/2024

Relinquished By:		**Method of Shipment (if applicable):**	**Received by:**	
Name/Signature: Egan Churchill-Gray / ECG	Date: 8/7/24	Carrier / Reference #:	Name/Signature: LS	Date: 8/7
Of: Senversa	Time: 12:00	Date/Time:	Of: ALS	Time: 1240
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic;
V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic;
F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's Iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

senversa

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: Eurofins ARL WA
Address: 46 - 48 Banksia Rd, Welshpool WA 6106
Contact: Sample Receipt
Phone: 08 6253 4444

Job Number:	P21705	**Purchase Order:**	
Project Name:	Burrup - Baseline Assessment	**Quote No:**	Senversa
Sampled By:	Egan Churchill-Gray	**Turn Around Time:**	Standard
Project Manager:	Ashton Betti	**Page:**	1 of 1
Email Report To:	ashton.betti@senversa.com.au egan.churchill-gray@senversa.com.au perth.labreports@senversa.com.au	**Phone/Mobile:**	0421 473 219

Sample Information					**Container Information**		**Analysis Required**											
Lab ID	**Sample ID**	**Matrix ***	**Date**	**Time**	**Type / Code**	**Total Bottles**	TRH(C6-C40)/BTEXN/PAH/8 metals (As, Cd, Cr, Cu, Pb, Hg, Ni and Zn)	PFAS – Full Suite (28 analytes)	pHF and pHFOX	SPOCAS Suite- Complete	CRS Suite - Complete	pH 1:5					HOLD	Comments: e.g. Highly contaminated sample; hazardous materials present; trace LORs etc.
	QC201	Soil	5/07/2024		1x glass jar, 1x HDPE jar, 1x ASS ba	3	X	X	X	X	X	X						
	QC202	Soil	5/07/2024		1x glass jar, 1x HDPE jar, 1x ASS ba	3	X	X	X	X	X	X						
	QC203	Soil	5/07/2024		1x glass jar, 1x HDPE jar, 1x ASS ba	3		X										
Total						9												

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	**Sampler Name:** Egan Churchill-Gray	**Signature:**	ECG	**Date:**	8/07/2024

Relinquished By:		**Method of Shipment (if applicable):**	**Received by:**	
Name/Signature: Egan Churchill-Gray / ECG	Date: 8/7	Carrier / Reference #:	Name/Signature:	Date: 08/07/24
Of: Senversa	Time: 12:00	Date/Time:	Of: 17.6	Time: 12:35
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic;
V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic;
F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

1115574

Completed by: ________
Checked by: ________

eurofins | ARL

www.eurofins.com.au EnviroSales@eurofins.com

Eurofins ARL Pty Ltd	**Eurofins Environment Testing Australia Pty Ltd**						**Eurofins ProMicro Pty Ltd**	**Eurofins Environment Testing NZ Ltd**			
ABN: 91 05 0159 898	ABN: 50 005 085 521						ABN: 47 009 120 549	NZBN: 9429046024954			
Perth	**Melbourne**	**Geelong**	**Sydney**	**Canberra**	**Brisbane**	**Newcastle**	**Perth ProMicro**	**Auckland**	**Auckland (Focus)**	**Christchurch**	**Tauranga**
46-48 Banksia Road	6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive	46-48 Banksia Road	35 O'Rorke Road	Unit C1/4 Pacific Rise,	43 Detroit Drive	1277 Cameron Road,
Welshpool	Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West	Welshpool	Penrose,	Mount Wellington,	Rolleston,	Gate Pa,
WA 6106	VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	NSW 2304	WA 6106	Auckland 1061	Auckland 1061	Christchurch 7675	Tauranga 3112
+61 8 6253 4444	+61 3 8564 5000	+61 3 8564 5000	+61 2 9900 8400	+61 2 6113 8091	T: +61 7 3902 4600	+61 2 4968 8448	+61 8 6253 4444	+64 9 526 4551	+64 9 525 0568	+64 3 343 5201	+64 9 525 0568
NATA# 2377	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 2561	IANZ# 1327	IANZ# 1308	IANZ# 1290	IANZ# 1402
Site# 2370	Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794 & 2780	Site# 25079	Site# 2554				

Sample Receipt Advice

Company name:	Senversa Pty Ltd WA
Contact name:	- Lab reports
Project name:	BURRUP - BASELINE ASSESSMENT
Project ID:	P21705
Turnaround time:	5 Day
Date/Time received	Jul 8, 2024 12:35 PM
Eurofins reference	1115574

Sample Information

✓ A detailed list of analytes logged into our LIMS, is included in the attached summary table.

✗ All samples have been received as described on the above COC.

✗ COC has been completed correctly.

✗ Attempt to chill was evident.

✗ Appropriately preserved sample containers have been used.

✗ All samples were received in good condition.

✓ Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.

✗ Appropriate sample containers have been used.

✓ Sample containers for volatile analysis received with zero headspace.

✗ Split sample sent to requested external lab.

✗ Some samples have been subcontracted.

N/A Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Elden Garrett on phone : 0892519602 or by email: EldenGarrett@eurofins.com

Results will be delivered electronically via email to - Lab reports - perth.labreports@senversa.com.au.

Note: A copy of these results will also be delivered to the general Senversa Pty Ltd WA email address.

Global Leader - Results you can trust

Eurofins ARL Pty Ltd ABN: 91 05 0159 898
Eurofins Environment Testing Australia Pty Ltd ABN: 50 005 085 521
Eurofins ProMicro Pty Ltd ABN: 47 009 120 549
Eurofins Environment Testing NZ Ltd NZBN: 9429046024954

web: www.eurofins.com.au
email: EnviroSales@eurofins.com

Perth	Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth ProMicro	Auckland	Auckland (Focus)	Christchurch	Tauranga
46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2377 Site# 2370	6 Monterey Road Dandenong South VIC 3175 +61 3 8564 5000 NATA# 1261 Site# 1254	19/8 Lewalan Street Grovedale VIC 3216 +61 3 8564 5000 NATA# 1261 Site# 25403	179 Magowar Road Girraween NSW 2145 +61 2 9900 8400 NATA# 1261 Site# 18217	Unit 1,2 Dacre Street Mitchell ACT 2911 +61 2 6113 8091 NATA# 1261 Site# 25466	1/21 Smallwood Place Murarrie QLD 4172 T: +61 7 3902 4600 NATA# 1261 Site# 20794 & 2780	1/2 Frost Drive Mayfield West NSW 2304 +61 2 4968 8448 NATA# 1261 Site# 25079	46-48 Banksia Road Welshpool WA 6106 +61 8 6253 4444 NATA# 2561 Site# 2554	35 O'Rorke Road Penrose, Auckland 1061 +64 9 526 4551 IANZ# 1327	Unit C1/4 Pacific Rise, Mount Wellington, Auckland 1061 +64 9 525 0568 IANZ# 1308	43 Detroit Drive Rolleston, Christchurch 7675 +64 3 343 5201 IANZ# 1290	1277 Cameron Road, Gate Pa, Tauranga 3112 +64 9 525 0568 IANZ# 1402

Company Name: Senversa Pty Ltd WA
Address: Level 18, 140 St Georges Terrace
Perth
WA 6000

Project Name: BURRUP - BASELINE ASSESSMENT
Project ID: P21705

Order No.:
Report #: 1115574
Phone: 0863240200
Fax: 0396060074

Received: Jul 8, 2024 12:35 PM
Due: Jul 15, 2024
Priority: 5 Day
Contact Name: - Lab reports

Eurofins Analytical Services Manager : Elden Garrett

Sample Detail						pH (1:5 Aqueous extract at 25 °C as rec.)	Acid Sulfate Soils Field pH Test	Metals M8	SPOCAS Suite - WA (Excluding ANC)	Chromium Reducible Sulfur Suite	Moisture Set	Moisture Set	Eurofins Suite B4	Per- and Polyfluoroalkyl Substances (PFASs)
Perth Laboratory - NATA # 2377 Site # 2370						X		X			X	X	X	
Melbourne Laboratory - NATA # 1261 Site # 1254											X	X		X
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780							X		X	X				
External Laboratory														
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**									
1	QC201	Jul 05, 2024		Soil	L24-Jl0019816	X	X	X	X	X		X	X	X
2	QC202	Jul 05, 2024		Soil	L24-Jl0019817	X	X	X	X	X		X	X	X
3	QC203	Jul 05, 2024		Soil	L24-Jl0019818						X			X
Test Counts						2	2	2	2	2	3	3	2	3

Certificate of Analysis

Senversa Pty Ltd (WA)
Level 18, 140 St Georges Terrace
Perth
WA 6000

Attention:	**- Lab reports**
Report	**1115574-S**
Project name	BURRUP - BASELINE ASSESSMENT
Project ID	P21705
Received Date	Jul 08, 2024

Client Sample ID **Sample Matrix** **Eurofins Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**QC201** **Soil** **L24-Jl0019816** **Jul 05, 2024**	**QC202** **Soil** **L24-Jl0019817** **Jul 05, 2024**	**QC203** **Soil** **L24-Jl0019818** **Jul 05, 2024**
Total Recoverable Hydrocarbons					
TRH C6-C9	20	mg/kg	< 20	< 20	-
TRH C10-C14	20	mg/kg	< 20	< 20	-
TRH C15-C28	50	mg/kg	< 50	< 50	-
TRH C29-C36	50	mg/kg	< 50	< 50	-
TRH C10-C36 (Total)	50	mg/kg	< 50	< 50	-
TRH C6-C10*	20	mg/kg	< 20	< 20	-
TRH C6-C10 less BTEX (F1)^{N04}	20	mg/kg	< 20	< 20	-
TRH >C10-C16	50	mg/kg	< 50	< 50	-
TRH >C10-C16 less Naphthalene (F2)*^{N01}	50	mg/kg	< 50	< 50	-
TRH >C16-C34	100	mg/kg	< 100	< 100	-
TRH >C34-C40*	100	mg/kg	< 100	< 100	-
TRH >C10-C40 (total)*	100	mg/kg	< 100	< 100	-
BTEX					
Benzene	0.1	mg/kg	< 0.1	< 0.1	-
Toluene	0.1	mg/kg	< 0.1	< 0.1	-
Ethylbenzene	0.1	mg/kg	< 0.1	< 0.1	-
m&p-Xylenes	0.2	mg/kg	< 0.2	< 0.2	-
o-Xylene	0.1	mg/kg	< 0.1	< 0.1	-
Xylenes - Total*	0.3	mg/kg	< 0.3	< 0.3	-
BTEX					
4-Bromofluorobenzene (surr.)	1	%	88	100	-
Total Recoverable Hydrocarbons - 2013 NEPM Fractions					
Naphthalene^{N02}	0.5	mg/kg	< 0.5	< 0.5	-
Polycyclic Aromatic Hydrocarbons					
Benzo(a)pyrene TEQ (lower bound) *	0.5	mg/kg	< 0.5	< 0.5	-
Benzo(a)pyrene TEQ (medium bound) *	0.5	mg/kg	0.6	0.6	-
Benzo(a)pyrene TEQ (upper bound) *	0.5	mg/kg	1.2	1.2	-
Acenaphthene	0.5	mg/kg	< 0.5	< 0.5	-
Acenaphthylene	0.5	mg/kg	< 0.5	< 0.5	-
Anthracene	0.5	mg/kg	< 0.5	< 0.5	-
Benz(a)anthracene	0.5	mg/kg	< 0.5	< 0.5	-
Benzo(a)pyrene	0.5	mg/kg	< 0.5	< 0.5	-
Benzo(b&j)fluoranthene^{N07}	0.5	mg/kg	< 0.5	< 0.5	-
Benzo(g.h.i)perylene	0.5	mg/kg	< 0.5	< 0.5	-
Benzo(k)fluoranthene	0.5	mg/kg	< 0.5	< 0.5	-

Client Sample ID			QC201	QC202	QC203
Sample Matrix			**Soil**	**Soil**	**Soil**
Eurofins Sample No.			**L24-Jl0019816**	**L24-Jl0019817**	**L24-Jl0019818**
Date Sampled			**Jul 05, 2024**	**Jul 05, 2024**	**Jul 05, 2024**
Test/Reference	LOR	Unit			
Polycyclic Aromatic Hydrocarbons					
Chrysene	0.5	mg/kg	< 0.5	< 0.5	-
Dibenz(a.h)anthracene	0.5	mg/kg	< 0.5	< 0.5	-
Fluoranthene	0.5	mg/kg	< 0.5	< 0.5	-
Fluorene	0.5	mg/kg	< 0.5	< 0.5	-
Indeno(1.2.3-cd)pyrene	0.5	mg/kg	< 0.5	< 0.5	-
Naphthalene	0.5	mg/kg	< 0.5	< 0.5	-
Phenanthrene	0.5	mg/kg	< 0.5	< 0.5	-
Pyrene	0.5	mg/kg	< 0.5	< 0.5	-
Total PAH*	0.5	mg/kg	< 0.5	< 0.5	-
2-Fluorobiphenyl (surr.)	1	%	80	87	-
p-Terphenyl-d14 (surr.)	1	%	97	116	-
pH	0.1	pH Units	9.0	8.9	-
Heavy Metals					
Arsenic	2	mg/kg	7.4	7.7	-
Cadmium	0.1	mg/kg	< 0.1	< 0.1	-
Chromium	1	mg/kg	15	6.8	-
Copper	1	mg/kg	29	1.5	-
Lead	1	mg/kg	4.5	2.3	-
Mercury	0.02	mg/kg	0.04	0.04	-
Nickel	1	mg/kg	6.6	2.9	-
Zinc	5	mg/kg	25	17	-
Acid Sulfate Soils Field pH Test					
pH-F (Field pH test)*	0.1	pH Units	8.7	8.7	-
pH-FOX (Field pH Peroxide test)*	0.1	pH Units	8.4	8.3	-
Reaction Ratings*[S05]	0	comment	4.0	4.0	-
Actual Acidity (NLM-3.2)					
pH-KCL (NLM-3.1)	0.1	pH Units	9.5	9.6	-
Titratable Actual Acidity (NLM-3.2)	2	mol H+/t	< 2	< 2	-
Titratable Actual Acidity (NLM-3.2)	0.003	% pyrite S	< 0.003	< 0.003	-
SPOCAS Suite - WA (Excluding ANC)					
SPOCAS - Liming rate - ASSMAC (Excluding ANC)		kg CaCO3/t	< 1	< 1	-
SPOCAS - Net Acidity - ASSMAC (Excluding ANC)		mol H+/t	< 10	< 10	-
SPOCAS - Net Acidity - ASSMAC (Excluding ANC)		% S	< 0.02	< 0.02	-
Potential Acidity - Titratable Peroxide					
pH-OX	0.1	pH Units	7.8	7.9	-
Titratable Peroxide Acidity (s-TPA)	0.02	% pyrite S	< 0.02	< 0.02	-
Titratable Peroxide Acidity (a-TPA)	2	mol H+/t	< 2	< 2	-
Titratable Sulfidic Acidity (a-TSA)	2	mol H+/t	< 2	< 2	-
Titratable Sulfidic Acidity (s-TSA)	0.02	% pyrite S	< 0.02	< 0.02	-
Extractable Sulfur					
Sulfur - KCl Extractable	0.005	% S	0.13	0.093	-
Peroxide Extractable Sulfur	0.005	% S	0.20	0.22	-
HCl Extractable Sulfur	0.005	% S	N/A	N/A	-
Potential Acidity (SPOS)					
Peroxide Oxidisable Sulfur (s-SPOS) (NLM 2.2)	0.005	% S	0.079	0.13	-
Peroxide Oxidisable Sulfur (a-SPOS) (NLM 2.2)	2	mol H+/t	49	79	-

Client Sample ID **Sample Matrix** **Eurofins Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**QC201** **Soil** **L24-Jl0019816** **Jul 05, 2024**	**QC202** **Soil** **L24-Jl0019817** **Jul 05, 2024**	**QC203** **Soil** **L24-Jl0019818** **Jul 05, 2024**
Retained Acidity (S-NAS)					
Net Acid soluble sulfur (SNAS) NLM-4.1	0.005	% S	N/A	N/A	-
Net Acid soluble sulfur (s-SNAS) NLM-4.1[S02]	0.005	% S	N/A	N/A	-
Net Acid soluble sulfur (a-SNAS) NLM-4.1	2	mol H+/t	N/A	N/A	-
HCl Extractable Sulfur Correction Factor	1	factor	2.0	2.0	-
Extractable Calcium					
Calcium - KCl Extractable	0.005	% Ca	0.20	0.17	-
Calcium - Peroxide	0.005	% Ca	16	22	-
Calcium - Acid Reacted	0.005	% Ca	16	22	-
Calcium - Acid Reacted (s-aCa)	0.005	% S	13	18	-
Calcium - Acid Reacted (a-aCa)	0.005	mol H+/t	7900	11000	-
Extractable Magnesium					
Magnesium - KCl Extractable	0.005	% Mg	0.11	0.11	-
Magnesium - Peroxide	0.005	% Mg	1.2	3.7	-
Magnesium - Acid Reacted	0.005	% Mg	1.1	3.6	-
Magnesium - Acid Reacted (s-aCa)	0.005	% S	1.5	4.7	-
Magnesium - Acid Reacted (a-aCa)	0.005	mol H+/t	930	2900	-
Acid Neutralising Capacity (ANCE)					
Acid Neutralising Capacity - (ANCE)	0.02	% CaCO3	38	64	-
Acid Neutralising Capacity - (s-ANCE)	0.02	% S	12	21	-
Acid Neutralising Capacity - (a-ANCE)	10	mol H+/t	7600	13000	-
Acid Neutralising Capacity (ANCbt)					
ANC Fineness Factor		factor	1.5	1.5	-
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	0.01	% CaCO3	43	59	-
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2)[S03]	0.02	% S	14	19	-
Acid Neutralising Capacity - (a-ANCbt) (NLM-5.2)	2	mol H+/t	8600	12000	-
Net Acidity (Including ANC)					
SPOCAS - Net Acidity - ASSMAC (Acidity Units)	10	mol H+/t	< 10	< 10	-
SPOCAS - Net Acidity - ASSMAC (Sulfur Units)	0.02	% S	< 0.02	< 0.02	-
SPOCAS - Liming rate - ASSMAC	1	kg CaCO3/t	< 1	< 1	-
s-CRS Suite - Net Acidity - NASSG (including ANC)	0.02	% S	N/A	N/A	-
CRS Suite - Net Acidity - NASSG (Including ANC)	10	mol H+/t	N/A	N/A	-
CRS Suite - Liming Rate - NASSG (Including ANC)[S01]	1	kg CaCO3/t	N/A	N/A	-
Potential Acidity - Chromium Reducible Sulfur					
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)[S04]	0.005	% S	0.006	< 0.005	-
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	3	mol H+/t	3.7	< 3	-
Extraneous Material					
<2mm Fraction	0.005	g	23	70	-
>2mm Fraction	0.005	g	5.2	9.8	-
Analysed Material	0.1	%	81	88	-
Extraneous Material	0.1	%	19	12	-
Sample Properties					
% Moisture	1	%	15	9.5	14
Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorobutanoic acid (PFBA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoropentanoic acid (PFPeA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorohexanoic acid (PFHxA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluoroheptanoic acid (PFHpA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorooctanoic acid (PFOA)[N11]	5	ug/kg	< 5	< 5	< 5
Perfluorononanoic acid (PFNA)[N11]	5	ug/kg	< 5	< 5	< 5

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Perfluoroalkyl carboxylic acids (PFCAs)					
Perfluorodecanoic acid (PFDA)^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluoroundecanoic acid (PFUnDA)^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorododecanoic acid (PFDoDA)^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorotridecanoic acid (PFTrDA)^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluorotetradecanoic acid (PFTeDA)^{N11}	5	ug/kg	< 5	< 5	< 5
13C4-PFBA (surr.)	1	%	88	78	75
13C5-PFPeA (surr.)	1	%	96	87	85
13C5-PFHxA (surr.)	1	%	97	87	83
13C4-PFHpA (surr.)	1	%	95	87	88
13C8-PFOA (surr.)	1	%	103	91	93
13C5-PFNA (surr.)	1	%	94	80	81
13C6-PFDA (surr.)	1	%	85	88	88
13C2-PFUnDA (surr.)	1	%	80	80	81
13C2-PFDoDA (surr.)	1	%	81	76	70
13C2-PFTeDA (surr.)	1	%	71	78	76
Perfluoroalkyl sulfonamido substances					
Perfluorooctane sulfonamide (FOSA)^{N11}	5	ug/kg	< 5	< 5	< 5
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)^{N11}	5	ug/kg	< 5	< 5	< 5
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)^{N11}	5	ug/kg	< 5	< 5	< 5
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)^{N11}	5	ug/kg	< 5	< 5	< 5
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)^{N11}	5	ug/kg	< 5	< 5	< 5
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)^{N11}	10	ug/kg	< 10	< 10	< 10
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)^{N11}	10	ug/kg	< 10	< 10	< 10
13C8-FOSA (surr.)	1	%	92	83	85
D3-N-MeFOSA (surr.)	1	%	125	104	108
D5-N-EtFOSA (surr.)	1	%	119	114	117
D7-N-MeFOSE (surr.)	1	%	91	83	95
D9-N-EtFOSE (surr.)	1	%	90	96	86
D5-N-EtFOSAA (surr.)	1	%	76	92	107
D3-N-MeFOSAA (surr.)	1	%	86	110	100
Perfluoroalkyl sulfonic acids (PFSAs)					
Perfluorobutanesulfonic acid (PFBS)^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorononanesulfonic acid (PFNS)^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluoropropanesulfonic acid (PFPrS)^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluoropentanesulfonic acid (PFPeS)^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluorohexanesulfonic acid (PFHxS)^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluoroheptanesulfonic acid (PFHpS)^{N15}	5	ug/kg	< 5	< 5	< 5
Perfluorooctanesulfonic acid (PFOS)^{N11}	5	ug/kg	< 5	< 5	< 5
Perfluorodecanesulfonic acid (PFDS)^{N15}	5	ug/kg	< 5	< 5	< 5
13C3-PFBS (surr.)	1	%	85	79	77
18O2-PFHxS (surr.)	1	%	90	77	81
13C8-PFOS (surr.)	1	%	63	87	87

Client Sample ID **Sample Matrix** **Eurofins Sample No.** **Date Sampled** Test/Reference	LOR	Unit	QC201 **Soil** **L24-Jl0019816** **Jul 05, 2024**	QC202 **Soil** **L24-Jl0019817** **Jul 05, 2024**	QC203 **Soil** **L24-Jl0019818** **Jul 05, 2024**
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)^{N11}	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)^{N11}	10	ug/kg	< 10	< 10	< 10
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)^{N11}	5	ug/kg	< 5	< 5	< 5
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)^{N11}	5	ug/kg	< 5	< 5	< 5
13C2-4:2 FTSA (surr.)	1	%	128	100	105
13C2-6:2 FTSA (surr.)	1	%	126	137	110
13C2-8:2 FTSA (surr.)	1	%	106	133	125
13C2-10:2 FTSA (surr.)	1	%	89	95	89
PFASs Summations					
Sum (PFHxS + PFOS)*	5	ug/kg	< 5	< 5	< 5
Sum of US EPA PFAS (PFOS + PFOA)*	5	ug/kg	< 5	< 5	< 5
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	5	ug/kg	< 5	< 5	< 5
Sum of WA DWER PFAS (n=10)*	10	ug/kg	< 10	< 10	< 10
Sum of PFASs (n=30)*	50	ug/kg	< 50	< 50	< 50

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Welshpool	Jul 08, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Jul 11, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Jul 11, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Welshpool	Jul 11, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons	Welshpool	Jul 08, 2024	14 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water			
pH	Welshpool	Jul 11, 2024	7 Days
- Method: ARL138 - pH in Soil and Biosolid			
Metals M8	Welshpool	Jul 08, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Acid Sulfate Soils Field pH Test	Brisbane	Jul 10, 2024	7 Days
- Method: LTM-GEN-7060 Determination of field pH (pHF) and field pH peroxide (pHFOX) tests			
SPOCAS Suite - WA (Excluding ANC)			
SPOCAS Suite - WA (Excluding ANC)	Brisbane	Jul 10, 2024	6 Week
- Method: LTM-GEN-7050			
Chromium Reducible Sulfur Suite			
Chromium Suite	Brisbane	Jul 10, 2024	6 Week
- Method: LTM-GEN-7070 Chromium Reducible Sulfur Suite			
Extraneous Material	Brisbane	Jul 10, 2024	6 Week
- Method: LTM-GEN-7050/7070			
% Moisture	Melbourne	Jul 08, 2024	14 Days
- Method: ARL135 Moisture in Solids			
- Method: LTM-GEN-7080 Moisture			
Per- and Polyfluoroalkyl Substances (PFASs)			
Perfluoroalkyl carboxylic acids (PFCAs)	Melbourne	Jul 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonamido substances	Melbourne	Jul 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
Perfluoroalkyl sulfonic acids (PFSAs)	Melbourne	Jul 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)	Melbourne	Jul 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			
PFASs Summations	Melbourne	Jul 08, 2024	
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS)			

Company Name: Senversa Pty Ltd WA
Address: Level 18, 140 St Georges Terrace
Perth
WA 6000

Project Name: BURRUP - BASELINE ASSESSMENT
Project ID: P21705

Order No.:
Report #: 1115574
Phone: 0863240200
Fax: 0396060074

Received: Jul 8, 2024 12:35 PM
Due: Jul 15, 2024
Priority: 5 Day
Contact Name: - Lab reports

Eurofins Analytical Services Manager : Elden Garrett

Sample Detail						pH (1:5 Aqueous extract at 25 °C as rec.)	Acid Sulfate Soils Field pH Test	Metals M8	SPOCAS Suite - WA (Excluding ANC)	Chromium Reducible Sulfur Suite	Moisture Set	Moisture Set	Eurofins Suite B4	Per- and Polyfluoroalkyl Substances (PFASs)
Perth Laboratory - NATA # 2377 Site # 2370						X		X			X	X	X	
Melbourne Laboratory - NATA # 1261 Site # 1254											X	X		X
Brisbane Laboratory - NATA # 1261 Site # 20794 & 2780							X		X	X				
External Laboratory														
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**									
1	QC201	Jul 05, 2024		Soil	L24-Jl0019816	X	X	X	X	X		X	X	X
2	QC202	Jul 05, 2024		Soil	L24-Jl0019817	X	X	X	X	X		X	X	X
3	QC203	Jul 05, 2024		Soil	L24-Jl0019818						X			X
Test Counts						2	2	2	2	2	3	3	2	3

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds where annotated.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the sampling date; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram	**mg/L:** milligrams per litre	**ppm:** parts per million
µg/L: micrograms per litre	**ppb:** parts per billion	**%:** Percentage
org/100 mL: Organisms per 100 millilitres	**NTU:** Nephelometric Turbidity Units	**MPN/100 mL:** Most Probable Number of organisms per 100 millilitres
CFU: Colony Forming Unit	**Colour:** Pt-Co Units (CU)	

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/kg	< 20			20	Pass	
TRH C10-C14	mg/kg	< 20			20	Pass	
TRH C15-C28	mg/kg	< 50			50	Pass	
TRH C29-C36	mg/kg	< 50			50	Pass	
TRH C6-C10*	mg/kg	< 20			20	Pass	
TRH >C10-C16	mg/kg	< 50			50	Pass	
TRH >C16-C34	mg/kg	< 100			100	Pass	
TRH >C34-C40*	mg/kg	< 100			100	Pass	
Method Blank							
BTEX							
Benzene	mg/kg	< 0.1			0.1	Pass	
Toluene	mg/kg	< 0.1			0.1	Pass	
Ethylbenzene	mg/kg	< 0.1			0.1	Pass	
m&p-Xylenes	mg/kg	< 0.2			0.2	Pass	
o-Xylene	mg/kg	< 0.1			0.1	Pass	
Xylenes - Total*	mg/kg	< 0.3			0.3	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/kg	< 2			2	Pass	
Cadmium	mg/kg	< 0.1			0.1	Pass	
Chromium	mg/kg	< 1			1	Pass	
Copper	mg/kg	< 1			1	Pass	
Lead	mg/kg	< 1			1	Pass	
Mercury	mg/kg	< 0.02			0.02	Pass	
Nickel	mg/kg	< 1			1	Pass	
Zinc	mg/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	ug/kg	< 5			5	Pass	
Perfluoropentanoic acid (PFPeA)	ug/kg	< 5			5	Pass	
Perfluorohexanoic acid (PFHxA)	ug/kg	< 5			5	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/kg	< 5			5	Pass	
Perfluorooctanoic acid (PFOA)	ug/kg	< 5			5	Pass	
Perfluorononanoic acid (PFNA)	ug/kg	< 5			5	Pass	
Perfluorodecanoic acid (PFDA)	ug/kg	< 5			5	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/kg	< 5			5	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/kg	< 5			5	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/kg	< 5			5	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/kg	< 5			5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	ug/kg	< 5			5	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/kg	< 5			5	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/kg	< 5			5	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/kg	< 5			5	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/kg	< 5			5	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/kg	< 10			10	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/kg	< 10			10	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	ug/kg	< 5			5	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/kg	< 5			5	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/kg	< 5			5	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/kg	< 5			5	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/kg	< 5			5	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/kg	< 5			5	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/kg	< 5			5	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/kg	< 5			5	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/kg	< 10			10	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/kg	< 5			5	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/kg	< 5			5	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	mg/kg	< 0.5			0.5	Pass	
Acenaphthylene	mg/kg	< 0.5			0.5	Pass	
Anthracene	mg/kg	< 0.5			0.5	Pass	
Benz(a)anthracene	mg/kg	< 0.5			0.5	Pass	
Benzo(a)pyrene	mg/kg	< 0.5			0.5	Pass	
Benzo(b&j)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Benzo(g.h.i)perylene	mg/kg	< 0.5			0.5	Pass	
Benzo(k)fluoranthene	mg/kg	< 0.5			0.5	Pass	
Chrysene	mg/kg	< 0.5			0.5	Pass	
Dibenz(a.h)anthracene	mg/kg	< 0.5			0.5	Pass	
Fluoranthene	mg/kg	< 0.5			0.5	Pass	
Fluorene	mg/kg	< 0.5			0.5	Pass	
Indeno(1.2.3-cd)pyrene	mg/kg	< 0.5			0.5	Pass	
Naphthalene	mg/kg	< 0.5			0.5	Pass	
Phenanthrene	mg/kg	< 0.5			0.5	Pass	
Pyrene	mg/kg	< 0.5			0.5	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	93			70-130	Pass	
TRH C10-C14	%	91			70-130	Pass	
TRH C6-C10*	%	90			70-130	Pass	
TRH >C10-C16	%	87			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	90			70-130	Pass	
Toluene	%	86			70-130	Pass	
Ethylbenzene	%	94			70-130	Pass	
m&p-Xylenes	%	88			70-130	Pass	
o-Xylene	%	88			70-130	Pass	
Xylenes - Total*	%	88			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	94			70-130	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Heavy Metals							
Arsenic	%	104			80-120	Pass	
Cadmium	%	89			80-120	Pass	
Chromium	%	86			80-120	Pass	
Copper	%	83			80-120	Pass	
Lead	%	81			80-120	Pass	
Mercury	%	87			80-120	Pass	
Nickel	%	85			80-120	Pass	
Zinc	%	91			80-120	Pass	
LCS - % Recovery							
Actual Acidity (NLM-3.2)							
pH-KCL (NLM-3.1)	%	99			80-120	Pass	
Titratable Actual Acidity (NLM-3.2)	%	98			80-120	Pass	
LCS - % Recovery							
Potential Acidity - Chromium Reducible Sulfur							
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)	%	90			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs)							
Perfluorobutanoic acid (PFBA)	%	83			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	86			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	82			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	85			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	85			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	89			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	95			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	99			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	94			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	89			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	96			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances							
Perfluorooctane sulfonamide (FOSA)	%	92			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	85			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	88			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	87			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	93			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	83			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	91			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)							
Perfluorobutanesulfonic acid (PFBS)	%	76			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	147			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	92			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	84			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	82			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	125			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	99			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	146			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	89			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	88			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	77			50-150	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
LCS - % Recovery							
Polycyclic Aromatic Hydrocarbons							
Acenaphthene	%	102			70-130	Pass	
Acenaphthylene	%	100			70-130	Pass	
Anthracene	%	108			70-130	Pass	
Benz(a)anthracene	%	86			70-130	Pass	
Benzo(a)pyrene	%	103			70-130	Pass	
Benzo(b&j)fluoranthene	%	122			70-130	Pass	
Benzo(g.h.i)perylene	%	106			70-130	Pass	
Benzo(k)fluoranthene	%	118			70-130	Pass	
Chrysene	%	97			70-130	Pass	
Dibenz(a.h)anthracene	%	104			70-130	Pass	
Fluoranthene	%	98			70-130	Pass	
Fluorene	%	103			70-130	Pass	
Indeno(1.2.3-cd)pyrene	%	97			70-130	Pass	
Naphthalene	%	104			70-130	Pass	
Phenanthrene	%	100			70-130	Pass	
Pyrene	%	107			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C6-C9	L24-Jl0018371	NCP	%	109			70-130	Pass	
TRH C10-C14	L24-Jl0032334	NCP	%	88			70-130	Pass	
TRH C6-C10*	L24-Jl0018371	NCP	%	100			70-130	Pass	
TRH >C10-C16	L24-Jl0032334	NCP	%	85			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	L24-Jl0018371	NCP	%	96			70-130	Pass	
Toluene	L24-Jl0018371	NCP	%	97			70-130	Pass	
Ethylbenzene	L24-Jl0018371	NCP	%	94			70-130	Pass	
m&p-Xylenes	L24-Jl0018371	NCP	%	99			70-130	Pass	
o-Xylene	L24-Jl0018371	NCP	%	98			70-130	Pass	
Xylenes - Total*	L24-Jl0018371	NCP	%	98			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	L24-Jl0018371	NCP	%	84			70-130	Pass	
Spike - % Recovery									
Polycyclic Aromatic Hydrocarbons				Result 1					
Acenaphthene	L24-Jl0014115	NCP	%	96			70-130	Pass	
Acenaphthylene	L24-Jl0014115	NCP	%	102			70-130	Pass	
Anthracene	L24-Jl0014115	NCP	%	92			70-130	Pass	
Benz(a)anthracene	L24-Jl0014115	NCP	%	102			70-130	Pass	
Benzo(a)pyrene	L24-Jl0014115	NCP	%	104			70-130	Pass	
Benzo(b&j)fluoranthene	L24-Jl0014115	NCP	%	114			70-130	Pass	
Benzo(g.h.i)perylene	L24-Jl0014115	NCP	%	98			70-130	Pass	
Benzo(k)fluoranthene	L24-Jl0014115	NCP	%	101			70-130	Pass	
Chrysene	L24-Jl0014115	NCP	%	98			70-130	Pass	
Dibenz(a.h)anthracene	L24-Jl0014115	NCP	%	104			70-130	Pass	
Fluoranthene	L24-Jl0014115	NCP	%	100			70-130	Pass	
Fluorene	L24-Jl0014115	NCP	%	104			70-130	Pass	
Indeno(1.2.3-cd)pyrene	L24-Jl0014115	NCP	%	107			70-130	Pass	
Naphthalene	L24-Jl0014115	NCP	%	99			70-130	Pass	
Phenanthrene	L24-Jl0014115	NCP	%	83			70-130	Pass	
Pyrene	L24-Jl0014115	NCP	%	99			70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic	L24-Jl0018386	NCP	%	80			75-125	Pass	
Cadmium	L24-Jl0018386	NCP	%	79			75-125	Pass	
Chromium	L24-Jl0018386	NCP	%	67			75-125	Fail	Q08
Copper	L24-Jl0018338	NCP	%	92			75-125	Pass	
Lead	L24-Jl0018386	NCP	%	121			75-125	Pass	
Mercury	L24-Jl0018338	NCP	%	89			75-125	Pass	
Nickel	L24-Jl0018338	NCP	%	94			75-125	Pass	
Zinc	L24-Jl0018338	NCP	%	94			75-125	Pass	
Spike - % Recovery									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1					
Perfluorobutanoic acid (PFBA)	M24-Jl0025411	NCP	%	89			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	M24-Jl0025411	NCP	%	88			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	M24-Jl0025411	NCP	%	93			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	M24-Jl0025411	NCP	%	93			50-150	Pass	
Perfluorooctanoic acid (PFOA)	M24-Jl0025411	NCP	%	94			50-150	Pass	
Perfluorononanoic acid (PFNA)	M24-Jl0025411	NCP	%	99			50-150	Pass	
Perfluorodecanoic acid (PFDA)	M24-Jl0025411	NCP	%	97			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	M24-Jl0025411	NCP	%	103			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	M24-Jl0025411	NCP	%	107			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	M24-Jl0025411	NCP	%	122			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M24-Jl0025411	NCP	%	105			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonamido substances				Result 1					
Perfluorooctane sulfonamide (FOSA)	M24-Jl0025411	NCP	%	98			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M24-Jl0025411	NCP	%	100			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M24-Jl0025411	NCP	%	91			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M24-Jl0025411	NCP	%	91			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M24-Jl0025411	NCP	%	105			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M24-Jl0025411	NCP	%	89			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M24-Jl0025411	NCP	%	93			50-150	Pass	
Spike - % Recovery									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1					
Perfluorobutanesulfonic acid (PFBS)	M24-Jl0025411	NCP	%	86			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	M24-Jl0025411	NCP	%	73			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M24-Jl0025411	NCP	%	107			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M24-Jl0025411	NCP	%	92			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M24-Jl0025411	NCP	%	94			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M24-Jl0025411	NCP	%	92			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	M24-Jl0025411	NCP	%	96			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorodecanesulfonic acid (PFDS)	M24-Jl0025411	NCP	%	101			50-150	Pass	
Spike - % Recovery									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1					
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M24-Jl0025411	NCP	%	82			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M24-Jl0025411	NCP	%	106			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M24-Jl0025411	NCP	%	83			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M24-Jl0025411	NCP	%	90			50-150	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	L24-Jl0018387	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C10-C14	L24-Jl0018378	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH C15-C28	L24-Jl0018378	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C29-C36	L24-Jl0018378	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH C6-C10*	L24-Jl0018387	NCP	mg/kg	< 20	< 20	<1	30%	Pass	
TRH >C10-C16	L24-Jl0018378	NCP	mg/kg	< 50	< 50	<1	30%	Pass	
TRH >C16-C34	L24-Jl0018378	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
TRH >C34-C40*	L24-Jl0018378	NCP	mg/kg	< 100	< 100	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	L24-Jl0018387	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Toluene	L24-Jl0018387	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Ethylbenzene	L24-Jl0018387	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
m&p-Xylenes	L24-Jl0018387	NCP	mg/kg	< 0.2	< 0.2	<1	30%	Pass	
o-Xylene	L24-Jl0018387	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Xylenes - Total*	L24-Jl0018387	NCP	mg/kg	< 0.3	< 0.3	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	L24-Jl0018387	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons				Result 1	Result 2	RPD			
Acenaphthene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Acenaphthylene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Anthracene	L24-Jl0014111	NCP	mg/kg	< 0.5	1.1	<1	30%	Pass	
Benz(a)anthracene	L24-Jl0014111	NCP	mg/kg	< 0.5	0.5	<1	30%	Pass	
Benzo(a)pyrene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(b&j)fluoranthene	L24-Jl0014111	NCP	mg/kg	< 0.5	0.5	<1	30%	Pass	
Benzo(g.h.i)perylene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Benzo(k)fluoranthene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Chrysene	L24-Jl0014111	NCP	mg/kg	< 0.5	0.6	16	30%	Pass	
Dibenz(a.h)anthracene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Fluoranthene	L24-Jl0014111	NCP	mg/kg	1.3	2.9	<1	30%	Pass	
Fluorene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Indeno(1.2.3-cd)pyrene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Naphthalene	L24-Jl0014111	NCP	mg/kg	< 0.5	< 0.5	<1	30%	Pass	
Phenanthrene	L24-Jl0014111	NCP	mg/kg	0.8	2.9	<1	30%	Pass	
Pyrene	L24-Jl0014111	NCP	mg/kg	1.4	2.8	<1	30%	Pass	

Duplicate									
				Result 1	Result 2	RPD			
pH	L23-No0001846	NCP	pH Units	9.6	9.5	<1	30%	Pass	
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic	L24-Jl0021071	NCP	mg/kg	< 2	< 2	<1	30%	Pass	
Cadmium	L24-Jl0021071	NCP	mg/kg	< 0.1	< 0.1	<1	30%	Pass	
Chromium	L24-Jl0021071	NCP	mg/kg	3.0	2.9	5.5	30%	Pass	
Copper	L24-Jl0021071	NCP	mg/kg	57	54	4.9	30%	Pass	
Lead	L24-Jl0021071	NCP	mg/kg	5.2	4.9	6.9	30%	Pass	
Mercury	L24-Jl0021071	NCP	mg/kg	0.19	0.17	7.2	30%	Pass	
Nickel	L24-Jl0021071	NCP	mg/kg	< 1	1.1	13	30%	Pass	
Zinc	L24-Jl0021071	NCP	mg/kg	150	150	2.8	30%	Pass	
Duplicate									
Acid Sulfate Soils Field pH Test				Result 1	Result 2	RPD			
pH-F (Field pH test)*	B24-Jl0023989	NCP	pH Units	4.9	5.0	pass	20%	Pass	
Duplicate									
Actual Acidity (NLM-3.2)				Result 1	Result 2	RPD			
pH-KCL (NLM-3.1)	B24-Jl0038179	NCP	pH Units	8.5	8.5	<1	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B24-Jl0038179	NCP	mol H+/t	< 2	< 2	<1	20%	Pass	
Titratable Actual Acidity (NLM-3.2)	B24-Jl0038179	NCP	% pyrite S	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Potential Acidity - Titratable Peroxide				Result 1	Result 2	RPD			
pH-OX	B24-Jl0038179	NCP	pH Units	8.0	8.2	3.4	20%	Pass	
Titratable Peroxide Acidity (s-TPA)	B24-Jl0038179	NCP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass	
Titratable Peroxide Acidity (a-TPA)	B24-Jl0038179	NCP	mol H+/t	< 2	< 2	<1	20%	Pass	
Titratable Sulfidic Acidity (a-TSA)	B24-Jl0038179	NCP	mol H+/t	< 2	< 2	<1	30%	Pass	
Titratable Sulfidic Acidity (s-TSA)	B24-Jl0038179	NCP	% pyrite S	< 0.02	< 0.02	<1	30%	Pass	
Duplicate									
Extractable Sulfur				Result 1	Result 2	RPD			
Sulfur - KCl Extractable	B24-Jl0038179	NCP	% S	0.028	0.027	2.4	30%	Pass	
Peroxide Extractable Sulfur	B24-Jl0038179	NCP	% S	0.031	0.031	1.5	20%	Pass	
HCl Extractable Sulfur	B24-Jl0038179	NCP	% S	N/A	N/A	N/A	20%	Pass	
Duplicate									
Potential Acidity (SPOS)				Result 1	Result 2	RPD			
Peroxide Oxidisable Sulfur (s-SPOS) (NLM 2.2)	B24-Jl0038179	NCP	% S	< 0.005	< 0.005	<1	30%	Pass	
Peroxide Oxidisable Sulfur (a-SPOS) (NLM 2.2)	B24-Jl0038179	NCP	mol H+/t	< 2	< 2	<1	30%	Pass	
Duplicate									
Retained Acidity (S-NAS)				Result 1	Result 2	RPD			
Net Acid soluble sulfur (SNAS) NLM-4.1	B24-Jl0038179	NCP	% S	N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (s-SNAS) NLM-4.1	B24-Jl0038179	NCP	% S	N/A	N/A	N/A	30%	Pass	
Net Acid soluble sulfur (a-SNAS) NLM-4.1	B24-Jl0038179	NCP	mol H+/t	N/A	N/A	N/A	30%	Pass	
Duplicate									
Extractable Calcium				Result 1	Result 2	RPD			
Calcium - KCl Extractable	B24-Jl0038179	NCP	% Ca	0.30	0.31	2.1	30%	Pass	
Calcium - Peroxide	B24-Jl0038179	NCP	% Ca	2.4	2.9	18	20%	Pass	
Calcium - Acid Reacted	B24-Jl0038179	NCP	% Ca	2.1	2.6	20	30%	Pass	
Calcium - Acid Reacted (s-aCa)	B24-Jl0038179	NCP	% S	1.7	2.1	20	30%	Pass	
Calcium - Acid Reacted (a-aCa)	B24-Jl0038179	NCP	mol H+/t	1000	1300	20	30%	Pass	

Duplicate									
Extractable Magnesium				Result 1	Result 2	RPD			
Magnesium - KCl Extractable	B24-Jl0038179	NCP	% Mg	0.031	0.030	2.9	30%	Pass	
Magnesium - Peroxide	B24-Jl0038179	NCP	% Mg	0.038	0.044	15	20%	Pass	
Magnesium - Acid Reacted	B24-Jl0038179	NCP	% Mg	< 0.005	< 0.005	<1	30%	Pass	
Magnesium - Acid Reacted (s-aCa)	B24-Jl0038179	NCP	% S	< 0.005	< 0.005	<1	30%	Pass	
Magnesium - Acid Reacted (a-aCa)	B24-Jl0038179	NCP	mol H+/t	< 0.005	< 0.005	<1	30%	Pass	
Duplicate									
Acid Neutralising Capacity (ANCE)				Result 1	Result 2	RPD			
Acid Neutralising Capacity - (ANCE)	B24-Jl0038179	NCP	% CaCO3	5.0	5.8	16	30%	Pass	
Acid Neutralising Capacity - (a-ANCE)	B24-Jl0038179	NCP	mol H+/t	990	1200	16	30%	Pass	
Duplicate									
Acid Neutralising Capacity (ANCbt)				Result 1	Result 2	RPD			
ANC Fineness Factor	B24-Jl0038179	NCP	factor	1.5	1.5	<1	30%	Pass	
Acid Neutralising Capacity - (ANCbt) (NLM-5.2)	B24-Jl0038179	NCP	% CaCO3	6.7	6.6	<1	20%	Pass	
Acid Neutralising Capacity - (s-ANCbt) (NLM-5.2)	B24-Jl0038179	NCP	% S	2.1	2.1	<1	30%	Pass	
Duplicate									
Net Acidity (Including ANC)				Result 1	Result 2	RPD			
SPOCAS - Net Acidity - ASSMAC (Acidity Units)	B24-Jl0038179	NCP	mol H+/t	< 10	< 10	<1	30%	Pass	
SPOCAS - Net Acidity - ASSMAC (Sulfur Units)	B24-Jl0038179	NCP	% S	< 0.02	< 0.02	<1	30%	Pass	
SPOCAS - Liming rate - ASSMAC	B24-Jl0038179	NCP	kg CaCO3/t	< 1	< 1	<1	30%	Pass	
s-CRS Suite - Net Acidity - NASSG (including ANC)	B24-Jl0038179	NCP	% S	N/A	N/A	N/A	30%	Pass	
CRS Suite - Net Acidity - NASSG (Including ANC)	B24-Jl0038179	NCP	mol H+/t	N/A	N/A	N/A	30%	Pass	
CRS Suite - Liming Rate - NASSG (Including ANC)	B24-Jl0038179	NCP	kg CaCO3/t	N/A	N/A	N/A	30%	Pass	
Duplicate									
Potential Acidity - Chromium Reducible Sulfur				Result 1	Result 2	RPD			
Chromium Reducible Sulfur (s-SCr) (NLM-2.1)	B24-Jl0038179	NCP	% S	< 0.005	< 0.005	<1	20%	Pass	
Chromium Reducible Sulfur (a-SCr) (NLM-2.1)	B24-Jl0038179	NCP	mol H+/t	< 3	< 3	<1	30%	Pass	
Duplicate									
Perfluoroalkyl carboxylic acids (PFCAs)				Result 1	Result 2	RPD			
Perfluorobutanoic acid (PFBA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanoic acid (PFPeA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanoic acid (PFHxA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanoic acid (PFHpA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorooctanoic acid (PFOA)	M24-Jl0029713	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanoic acid (PFNA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanoic acid (PFDA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroundecanoic acid (PFUnDA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorododecanoic acid (PFDoDA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorotridecanoic acid (PFTrDA)	M24-Jl0029714	NCP	ug/kg	Dil 0.0022	Dil 0.0032	n/a	30%	Pass	
Perfluorotetradecanoic acid (PFTeDA)	M24-Jl0029714	NCP	ug/kg	Conf 55.2799	Conf 54.9738	n/a	30%	Pass	

Duplicate									
Perfluoroalkyl sulfonamido substances				Result 1	Result 2	RPD			
Perfluorooctane sulfonamide (FOSA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	M24-Jl0029714	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	M24-Jl0029714	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
Duplicate									
Perfluoroalkyl sulfonic acids (PFSAs)				Result 1	Result 2	RPD			
Perfluorobutanesulfonic acid (PFBS)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorononanesulfonic acid (PFNS)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropropanesulfonic acid (PFPrS)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoropentanesulfonic acid (PFPeS)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorohexanesulfonic acid (PFHxS)	M24-Jl0029713	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	M24-Jl0029714	NCP	ug/kg	Conf 0	Conf 0	n/a	30%	Pass	
Perfluorooctanesulfonic acid (PFOS)	M24-Jl0029713	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Perfluorodecanesulfonic acid (PFDS)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)				Result 1	Result 2	RPD			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	M24-Jl0029713	NCP	ug/kg	< 10	< 10	<1	30%	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	M24-Jl0029714	NCP	ug/kg	< 5	< 5	<1	30%	Pass	
Duplicate									
Sample Properties				Result 1	Result 2	RPD			
% Moisture	M24-Jl0020255	NCP	%	22	24	6.8	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	No
Sample correctly preserved	No
Appropriate sample containers have been used	No
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N07	Please note:- These two PAH isomers closely co-elute using the most contemporary analytical methods and both the reported concentration (and the TEQ) apply specifically to the total of the two co-eluting PAHs
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).
Q08	The matrix spike recovery is outside of the recommended acceptance criteria. An acceptable recovery was obtained for the laboratory control sample indicating a sample matrix interference.
S01	Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil' multiply 'reported results' x 'wet bulk density of soil in t/m3'
S02	Retained Acidity is Reported when the pHKCl is less than pH 4.5
S03	Acid Neutralising Capacity is only required if the pHKCl if greater than or equal to pH 6.5
S04	Acid Sulfate Soil Samples have a 24 hour holding time unless frozen or dried within that period
S05	Field Screen uses the following fizz rating to classify the rate the samples reacted to the peroxide: 1.0; No reaction to slight. 2.0; Moderate reaction. 3.0; Strong reaction with persistent froth. 4.0; Extreme reaction.

Authorised by:

Elden Garrett	Analytical Services Manager
Carroll Lee	Senior Analyst-PFAS
Douglas Todd	Senior Analyst-Metal
Douglas Todd	Senior Analyst-Organic
Douglas Todd	Senior Analyst-Sample Properties
Douglas Todd	Senior Analyst-Volatile
John Horwood	Senior Analyst-Organic
Jonathon Angell	Senior Analyst-SPOCAS
Lauren Killin	Senior Analyst-Inorganic
Mary Makarios	Senior Analyst-Sample Properties

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order : **EP2409638**

Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Ashvini Wickramasinghe
Address	: LEVEL 18, 140 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
E-mail	: Ashton.Betti@senversa.com.au	E-mail	: ashvini.wickramasinghe@alsglobal.com
Telephone	: +61 08 6557 8881	Telephone	: +61-8-9406 1301
Facsimile	: +61 03 9606 0074	Facsimile	: +61-8-9406 1399
Project	: P21705 Burrup - Baseline Assessment	Page	: 1 of 3
Order number	: PO023451	Quote number	: EB2023SENVER0001 (EN/000)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: Egan Churchill-Gray		

Dates

Date Samples Received	: 08-Jul-2024 12:40	Issue Date	: 08-Jul-2024
Client Requested Due Date	: 15-Jul-2024	Scheduled Reporting Date	: **15-Jul-2024**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 3	Temperature	: 3.3 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 9 / 9

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- Please see scanned COC for sample discrepencies: extra samples , samples not received etc.
- Please direct any queries related to sample condition / numbering / breakages to Sample Receipt (Samples.Perth@alsglobal.com)
- Analytical work for this work order will be conducted at ALS Environmental Perth.
- Please direct any turnaround / technical queries to the laboratory contact designated above.
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **pH analysis should be conducted within 6 hours of sampling.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The laboratory will process these samples unless instructions are received from you indicating you do not wish to proceed. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - EA005P pH (Auto Titrator)	WATER - ED038 (CaCO3 only) Acidity as CaCO3 only	WATER - EP231X-ST PFAS - Full Suite (30 analytes) Super Trace	WATER - NT-01 & 02 Ca, Mg, Na, K, Cl, SO4, Alkalinity	WATER - NT-08A Total Nitrogen + NO2 + NO3 + NH3 + Total P +	WATER - W-05 TRH/BTEXN/8 Metals	WATER - W-18 TRH(C6 - C9)/BTEXN
EP2409638-001	05-Jul-2024 00:00	MW01	✓	✓	✓	✓	✓	✓	
EP2409638-002	05-Jul-2024 00:00	MW02	✓	✓	✓	✓	✓	✓	
EP2409638-003	05-Jul-2024 00:00	MW03	✓	✓	✓	✓	✓	✓	
EP2409638-004	05-Jul-2024 00:00	MW04	✓	✓	✓	✓	✓	✓	
EP2409638-005	05-Jul-2024 00:00	MW05	✓	✓	✓	✓	✓	✓	
EP2409638-006	05-Jul-2024 00:00	QC104	✓	✓	✓	✓	✓	✓	
EP2409638-007	05-Jul-2024 00:00	QC302			✓		✓	✓	
EP2409638-008	05-Jul-2024 00:00	QC402							✓
EP2409638-009	05-Jul-2024 00:00	QC403			✓				

Proactive Holding Time Report

The following table summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory.

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method Client Sample ID(s)	Container	Due for extraction	Due for analysis	Samples Received		Instructions Received	
				Date	Evaluation	Date	Evaluation
EA005-P: pH by Auto Titrator							
MW01	Clear Plastic Bottle - Natural	----	05-Jul-2024	08-Jul-2024	✘	----	----
MW02	Clear Plastic Bottle - Natural	----	05-Jul-2024	08-Jul-2024	✘	----	----
MW03	Clear Plastic Bottle - Natural	----	05-Jul-2024	08-Jul-2024	✘	----	----
MW04	Clear Plastic Bottle - Natural	----	05-Jul-2024	08-Jul-2024	✘	----	----
MW05	Clear Plastic Bottle - Natural	----	05-Jul-2024	08-Jul-2024	✘	----	----
QC104	Clear Plastic Bottle - Natural	----	05-Jul-2024	08-Jul-2024	✘	----	----
EK057G: Nitrite as N by Discrete Analyser							
MW01	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW02	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW03	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW04	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW05	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
QC104	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
QC302	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
EK071G: Reactive Phosphorus as P-By Discrete Analyser							
MW01	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW02	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW03	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW04	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
MW05	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
QC104	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----
QC302	Clear Plastic Bottle - Natural	----	07-Jul-2024	08-Jul-2024	✘	----	----

Requested Deliverables

ASHTON BETTI

- *AU Certificate of Analysis - NATA (COA)	Email	Ashton.Betti@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	Ashton.Betti@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	Ashton.Betti@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	Ashton.Betti@senversa.com.au
- A4 - AU Tax Invoice (INV)	Email	Ashton.Betti@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	Ashton.Betti@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	Ashton.Betti@senversa.com.au

Egan Churchill-Gray

- *AU Certificate of Analysis - NATA (COA)	Email	egan.churchill-gray@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	egan.churchill-gray@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	egan.churchill-gray@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	egan.churchill-gray@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	egan.churchill-gray@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	egan.churchill-gray@senversa.com.au

PERTH LAB REPORTS

- *AU Certificate of Analysis - NATA (COA)	Email	perth.labreports@senversa.com.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	perth.labreports@senversa.com.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	perth.labreports@senversa.com.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	perth.labreports@senversa.com.au
- Chain of Custody (CoC) (COC)	Email	perth.labreports@senversa.com.au
- EDI Format - ESDAT (ESDAT)	Email	perth.labreports@senversa.com.au

SUPPLIER ACCOUNTS

- A4 - AU Tax Invoice (INV)	Email	supplieraccounts@senversa.com.au

CERTIFICATE OF ANALYSIS

Work Order	: **EP2409638**	Page	: 1 of 13
Amendment	: **1**		
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Ashvini Wickramasinghe
Address	: LEVEL 18, 140 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: +61-8-9406 1301
Project	: P21705 Burrup - Baseline Assessment	Date Samples Received	: 08-Jul-2024 12:40
Order number	: PO023451	Date Analysis Commenced	: 08-Jul-2024
C-O-C number	: ----	Issue Date	: 08-Aug-2024 13:33
Sampler	: Egan Churchill-Gray		
Site	: ----		
Quote number	: EN/000		
No. of samples received	: 9		
No. of samples analysed	: 9		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contract for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- As per QWI – EN55-3 Data Interpreting Procedures, Ionic balances are typically calculated using Major Anions - Chloride, Alkalinity and Sulfate; and Major Cations - Calcium, Magnesium, Potassium and Sodium. Where applicable and dependent upon sample matrix, the Ionic Balance may also include the additional contribution of Ammonia, Dissolved Metals by ICPMS and H+ to the Cations and Nitrate, SiO2 and Fluoride to the Anions.
- EG020: Metals LOR for samples EP2409638-001 to -006 raised due to high TDS content.
- EP231X-ST: LOR raised for particular analytes on various samples due to matrix interferences.
- EK061G (Total Kjeldahl Nitrogen): LOR raised for sample #3 and #5 due to possible sample matrix interference.
- EG035F: LOR raised for Mercury on sample EP2409638-001 to 006 due to possible matrix interference.
- EK061G/EK067G (Total Kjeldahl Nitrogen/Total Phosphorus as P): LOR raised for particular samples due to possible sample matrix interference.
- EK067G (Total Phosphorus as P): LOR raised for samples EP2409638-001, 002 and 006 due to possible sample matrix interference.
- Amendment (08/08/2024): This report has been amended following a change to the reported LORs for method EP231X-ST for all samples. All analysis results as per previous report.
- Ionic Balance out of acceptable limits for sample #3 due to analytes not quantified in this report. Major cations (ED093F) and major anions (ED041G/ED045G) have been confirmed by re-analysis.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.
- EP231: Stable isotope enriched internal standards are added to samples prior to extraction. Target compounds have a direct analogous internal standard with the exception of PFPeS, PFHpA, PFDS, PFTrDA and 10:2 FTS. These compounds use an internal standard that is chemically related and has a retention time close to that of the target compound. The DQO for internal standard response is 50-150% of that established at initial calibration. PFOS is quantified using a certified, traceable standard consisting of linear and branched PFOS isomers. These practices are in line with recommendations in the National Environmental Management Plan for PFAS (Australian HEPA) and also conform to QSM 5.3 (US DoD) requirements.
- ED045G: The presence of Thiocyanate, Thiosulfate and Sulfite can positively contribute to the chloride result, thereby may bias results higher than expected. Results should be scrutinised accordingly.

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**MW01**	**MW02**	**MW03**	**MW04**	**MW05**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-001**	**EP2409638-002**	**EP2409638-003**	**EP2409638-004**	**EP2409638-005**
				Result	Result	Result	Result	Result
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.56**	**7.33**	**7.30**	**7.47**	**7.17**
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**117**	**79**	**62**	**136**	**104**
Total Alkalinity as CaCO3	----	1	mg/L	**117**	**79**	**62**	**136**	**104**
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**39**	**38**	**41**	**60**	**68**
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**6920**	**7570**	**9750**	**8760**	**9840**
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**54000**	**71800**	**96000**	**74400**	**88800**
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**1320**	**1510**	**1410**	**1280**	**1230**
Magnesium	7439-95-4	1	mg/L	**3600**	**4070**	**6270**	**5310**	**6120**
Sodium	7440-23-5	1	mg/L	**32400**	**37000**	**55400**	**48100**	**55700**
Potassium	7440-09-7	1	mg/L	**1100**	**1310**	**1960**	**1610**	**2010**
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.020	<0.020	<0.050	<0.020	<0.050
Cadmium	7440-43-9	0.0001	mg/L	<0.0020	<0.0020	<0.0050	<0.0020	<0.0050
Chromium	7440-47-3	0.001	mg/L	<0.020	<0.020	<0.050	<0.020	<0.050
Copper	7440-50-8	0.001	mg/L	<0.020	<0.020	<0.050	<0.020	<0.050
Nickel	7440-02-0	0.001	mg/L	<0.020	<0.020	<0.050	<0.020	<0.050
Lead	7439-92-1	0.001	mg/L	<0.020	<0.020	<0.050	<0.020	<0.050
Zinc	7440-66-6	0.005	mg/L	**0.125**	<0.100	<0.250	<0.100	<0.250
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**MW01**	**MW02**	**MW03**	**MW04**	**MW05**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-001**	**EP2409638-002**	**EP2409638-003**	**EP2409638-004**	**EP2409638-005**
				Result	Result	Result	Result	Result
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.49**	**0.11**	**0.32**	**0.68**	**0.44**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	**0.04**	<0.01	**0.01**	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.23**	**0.02**	**0.31**	**0.64**	**0.05**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.27**	**0.02**	**0.32**	**0.64**	**0.05**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**1.1**	**0.3**	**1.0**	**1.1**	**0.8**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**1.4**	**0.3**	**1.3**	**1.7**	**0.8**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	<0.05	**0.24**	**0.12**	**0.16**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.02**	**0.04**	**0.02**	**0.05**	**0.04**
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**1670**	**2180**	**2910**	**2280**	**2710**
ø Total Cations	----	0.01	meq/L	**1800**	**2050**	**3050**	**2630**	**3040**
ø Ionic Balance	----	0.01	%	**3.74**	**3.10**	**2.25**	**7.12**	**5.69**
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	<20	<20
C10 - C14 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
C29 - C36 Fraction	----	50	µg/L	<50	<50	<50	<50	<50
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	<20	<20

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)				*Sample ID*	**MW01**	**MW02**	**MW03**	**MW04**	**MW05**
				Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00
	Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-001**	**EP2409638-002**	**EP2409638-003**	**EP2409638-004**	**EP2409638-005**
					Result	Result	Result	Result	Result
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued									
^	**C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	<20	<20
	>C10 - C16 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
	>C16 - C34 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
	>C34 - C40 Fraction	----	100	µg/L	<100	<100	<100	<100	<100
^	**>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	<100	<100	<100
^	**>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	<100	<100	<100
EP080: BTEXN									
	Benzene	71-43-2	1	µg/L	<1	<1	<1	<1	<1
	Toluene	108-88-3	2	µg/L	<2	<2	<2	<2	<2
	Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	<2	<2
	meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	<2	<2
	ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	<2	<2
^	**Total Xylenes**	----	2	µg/L	<2	<2	<2	<2	<2
^	**Sum of BTEX**	----	1	µg/L	<1	<1	<1	<1	<1
	Naphthalene	91-20-3	5	µg/L	<5	<5	<5	<5	<5
EP231A: Perfluoroalkyl Sulfonic Acids									
	Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	**0.0010**	**0.0005**	<0.0005	**0.0013**	**0.0005**
	Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0010	<0.0005
	Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	**0.0006**	<0.0005	<0.0005	<0.0010	<0.0005
	Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
	Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002
	Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231B: Perfluoroalkyl Carboxylic Acids									

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Sample ID	MW01	MW02	MW03	MW04	MW05
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	EP2409638-001	EP2409638-002	EP2409638-003	EP2409638-004	EP2409638-005
				Result	Result	Result	Result	Result
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	**0.036**	**0.031**	**0.040**	**0.051**	**0.058**
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	**0.0414**	**0.0515**	**0.0523**	**0.0984**	**0.0954**
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	**0.0193**	**0.0230**	**0.0180**	**0.0603**	**0.0144**
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	**0.0071**	**0.0050**	**0.0016**	**0.0186**	<0.0005
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	**0.0008**	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	<0.0005	<0.0005	<0.0005	<0.0005
EP231D: (n:2) Fluorotelomer Sulfonic Acids								

Analytical Results

Sub-Matrix: **WATER**
(Matrix: **WATER**)

			Sample ID	**MW01**	**MW02**	**MW03**	**MW04**	**MW05**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00
Compound	CAS Number	LOR	Unit	**EP2409638-001**	**EP2409638-002**	**EP2409638-003**	**EP2409638-004**	**EP2409638-005**
				Result	Result	Result	Result	Result
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	<0.001	<0.001	<0.001	<0.001
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	µg/L	**0.106**	**0.111**	**0.112**	----	----
Sum of PFAS	----	0.0003	µg/L	----	----	----	**0.230**	**0.168**
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	µg/L	**0.0006**	<0.0002	<0.0002	<0.0002	<0.0002
Sum of PFAS (WA DER List)	----	0.0002	µg/L	**0.106**	**0.111**	**0.112**	**0.230**	**0.168**
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**124**	**124**	**135**	**133**	**136**
Toluene-D8	2037-26-5	2	%	**116**	**117**	**117**	**116**	**114**
4-Bromofluorobenzene	460-00-4	2	%	**114**	**114**	**115**	**113**	**114**
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0005	%	**120**	**122**	**120**	**118**	**121**
13C8-PFOA	----	0.0005	%	**121**	**123**	**125**	**128**	**112**

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**QC104**	**QC302**	**QC402**	**QC403**	**----**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-006**	**EP2409638-007**	**EP2409638-008**	**EP2409638-009**	**--------**
				Result	Result	Result	Result	----
EA005P: pH by PC Titrator								
pH Value	----	0.01	pH Unit	**7.34**	----	----	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**77**	----	----	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**77**	----	----	----	----
ED038A: Acidity								
Acidity as CaCO3	----	1	mg/L	**37**	----	----	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**7420**	----	----	----	----
ED045G: Chloride by Discrete Analyser								
Chloride	16887-00-6	1	mg/L	**72800**	----	----	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**1480**	----	----	----	----
Magnesium	7439-95-4	1	mg/L	**4140**	----	----	----	----
Sodium	7440-23-5	1	mg/L	**39100**	----	----	----	----
Potassium	7440-09-7	1	mg/L	**1310**	----	----	----	----
EG020F: Dissolved Metals by ICP-MS								
Arsenic	7440-38-2	0.001	mg/L	<0.020	<0.001	----	----	----
Cadmium	7440-43-9	0.0001	mg/L	<0.0020	<0.0001	----	----	----
Chromium	7440-47-3	0.001	mg/L	<0.020	<0.001	----	----	----
Copper	7440-50-8	0.001	mg/L	<0.020	<0.001	----	----	----
Nickel	7440-02-0	0.001	mg/L	<0.020	<0.001	----	----	----
Lead	7439-92-1	0.001	mg/L	<0.020	<0.001	----	----	----
Zinc	7440-66-6	0.005	mg/L	**0.113**	<0.005	----	----	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0005	<0.0001	----	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**QC104**	**QC302**	**QC402**	**QC403**	**----**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-006**	**EP2409638-007**	**EP2409638-008**	**EP2409638-009**	**--------**
				Result	Result	Result	Result	----
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.10**	<0.01	----	----	----
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	----	----	----
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.03**	<0.01	----	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	----	0.01	mg/L	**0.03**	<0.01	----	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	----	0.1	mg/L	**0.5**	<0.1	----	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ **Total Nitrogen as N**	----	0.1	mg/L	**0.5**	<0.1	----	----	----
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	----	0.01	mg/L	<0.05	<0.01	----	----	----
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	**0.03**	<0.01	----	----	----
EN055: Ionic Balance								
ø Total Anions	----	0.01	meq/L	**2210**	----	----	----	----
ø Total Cations	----	0.01	meq/L	**2150**	----	----	----	----
ø Ionic Balance	----	0.01	%	**1.39**	----	----	----	----
EP080/071: Total Petroleum Hydrocarbons								
C6 - C9 Fraction	----	20	µg/L	<20	<20	<20	----	----
C10 - C14 Fraction	----	50	µg/L	<50	<50	----	----	----
C15 - C28 Fraction	----	100	µg/L	<100	<100	----	----	----
C29 - C36 Fraction	----	50	µg/L	<50	<50	----	----	----
^ **C10 - C36 Fraction (sum)**	----	50	µg/L	<50	<50	----	----	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions								
C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	<20	----	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**QC104**	**QC302**	**QC402**	**QC403**	**----**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-006**	**EP2409638-007**	**EP2409638-008**	**EP2409638-009**	**--------**
				Result	Result	Result	Result	----
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions - Continued								
^ **C6 - C10 Fraction minus BTEX (F1)**	C6_C10-BTEX	20	µg/L	<20	<20	<20	----	----
>C10 - C16 Fraction	----	100	µg/L	<100	<100	----	----	----
>C16 - C34 Fraction	----	100	µg/L	<100	<100	----	----	----
>C34 - C40 Fraction	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C40 Fraction (sum)**	----	100	µg/L	<100	<100	----	----	----
^ **>C10 - C16 Fraction minus Naphthalene (F2)**	----	100	µg/L	<100	<100	----	----	----
EP080: BTEXN								
Benzene	71-43-2	1	µg/L	<1	<1	<1	----	----
Toluene	108-88-3	2	µg/L	<2	<2	<2	----	----
Ethylbenzene	100-41-4	2	µg/L	<2	<2	<2	----	----
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	<2	----	----
ortho-Xylene	95-47-6	2	µg/L	<2	<2	<2	----	----
^ **Total Xylenes**	----	2	µg/L	<2	<2	<2	----	----
^ **Sum of BTEX**	----	1	µg/L	<1	<1	<1	----	----
Naphthalene	91-20-3	5	µg/L	<5	<5	<5	----	----
EP231A: Perfluoroalkyl Sulfonic Acids								
Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	**0.0006**	<0.0005	----	<0.0005	----
Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0002	µg/L	<0.0002	<0.0002	----	<0.0002	----
Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
EP231B: Perfluoroalkyl Carboxylic Acids								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			*Sample ID*	**QC104**	**QC302**	**QC402**	**QC403**	**----**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-006**	**EP2409638-007**	**EP2409638-008**	**EP2409638-009**	**--------**
				Result	Result	Result	Result	----
EP231B: Perfluoroalkyl Carboxylic Acids - Continued								
Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	**0.032**	<0.002	----	<0.002	----
Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	**0.0553**	<0.0005	----	<0.0005	----
Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	**0.0221**	<0.0005	----	<0.0005	----
Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	**0.0050**	<0.0005	----	<0.0005	----
Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
EP231C: Perfluoroalkyl Sulfonamides								
Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	<0.001	----	<0.001	----
N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	<0.001	----	<0.001	----
N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	<0.001	----	<0.001	----
N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	<0.001	----	<0.001	----
N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	<0.0005	----	<0.0005	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids								

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)			Sample ID	**QC104**	**QC302**	**QC402**	**QC403**	**----**
			Sampling date / time	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	05-Jul-2024 00:00	----
Compound	*CAS Number*	*LOR*	*Unit*	**EP2409638-006**	**EP2409638-007**	**EP2409638-008**	**EP2409638-009**	**--------**
				Result	Result	Result	Result	----
EP231D: (n:2) Fluorotelomer Sulfonic Acids - Continued								
4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	<0.001	----	<0.001	----
6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	<0.001	----	<0.001	----
8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	<0.001	----	<0.001	----
10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	<0.001	----	<0.001	----
EP231P: PFAS Sums								
Sum of PFAS	----	0.0002	µg/L	**----**	<0.0002	----	<0.0002	----
Sum of PFAS	----	0.0003	µg/L	**0.115**	**----**	----	**----**	----
Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0002	µg/L	<0.0002	<0.0002	----	<0.0002	----
Sum of PFAS (WA DER List)	----	0.0002	µg/L	**0.115**	<0.0002	----	<0.0002	----
EP080S: TPH(V)/BTEX Surrogates								
1.2-Dichloroethane-D4	17060-07-0	2	%	**122**	**115**	**114**	----	----
Toluene-D8	2037-26-5	2	%	**116**	**115**	**100**	----	----
4-Bromofluorobenzene	460-00-4	2	%	**114**	**111**	**112**	----	----
EP231S: PFAS Surrogate								
13C4-PFOS	----	0.0005	%	**121**	**124**	----	**126**	----
13C8-PFOA	----	0.0005	%	**123**	**114**	----	**115**	----

Surrogate Control Limits

Sub-Matrix: **WATER**

		Recovery Limits (%)	
Compound	*CAS Number*	*Low*	*High*
EP080S: TPH(V)/BTEX Surrogates			
1.2-Dichloroethane-D4	17060-07-0	61	141
Toluene-D8	2037-26-5	73	126
4-Bromofluorobenzene	460-00-4	60	125
EP231S: PFAS Surrogate			
13C4-PFOS	----	65	140
13C8-PFOA	----	71	133

QUALITY CONTROL REPORT

Work Order	: **EP2409638**	Page	: 1 of 13
Amendment	: **1**		
Client	: **SENVERSA PTY LTD**	Laboratory	: Environmental Division Perth
Contact	: MS ASHTON BETTI	Contact	: Ashvini Wickramasinghe
Address	: LEVEL 18, 140 ST GEORGES TERRACE PERTH 6000	Address	: 26 Rigali Way Wangara WA Australia 6065
Telephone	: +61 08 6557 8881	Telephone	: +61-8-9406 1301
Project	: P21705 Burrup - Baseline Assessment	Date Samples Received	: 08-Jul-2024
Order number	: PO023451	Date Analysis Commenced	: 08-Jul-2024
C-O-C number	: ----	Issue Date	: 08-Aug-2024
Sampler	: Egan Churchill-Gray		
Site	: ----		
Quote number	: EN/000		
No. of samples received	: 9		
No. of samples analysed	: 9		

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Canhuang Ke	Inorganics Supervisor	Perth Inorganics, Wangara, WA
Chris Lemaitre	Laboratory Manager (Perth)	Perth Inorganics, Wangara, WA
Thomas Donovan	Senior Organic Chemist	Perth Organics, Wangara, WA

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC
* = The final LOR has been raised due to dilution or other sample specific cause; adjusted LOR is shown in brackets. The duplicate ranges for Acceptable RPD% are applied to the final LOR where applicable.

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EA005P: pH by PC Titrator (QC Lot: 5918399)									
EP2409820-005	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	2.63	2.63	0.0	0% - 20%
EP2409598-002	Anonymous	EA005-P: pH Value	----	0.01	pH Unit	8.15	8.14	0.1	0% - 20%
ED037P: Alkalinity by PC Titrator (QC Lot: 5918401)									
EP2409820-005	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	<1	0.0	No Limit
EP2409598-002	Anonymous	ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	0.0	No Limit
		ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	499	500	0.3	0% - 20%
		ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	499	500	0.3	0% - 20%
ED038A: Acidity (QC Lot: 5921220)									
EP2409405-003	Anonymous	ED038: Acidity as CaCO3	----	1	mg/L	50	48	2.9	0% - 20%
EP2409638-001	MW01	ED038: Acidity as CaCO3	----	1	mg/L	39	38	0.0	0% - 20%
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 5909943)									
EP2409609-002	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	18	19	0.0	0% - 50%
EP2409609-011	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	226	234	3.6	0% - 20%
ED045G: Chloride by Discrete Analyser (QC Lot: 5909944)									
EP2409609-002	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	27	27	0.0	0% - 20%
EP2409609-011	Anonymous	ED045G: Chloride	16887-00-6	1	mg/L	100	101	0.0	0% - 20%

Sub-Matrix: **WATER**				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
ED093F: Dissolved Major Cations (QC Lot: 5916495)									
EP2409638-002	MW02	ED093F: Calcium	7440-70-2	1 (20)*	mg/L	1510	1540	2.4	0% - 20%
		ED093F: Magnesium	7439-95-4	1 (20)*	mg/L	4070	4120	1.2	0% - 20%
		ED093F: Sodium	7440-23-5	1 (20)*	mg/L	37000	37400	1.2	0% - 20%
		ED093F: Potassium	7440-09-7	1 (20)*	mg/L	1310	1320	1.1	0% - 20%
EP2409489-001	Anonymous	ED093F: Calcium	7440-70-2	1	mg/L	66	68	2.1	0% - 20%
		ED093F: Magnesium	7439-95-4	1	mg/L	42	42	0.0	0% - 20%
		ED093F: Sodium	7440-23-5	1	mg/L	37	38	0.0	0% - 20%
		ED093F: Potassium	7440-09-7	1	mg/L	14	14	0.0	0% - 50%
EG020F: Dissolved Metals by ICP-MS (QC Lot: 5916496)									
EP2409588-020	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001 (0.0020)*	mg/L	<0.0020	<0.0020	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001 (0.020) *	mg/L	<0.020	0.022	9.9	No Limit
		EG020A-F: Copper	7440-50-8	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001 (0.020) *	mg/L	0.150	0.157	5.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005 (0.100) *	mg/L	0.193	0.180	7.0	No Limit
EP2409638-002	MW02	EG020A-F: Cadmium	7440-43-9	0.0001 (0.0020)*	mg/L	<0.0020	<0.0020	0.0	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Chromium	7440-47-3	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Copper	7440-50-8	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Lead	7439-92-1	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Nickel	7440-02-0	0.001 (0.020) *	mg/L	<0.020	<0.020	0.0	No Limit
		EG020A-F: Zinc	7440-66-6	0.005 (0.100) *	mg/L	<0.100	<0.100	0.0	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 5916493)									
EP2409451-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit
EP2409598-002	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EK055G: Ammonia as N by Discrete Analyser (QC Lot: 5909948)									
EP2409621-004	Anonymous	EK055G: Ammonia as N	7664-41-7	0.01	mg/L	0.02	0.02	0.0	No Limit
EK057G: Nitrite as N by Discrete Analyser (QC Lot: 5909941)									
EP2409609-002	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP2409609-011	Anonymous	EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 5909949)									
EP2409621-004	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	0.01	<0.01	0.0	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5911501)									
EP2409598-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	2.5	2.5	0.0	0% - 20%
EP2409609-011	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	0.3	0.6	57.2	No Limit
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 5911503)									
EP2409638-007	QC302	EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	0.2	0.0	No Limit
EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 5911502)									
EP2409655-001	Anonymous	EK067G: Total Phosphorus as P	----	0.01 (0.05)*	mg/L	9.54	9.48	0.6	0% - 20%
EP2409638-007	QC302	EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EK071G: Reactive Phosphorus as P by discrete analyser (QC Lot: 5909942)									
EP2409609-002	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP2409609-011	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5910331)									
EP2409636-028	Anonymous	EP071: C15 - C28 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: C10 - C14 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
		EP071: C29 - C36 Fraction	----	50	µg/L	<50	<50	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5913460)									
EP2409620-001	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP2409638-002	MW02	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 5913465)									
EP2408309-008	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP2409651-004	Anonymous	EP080: C6 - C9 Fraction	----	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5910331)									
EP2409636-028	Anonymous	EP071: >C10 - C16 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C16 - C34 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
		EP071: >C34 - C40 Fraction	----	100	µg/L	<100	<100	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5913460)									
EP2409620-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP2409638-002	MW02	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5913465)									
EP2408309-008	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit

Sub-Matrix: **WATER**				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 5913465) - continued									
EP2409651-004	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	<20	0.0	No Limit
EP080: BTEXN (QC Lot: 5913460)									
EP2409620-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2409638-002	MW02	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP080: BTEXN (QC Lot: 5913465)									
EP2408309-008	Anonymous	EP080: Benzene	71-43-2	1	µg/L	3	3	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP2409651-004	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.0	No Limit
		EP080: Toluene	108-88-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.0	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.0	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.0	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.0	No Limit
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5913573)									
EP2409638-001	MW01	EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003 (0.0002)*	µg/L	<0.0002	<0.0002	0.0	No Limit
		EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	0.0010	0.0008	16.5	No Limit
		EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit

Sub-Matrix: **WATER**

				Laboratory Duplicate (DUP) Report					
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*LOR*	*Unit*	*Original Result*	*Duplicate Result*	*RPD (%)*	*Acceptable RPD (%)*
EP231A: Perfluoroalkyl Sulfonic Acids (QC Lot: 5913573) - continued									
EP2409638-001	MW01	EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	0.0006	0.0006	0.0	No Limit
		EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
EP231B: Perfluoroalkyl Carboxylic Acids (QC Lot: 5913573)									
EP2409638-001	MW01	EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	0.0414	0.0429	3.6	0% - 20%
		EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	0.0193	0.0198	2.9	0% - 20%
		EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	0.0071	0.0072	0.0	0% - 50%
		EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	0.0008	0.0008	0.0	No Limit
		EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	0.036	0.036	0.0	0% - 50%
EP231C: Perfluoroalkyl Sulfonamides (QC Lot: 5913573)									
EP2409638-001	MW01	EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	<0.0005	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	<0.001	0.0	No Limit
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5913573)									
EP2409638-001	MW01	EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	<0.001	0.0	No Limit

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Original Result	Duplicate Result	RPD (%)	Acceptable RPD (%)
				Laboratory Duplicate (DUP) Report					
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QC Lot: 5913573) - continued									
EP2409638-001	MW01	EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	<0.001	0.0	No Limit
		EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	<0.001	0.0	No Limit
EP231P: PFAS Sums (QC Lot: 5913573)									
EP2409638-001	MW01	EP231X-ST: Sum of PFAS	----	0.0003 (0.0002)*	µg/L	0.106	0.108	1.8	0% - 20%
		EP231X-ST: Sum of PFHxS and PFOS	355-46-4/1763-23-1	0.0003 (0.0002)*	µg/L	0.0006	0.0006	0.0	No Limit
		EP231X-ST: Sum of PFAS (WA DER List)	----	0.0003 (0.0002)*	µg/L	0.106	0.108	1.8	0% - 20%

Method Blank (MB) and Laboratory Control Sample (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Sample (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
				Result	Concentration	LCS	Low	High
EA005P: pH by PC Titrator (QCLot: 5918399)								
EA005-P: pH Value	----	----	pH Unit	----	4 pH Unit	100	98.5	102
				----	7 pH Unit	100	98.5	102
ED037P: Alkalinity by PC Titrator (QCLot: 5918401)								
ED037-P: Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	----	----	----	----
ED037-P: Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	----	----	----	----
ED037-P: Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	<1	----	----	----	----
ED037-P: Total Alkalinity as CaCO3	----	1	mg/L	<1	20 mg/L	111	85.1	126
				<1	200 mg/L	102	90.5	111
ED038A: Acidity (QCLot: 5921220)								
ED038: Acidity as CaCO3	----	----	mg/L	----	20.3 mg/L	111	70.0	130
				----	405.5 mg/L	98.7	70.0	130
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5909943)								
ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	<1	25 mg/L	98.8	89.9	112
				<1	500 mg/L	101	89.9	112
ED045G: Chloride by Discrete Analyser (QCLot: 5909944)								
ED045G: Chloride	16887-00-6	1	mg/L	<1	10 mg/L	96.0	88.6	113
				<1	1000 mg/L	103	88.6	113
ED093F: Dissolved Major Cations (QCLot: 5916495)								
ED093F: Calcium	7440-70-2	1	mg/L	<1	50 mg/L	103	86.5	117
ED093F: Magnesium	7439-95-4	1	mg/L	<1	50 mg/L	97.3	88.4	110
ED093F: Sodium	7440-23-5	1	mg/L	<1	50 mg/L	102	91.4	113
ED093F: Potassium	7440-09-7	1	mg/L	<1	50 mg/L	95.9	84.6	108
EG020F: Dissolved Metals by ICP-MS (QCLot: 5916496)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	107	90.3	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	106	89.7	108
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	99.1	87.3	107
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	102	88.9	108
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	101	89.4	106
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	105	87.2	108
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	112	89.5	112

Sub-Matrix: **WATER**

Method: Compound	*CAS Number*	*LOR*	*Unit*	*Method Blank (MB) Report*	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
				Result	*Concentration*	*LCS*	*Low*	*High*
EG035F: Dissolved Mercury by FIMS (QCLot: 5916493)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.005 mg/L	110	85.6	120
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5909948)								
EK055G: Ammonia as N	7664-41-7	0.01	mg/L	<0.01	1 mg/L	100	86.2	111
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5909941)								
EK057G: Nitrite as N	14797-65-0	0.01	mg/L	<0.01	0.5 mg/L	103	88.7	113
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5909949)								
EK059G: Nitrite + Nitrate as N	----	0.01	mg/L	<0.01	0.5 mg/L	97.9	90.5	110
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5911501)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	96.9	80.0	115
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5911503)								
EK061G: Total Kjeldahl Nitrogen as N	----	0.1	mg/L	<0.1	10 mg/L	97.2	80.0	115
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5911502)								
EK067G: Total Phosphorus as P	----	0.01	mg/L	<0.01	4.42 mg/L	95.8	70.0	110
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5909942)								
EK071G: Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	0.5 mg/L	102	89.4	109
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5910331)								
EP071: C10 - C14 Fraction	----	50	µg/L	<50	400 µg/L	81.5	39.3	103
EP071: C15 - C28 Fraction	----	100	µg/L	<100	600 µg/L	92.6	47.2	122
EP071: C29 - C36 Fraction	----	50	µg/L	<50	400 µg/L	97.2	42.5	119
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5913460)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	94.9	73.6	113
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5913465)								
EP080: C6 - C9 Fraction	----	20	µg/L	<20	360 µg/L	90.9	73.6	113
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5910331)								
EP071: >C10 - C16 Fraction	----	100	µg/L	<100	500 µg/L	84.1	47.0	100
EP071: >C16 - C34 Fraction	----	100	µg/L	<100	700 µg/L	97.4	46.2	116
EP071: >C34 - C40 Fraction	----	100	µg/L	<100	300 µg/L	78.5	24.7	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5913460)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	95.2	73.9	115
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5913465)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	92.0	73.9	115
EP080: BTEXN (QCLot: 5913460)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	98.3	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	96.0	81.0	115

Sub-Matrix: **WATER**

				Method Blank (MB) Report	*Laboratory Control Spike (LCS) Report*			
					Spike	*Spike Recovery (%)*	*Acceptable Limits (%)*	
Method: Compound	*CAS Number*	*LOR*	*Unit*	*Result*	*Concentration*	*LCS*	*Low*	*High*
EP080: BTEXN (QCLot: 5913460) - continued								
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	94.8	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	100	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	96.5	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	110	77.0	118
EP080: BTEXN (QCLot: 5913465)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	89.3	84.1	114
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	97.6	81.0	115
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	97.6	84.4	113
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	103	84.3	114
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	101	86.5	111
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	108	77.0	118
EP231A: Perfluoroalkyl Sulfonic Acids (QCLot: 5913573)								
EP231X-ST: Perfluorobutane sulfonic acid (PFBS)	375-73-5	0.0005	µg/L	<0.0005	0.00355 µg/L	107	72.0	130
EP231X-ST: Perfluoropentane sulfonic acid (PFPeS)	2706-91-4	0.0005	µg/L	<0.0005	0.00376 µg/L	109	71.0	127
EP231X-ST: Perfluorohexane sulfonic acid (PFHxS)	355-46-4	0.0005	µg/L	<0.0005	0.00379 µg/L	102	68.0	131
EP231X-ST: Perfluoroheptane sulfonic acid (PFHpS)	375-92-8	0.0005	µg/L	<0.0005	0.00381 µg/L	109	69.0	134
EP231X-ST: Perfluorooctane sulfonic acid (PFOS)	1763-23-1	0.0003	µg/L	<0.0003	0.00371 µg/L	114	65.0	140
EP231X-ST: Perfluorodecane sulfonic acid (PFDS)	335-77-3	0.0005	µg/L	<0.0005	0.00385 µg/L	96.8	53.0	142
EP231B: Perfluoroalkyl Carboxylic Acids (QCLot: 5913573)								
EP231X-ST: Perfluorobutanoic acid (PFBA)	375-22-4	0.002	µg/L	<0.002	0.02 µg/L	108	73.0	129
EP231X-ST: Perfluoropentanoic acid (PFPeA)	2706-90-3	0.0005	µg/L	<0.0005	0.004 µg/L	107	72.0	129
EP231X-ST: Perfluorohexanoic acid (PFHxA)	307-24-4	0.0005	µg/L	<0.0005	0.004 µg/L	104	72.0	129
EP231X-ST: Perfluoroheptanoic acid (PFHpA)	375-85-9	0.0005	µg/L	<0.0005	0.004 µg/L	106	72.0	130
EP231X-ST: Perfluorooctanoic acid (PFOA)	335-67-1	0.0005	µg/L	<0.0005	0.004 µg/L	117	71.0	133
EP231X-ST: Perfluorononanoic acid (PFNA)	375-95-1	0.0005	µg/L	<0.0005	0.004 µg/L	110	69.0	130
EP231X-ST: Perfluorodecanoic acid (PFDA)	335-76-2	0.0005	µg/L	<0.0005	0.004 µg/L	106	71.0	129
EP231X-ST: Perfluoroundecanoic acid (PFUnDA)	2058-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	122	69.0	133
EP231X-ST: Perfluorododecanoic acid (PFDoDA)	307-55-1	0.0005	µg/L	<0.0005	0.004 µg/L	108	72.0	134
EP231X-ST: Perfluorotridecanoic acid (PFTrDA)	72629-94-8	0.0005	µg/L	<0.0005	0.004 µg/L	104	65.0	144
EP231X-ST: Perfluorotetradecanoic acid (PFTeDA)	376-06-7	0.0005	µg/L	<0.0005	0.004 µg/L	112	71.0	132
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5913573)								
EP231X-ST: Perfluorooctane sulfonamide (FOSA)	754-91-6	0.0005	µg/L	<0.0005	0.004 µg/L	114	67.0	137

Sub-Matrix: **WATER**

				Method Blank (MB) Report	Laboratory Control Spike (LCS) Report			
					Spike	Spike Recovery (%)	Acceptable Limits (%)	
Method: Compound	CAS Number	LOR	Unit	Result	Concentration	LCS	Low	High
EP231C: Perfluoroalkyl Sulfonamides (QCLot: 5913573) - continued								
EP231X-ST: N-Methyl perfluorooctane sulfonamide (MeFOSA)	31506-32-8	0.001	µg/L	<0.001	0.01 µg/L	70.1	68.0	141
EP231X-ST: N-Ethyl perfluorooctane sulfonamide (EtFOSA)	4151-50-2	0.001	µg/L	<0.001	0.01 µg/L	58.6	57.9	141
EP231X-ST: N-Methyl perfluorooctane sulfonamidoethanol (MeFOSE)	24448-09-7	0.001	µg/L	<0.001	0.01 µg/L	104	63.3	134
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoethanol (EtFOSE)	1691-99-2	0.001	µg/L	<0.001	0.01 µg/L	98.7	60.0	136
EP231X-ST: N-Methyl perfluorooctane sulfonamidoacetic acid (MeFOSAA)	2355-31-9	0.0005	µg/L	<0.0005	0.004 µg/L	114	65.0	136
EP231X-ST: N-Ethyl perfluorooctane sulfonamidoacetic acid (EtFOSAA)	2991-50-6	0.0005	µg/L	<0.0005	0.004 µg/L	115	61.0	135
EP231D: (n:2) Fluorotelomer Sulfonic Acids (QCLot: 5913573)								
EP231X-ST: 4:2 Fluorotelomer sulfonic acid (4:2 FTS)	757124-72-4	0.001	µg/L	<0.001	0.00374 µg/L	104	63.0	143
EP231X-ST: 6:2 Fluorotelomer sulfonic acid (6:2 FTS)	27619-97-2	0.001	µg/L	<0.001	0.0038 µg/L	119	64.0	140
EP231X-ST: 8:2 Fluorotelomer sulfonic acid (8:2 FTS)	39108-34-4	0.001	µg/L	<0.001	0.00384 µg/L	113	67.0	138
EP231X-ST: 10:2 Fluorotelomer sulfonic acid (10:2 FTS)	120226-60-0	0.001	µg/L	<0.001	0.00386 µg/L	98.6	53.1	133
EP231P: PFAS Sums (QCLot: 5913573)								
EP231X-ST: Sum of PFAS	----	0.0003	µg/L	<0.0003	----	----	----	----
EP231X-ST: Sum of PFHxS and PFOS	355-46-4/17 63-23-1	0.0003	µg/L	<0.0003	----	----	----	----
EP231X-ST: Sum of PFAS (WA DER List)	----	0.0003	µg/L	<0.0003	----	----	----	----

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Concentration	MS	Low	High
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 5909943)							
EP2409609-001	Anonymous	ED041G: Sulfate as SO4 - Turbidimetric	14808-79-8	100 mg/L	102	70.4	130
ED045G: Chloride by Discrete Analyser (QCLot: 5909944)							
EP2409609-001	Anonymous	ED045G: Chloride	16887-00-6	200 mg/L	127	70.0	130
EG020F: Dissolved Metals by ICP-MS (QCLot: 5916496)							
EP2409588-021	Anonymous	EG020A-F: Arsenic	7440-38-2	4 mg/L	119	70.0	130
		EG020A-F: Cadmium	7440-43-9	1 mg/L	112	70.0	130
		EG020A-F: Chromium	7440-47-3	4 mg/L	101	70.0	130

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	*SpikeRecovery(%)*	*Acceptable Limits (%)*	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EG020F: Dissolved Metals by ICP-MS (QCLot: 5916496) - continued							
EP2409588-021	Anonymous	EG020A-F: Copper	7440-50-8	4 mg/L	110	70.0	130
		EG020A-F: Lead	7439-92-1	4 mg/L	100	70.0	130
		EG020A-F: Nickel	7440-02-0	4 mg/L	113	70.0	130
		EG020A-F: Zinc	7440-66-6	4 mg/L	119	70.0	130
EG035F: Dissolved Mercury by FIMS (QCLot: 5916493)							
EP2409451-003	Anonymous	EG035F: Mercury	7439-97-6	0.005 mg/L	120	70.0	130
EK055G: Ammonia as N by Discrete Analyser (QCLot: 5909948)							
EP2409621-003	Anonymous	EK055G: Ammonia as N	7664-41-7	1 mg/L	113	70.0	130
EK057G: Nitrite as N by Discrete Analyser (QCLot: 5909941)							
EP2409609-001	Anonymous	EK057G: Nitrite as N	14797-65-0	0.5 mg/L	102	70.0	130
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 5909949)							
EP2409621-003	Anonymous	EK059G: Nitrite + Nitrate as N	----	0.5 mg/L	97.1	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5911501)							
EP2409598-002	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	101	70.0	130
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 5911503)							
EP2409645-001	Anonymous	EK061G: Total Kjeldahl Nitrogen as N	----	5 mg/L	103	70.0	130
EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 5911502)							
EP2409645-001	Anonymous	EK067G: Total Phosphorus as P	----	1 mg/L	95.2	70.0	130
EK071G: Reactive Phosphorus as P by discrete analyser (QCLot: 5909942)							
EP2409609-001	Anonymous	EK071G: Reactive Phosphorus as P	14265-44-2	0.5 mg/L	102	70.0	130
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5910331)							
EP2409638-002	MW02	EP071: C10 - C14 Fraction	----	400 µg/L	82.7	44.5	122
		EP071: C15 - C28 Fraction	----	600 µg/L	94.8	55.1	143
		EP071: C29 - C36 Fraction	----	400 µg/L	99.6	53.6	128
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5913460)							
EP2409621-001	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	101	77.0	137
EP080/071: Total Petroleum Hydrocarbons (QCLot: 5913465)							
EP2409610-001	Anonymous	EP080: C6 - C9 Fraction	----	240 µg/L	80.6	77.0	137
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5910331)							
EP2409638-002	MW02	EP071: >C10 - C16 Fraction	----	500 µg/L	84.1	44.5	122
		EP071: >C16 - C34 Fraction	----	700 µg/L	101	55.1	143
		EP071: >C34 - C40 Fraction	----	300 µg/L	74.8	53.6	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5913460)							
EP2409621-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	97.6	77.0	137

Sub-Matrix: **WATER**

				Matrix Spike (MS) Report			
				Spike	SpikeRecovery(%)	Acceptable Limits (%)	
Laboratory sample ID	*Sample ID*	*Method: Compound*	*CAS Number*	*Concentration*	*MS*	*Low*	*High*
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 5913465)							
EP2409610-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	290 µg/L	78.4	77.0	137
EP080: BTEXN (QCLot: 5913460)							
EP2409621-001	Anonymous	EP080: Benzene	71-43-2	20 µg/L	102	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	99.3	73.5	126
EP080: BTEXN (QCLot: 5913465)							
EP2409610-001	Anonymous	EP080: Benzene	71-43-2	20 µg/L	100	77.0	122
		EP080: Toluene	108-88-3	20 µg/L	96.2	73.5	126

QA/QC Compliance Assessment to assist with Quality Review

Work Order : **EP2409638**

Amendment : **1**

Client : **SENVERSA PTY LTD**
Contact : MS ASHTON BETTI
Project : P21705 Burrup - Baseline Assessment
Site : ----
Sampler : Egan Churchill-Gray
Order number : PO023451

Laboratory : Environmental Division Perth
Telephone : +61-8-9406 1301
Date Samples Received : 08-Jul-2024
Issue Date : 08-Aug-2024
No. of samples received : 9
No. of samples analysed : 9

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, where applicable to the methodology, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

Method	*Extraction / Preparation*			*Analysis*		
Container / Client Sample ID(s)	*Date extracted*	*Due for extraction*	**Days overdue**	*Date analysed*	*Due for analysis*	**Days overdue**
EA005P: pH by PC Titrator						
Clear Plastic Bottle - Natural						
MW01, MW02, MW03, MW04, MW05, QC104	----	----	----	13-Jul-2024	05-Jul-2024	**8**
EK057G: Nitrite as N by Discrete Analyser						
Clear Plastic Bottle - Natural						
MW01, MW02, MW03, MW04, MW05, QC104, QC302	----	----	----	08-Jul-2024	07-Jul-2024	**1**
EK071G: Reactive Phosphorus as P by discrete analyser						
Clear Plastic Bottle - Natural						
MW01, MW02, MW03, MW04, MW05, QC104, QC302	----	----	----	08-Jul-2024	07-Jul-2024	**1**

Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type		Count		Rate (%)		Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)						
TRH - Semivolatile Fraction	EP071	1	17	5.88	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)						
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	0	8	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
Container / *Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method	***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*		***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EA005P: pH by PC Titrator							
Clear Plastic Bottle - Natural (EA005-P) MW01, MW02, MW03, MW04, MW05, QC104	**05-Jul-2024**	**----**	----	----	**13-Jul-2024**	05-Jul-2024	×
ED037P: Alkalinity by PC Titrator							
Clear Plastic Bottle - Natural (ED037-P) MW01, MW02, MW03, MW04, MW05, QC104	**05-Jul-2024**	**----**	----	----	**13-Jul-2024**	19-Jul-2024	✓
ED038A: Acidity							
Clear Plastic Bottle - Natural (ED038) MW01, MW02, MW03, MW04, MW05, QC104	**05-Jul-2024**	**----**	----	----	**15-Jul-2024**	19-Jul-2024	✓
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA							
Clear Plastic Bottle - Natural (ED041G) MW01, MW02, MW03, MW04, MW05, QC104	**05-Jul-2024**	**----**	----	----	**08-Jul-2024**	02-Aug-2024	✓
ED045G: Chloride by Discrete Analyser							
Clear Plastic Bottle - Natural (ED045G) MW01, MW02, MW03, MW04, MW05, QC104	**05-Jul-2024**	**----**	----	----	**08-Jul-2024**	02-Aug-2024	✓
ED093F: Dissolved Major Cations							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (ED093F) MW01, MW02, MW03, MW04, MW05, QC104	**05-Jul-2024**	**----**	----	----	**12-Jul-2024**	02-Aug-2024	✓
EG020F: Dissolved Metals by ICP-MS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG020A-F) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**----**	----	----	**12-Jul-2024**	01-Jan-2025	✓
EG035F: Dissolved Mercury by FIMS							
Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**----**	----	----	**12-Jul-2024**	02-Aug-2024	✓

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

Method ***Container*** */ Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation*			*Analysis*		
		Date extracted	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EK055G: Ammonia as N by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK055G) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**----**	----	----	**08-Jul-2024**	02-Aug-2024	✓
EK057G: Nitrite as N by Discrete Analyser							
Clear Plastic Bottle - Natural (EK057G) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**----**	----	----	**08-Jul-2024**	07-Jul-2024	✘
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK059G) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**----**	----	----	**08-Jul-2024**	02-Aug-2024	✓
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK061G) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**10-Jul-2024**	02-Aug-2024	✓	**13-Jul-2024**	02-Aug-2024	✓
EK067G: Total Phosphorus as P by Discrete Analyser							
Clear Plastic Bottle - Sulfuric Acid (EK067G) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**10-Jul-2024**	02-Aug-2024	✓	**13-Jul-2024**	02-Aug-2024	✓
EK071G: Reactive Phosphorus as P by discrete analyser							
Clear Plastic Bottle - Natural (EK071G) MW01, MW02, MW03, MW04, MW05, QC104, QC302	**05-Jul-2024**	**----**	----	----	**08-Jul-2024**	07-Jul-2024	✘

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method ***Container** / Client Sample ID(s)*	***Sample Date***	*Extraction / Preparation* ***Date extracted***	 *Due for extraction*	 *Evaluation*	*Analysis* ***Date analysed***	 *Due for analysis*	 *Evaluation*
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071) MW01, MW02, MW03, MW04	**05-Jul-2024**	**10-Jul-2024**	12-Jul-2024	✓	**12-Jul-2024**	19-Aug-2024	✓
Amber Glass Bottle - Unpreserved (EP071) MW05, QC104, QC302	**05-Jul-2024**	**10-Jul-2024**	12-Jul-2024	✓	**13-Jul-2024**	19-Aug-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW01, MW02	**05-Jul-2024**	**11-Jul-2024**	19-Jul-2024	✓	**11-Jul-2024**	19-Jul-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW03, MW04, MW05, QC104, QC302, QC402	**05-Jul-2024**	**11-Jul-2024**	19-Jul-2024	✓	**12-Jul-2024**	19-Jul-2024	✓
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071) MW01, MW02, MW03, MW04	**05-Jul-2024**	**10-Jul-2024**	12-Jul-2024	✓	**12-Jul-2024**	19-Aug-2024	✓
Amber Glass Bottle - Unpreserved (EP071) MW05, QC104, QC302	**05-Jul-2024**	**10-Jul-2024**	12-Jul-2024	✓	**13-Jul-2024**	19-Aug-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW01, MW02	**05-Jul-2024**	**11-Jul-2024**	19-Jul-2024	✓	**11-Jul-2024**	19-Jul-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW03, MW04, MW05, QC104, QC302, QC402	**05-Jul-2024**	**11-Jul-2024**	19-Jul-2024	✓	**12-Jul-2024**	19-Jul-2024	✓
EP080: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP080) MW01, MW02	**05-Jul-2024**	**11-Jul-2024**	19-Jul-2024	✓	**11-Jul-2024**	19-Jul-2024	✓
Amber VOC Vial - Sulfuric Acid (EP080) MW03, MW04, MW05, QC104, QC302, QC402	**05-Jul-2024**	**11-Jul-2024**	19-Jul-2024	✓	**12-Jul-2024**	19-Jul-2024	✓
EP231A: Perfluoroalkyl Sulfonic Acids							
HDPE (no PTFE) (EP231X-ST) MW01, MW02, MW03, MW04, MW05, QC104, QC302, QC403	**05-Jul-2024**	**10-Jul-2024**	01-Jan-2025	✓	**11-Jul-2024**	01-Jan-2025	✓

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

Method		***Sample Date***	*Extraction / Preparation*			*Analysis*		
***Container** / Client Sample ID(s)*			***Date extracted***	*Due for extraction*	*Evaluation*	***Date analysed***	*Due for analysis*	*Evaluation*
EP231B: Perfluoroalkyl Carboxylic Acids								
HDPE (no PTFE) (EP231X-ST)								
MW01,	MW02,	**05-Jul-2024**	**10-Jul-2024**	01-Jan-2025	✓	**11-Jul-2024**	01-Jan-2025	✓
MW03,	MW04,							
MW05,	QC104,							
QC302,	QC403							
EP231C: Perfluoroalkyl Sulfonamides								
HDPE (no PTFE) (EP231X-ST)								
MW01,	MW02,	**05-Jul-2024**	**10-Jul-2024**	01-Jan-2025	✓	**11-Jul-2024**	01-Jan-2025	✓
MW03,	MW04,							
MW05,	QC104,							
QC302,	QC403							
EP231D: (n:2) Fluorotelomer Sulfonic Acids								
HDPE (no PTFE) (EP231X-ST)								
MW01,	MW02,	**05-Jul-2024**	**10-Jul-2024**	01-Jan-2025	✓	**11-Jul-2024**	01-Jan-2025	✓
MW03,	MW04,							
MW05,	QC104,							
QC302,	QC403							
EP231P: PFAS Sums								
HDPE (no PTFE) (EP231X-ST)								
MW01,	MW02,	**05-Jul-2024**	**10-Jul-2024**	01-Jan-2025	✓	**11-Jul-2024**	01-Jan-2025	✓
MW03,	MW04,							
MW05,	QC104,							
QC302,	QC403							

Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Laboratory Duplicates (DUP)							
Acidity as Calcium Carbonate	ED038	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	2	14	**14.29**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	9	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	2	18	**11.11**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	8	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	2	13	**15.38**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	3	29	**10.34**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**10.00**	✗	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	4	40	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
Acidity as Calcium Carbonate	ED038	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Alkalinity by Auto Titrator	ED037-P	2	16	**12.50**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
pH by Auto Titrator	EA005-P	2	20	**10.00**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	2	17	**11.76**	**10.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	*Method*	*QC*	*Regular*	***Actual***	***Expected***	*Evaluation*	
Method Blanks (MB) - Continued							
Alkalinity by Auto Titrator	ED037-P	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Major Cations - Dissolved	ED093F	1	14	**7.14**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	1	8	**12.50**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Ammonia as N by Discrete analyser	EK055G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Chloride by Discrete Analyser	ED045G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Mercury by FIMS	EG035F	1	20	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	1	9	**11.11**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Nitrite as N by Discrete Analyser	EK057G	1	18	**5.56**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	0	8	**0.00**	**5.00**	✗	NEPM 2013 B3 & ALS QC Standard
Reactive Phosphorus as P-By Discrete Analyser	EK071G	1	13	**7.69**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	2	29	**6.90**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
Total Phosphorus as P By Discrete Analyser	EK067G	1	16	**6.25**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	**5.88**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	40	**5.00**	**5.00**	✓	NEPM 2013 B3 & ALS QC Standard

Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
pH by Auto Titrator	EA005-P	WATER	In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM Schedule B(3)
Alkalinity by Auto Titrator	ED037-P	WATER	In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) on a settled supernatant aliquot of the sample using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM Schedule B(3)
Acidity as Calcium Carbonate	ED038	WATER	In house: Referenced to APHA 2310 B Acidity is determined by manual titration with a standardised alkali to an end-point pH of 8.3. This method is compliant with NEPM Schedule B(3)
Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser	ED041G	WATER	In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM Schedule B(3)
Chloride by Discrete Analyser	ED045G	WATER	In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride. In the presence of ferric ions the liberated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm.
Major Cations - Dissolved	ED093F	WATER	In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM Schedule B(3) Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM Schedule B(3) Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM Schedule B(3)
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
Ammonia as N by Discrete analyser	EK055G	WATER	In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrite as N by Discrete Analyser	EK057G	WATER	In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Nitrate as N by Discrete Analyser	EK058G	WATER	In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM Schedule B(3)

Analytical Methods	*Method*	*Matrix*	*Method Descriptions*
Nitrite and Nitrate as N (NOx) by Discrete Analyser	EK059G	WATER	In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Total Kjeldahl Nitrogen as N By Discrete Analyser	EK061G	WATER	In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM Schedule B(3)
Total Nitrogen as N (TKN + Nox) By Discrete Analyser	EK062G	WATER	In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM Schedule B(3)
Total Phosphorus as P By Discrete Analyser	EK067G	WATER	In house: Referenced to APHA 4500-P H, Jirka et al, Zhang et al. This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM Schedule B(3)
Reactive Phosphorus as P-By Discrete Analyser	EK071G	WATER	In house: Referenced to APHA 4500-P F Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by Discrete Analyser. This method is compliant with NEPM Schedule B(3)
Ionic Balance by PCT DA and Turbi SO4 DA	* EN055 - PG	WATER	In house: Referenced to APHA 1030F. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260 Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GCMS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)
Per- and Polyfluoroalkyl Substances (PFAS) by LCMSMS	EP231X-ST	WATER	In-house: Analysis of fresh and saline waters by Solid Phase Extraction (SPE) followed by LC-Electrospray-MS-MS, Negative Mode using MRM and internal standard quantitation. Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is concentrated, combined with an equal volume of reagent water and filtered for analysis. Method procedures and data quality objectives conform to US DoD QSM 5.4, table B-15 requirements.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
TKN/TP Digestion	EK061/EK067	WATER	In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM Schedule B(3)
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3) . ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

Preparation Methods	*Method*	*Matrix*	*Method Descriptions*
Solid Phase Extraction (SPE) for PFAS in water	* ORG72	WATER	In-house: Isotopically labelled analogues of target analytes used as internal standards and surrogates are added to the sample container. The entire contents are transferred to a solid phase extraction (SPE) cartridge. The sample container is successively rinsed with aliquots of the elution solvent. The eluted extract is combined with an equal volume of reagent water and a portion is filtered for analysis. Method procedures conform to US DoD QSM 5.3, table B-15 requirements.

senversa

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Chain of Custody Documentation

Laboratory: ALS WA
Address: 26 Rigali Way, Wangara WA 6065
Contact: Sample Receipt
Phone: 08 9406 1301

Environmental Division
Perth
Work Order Reference
EP2409638

Telephone : - 61-8-9406 1301

Job Number:	P21705	**Purchase Order:**	PO023451
Project Name:	Burrup - Baseline Assessment	**Quote No:**	Senversa
Sampled By:	Egan Churchill-Gray	**Turn Around Time:**	Standard
Project Manager:	Ashton Betti	**Page:**	1 of 1
Email Report To:	ashton.betti@senversa.com.au egan.churchill-gray@senversa.com.au perth.labreports@senversa.com.au	**Phone/Mobile:**	0421 473 219

Sample Information					**Container Information**		**Analysis Required**											
Lab ID	**Sample ID**	**Matrix ***	**Date**	**Time**	**Type / Code**	**Total Bottles**	TRH (C6-C40), BTEXN, 8 Dissolved Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn) **[W-5]**	PFAS – Super Trace Full Suite (28 analytes) **[EP231X-ST]**	Ultra Trace – Nitrite, Nitrate, Ammonia, Reactive Phosphorus, Total Nitrogen, TKN, Total Phosphorus **[UTN-04]**	pH **[EA005]**	Cations & Anions: Major (Ca, Mg, Na, K, Cl, SO4, Alkalinity-residual alkali) + Ionic Balance **[NT-1 & NT-2]**	Acidity as CaCO3 **[ED038]**	TRH (C6-C40), BTEX **(W-4)**					
1	MW01	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X	X	X	X						pH: 7.56, Temp: 24.8 C Extra PFAS bottles for lab QC
2	MW02	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X	X	X	X						pH: 7.24, temp: 25.3 C Extra amber bottle for lab QC
3	MW03	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X	X	X	X						pH: 7.43, temp: 23.0 C
4	MW04	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X	X	X	X						pH: 7.40, temp: 23.6 C
5	MW05	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X	X	X	X						pH: 6.95, temp: 22.5 C
6	QC104	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X	X	X	X						pH: 7.24, temp: 25.3 C
7	QC302	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X									
8	QC402	Water	5/07/2024		1x VS	1							X					Lab ID: TBW871
9	QC403	Water	5/07/2024		2x P	2		X										Lab ID: TBW872
Total						59												

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:		**Sampler Name:**	Egan Churchill-Gray	**Signature:**	ECG	**Date:**	8/07/2024

Relinquished By:		**Method of Shipment (if applicable):**	**Received by:**	
Name/Signature: Egan Churchill-Gray / ECG	Date: 8/7/24	Carrier / Reference #:	Name/Signature: ES	Date: 8/7
Of: Senversa	Time: 12:00	Date/Time:	Of: ALS	Time: 1240
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

Completed by: ________
Checked by: ________

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Chain of Custody Documentation

Senversa Pty Ltd
www.senversa.com.au
ABN 89 132 231 380

Laboratory:	Eurofins ARL WA
Address:	46 - 48 Banksia Rd, Welshpool WA 6106
Contact:	Sample Receipt
Phone:	08 6253 4444

Job Number:	P21705	**Purchase Order:**		
Project Name:	Burrup - Baseline Assessment	**Quote No:**	Senversa	
Sampled By:	Egan Churchill-Gray	**Turn Around Time:**	Standard	
Project Manager:	Ashton Betti	**Page:**	1	of 1
Email Report To:	ashton.betti@senversa.com.au egan.churchill-gray@senversa.com.au perth.labreports@senversa.com.au	**Phone/Mobile:**	0421 473 219	

Sample Information					**Container Information**		**Analysis Required**											
Lab ID	**Sample ID**	**Matrix ***	**Date**	**Time**	**Type / Code**	**Total Bottles**	TRH (C6-C40), BTEXN, 8 Dissolved Metals (As, Cd, Cr, Cu, Pb, Hg, Ni, Zn)	PFAS – Super Trace Full Suite (28 analytes)	Ultra Trace – Nitrite, Nitrate, Ammonia, Reactive Phosphorus, Total Nitrogen, TKN, Total Phosphorus	Cations & Anions: Major (Ca, Mg, Na, K, Cl, SO4, Alkalinity-residual alkali) + Ionic Balance	Acidity as CaCO3						HOLD	Comments: e.g. Highly contaminated sample; hazardous materials present; trace LORs etc.
	QC204	Water	5/07/2024		2x VS, 1x UA, 4x P, 1x N	8	X	X	X	X	X							
Total						8												

Sampler: I attest that proper field sampling procedures in accordance with Senversa standard procedures and/or project specifications were used during the collection of these samples:	**Sampler Name:** Egan Churchill-Gray	**Signature:**	ECG	**Date:**	8/07/2024

Relinquished By:		**Method of Shipment (if applicable):**	**Received by:**	
Name/Signature: Egan Churchill-Gray / ECG	Date: 8/7/2024	Carrier / Reference #:	Name/Signature: 16.4	Date: 08/07/24
Of: Senversa	Time: 12:00	Date/Time:	Of:	Time: 12:35
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:
Name/Signature:	Date:	Carrier / Reference #:	Name/Signature:	Date:
Of:	Time:	Date/Time:	Of:	Time:

Water Container Codes: P = Unpreserved Plastic; N = Nitric Acid (HNO_3) Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide (NaOH)/Cadmium (Cd) Preserved; S = Sodium Hydroxide Preserved Plastic; STH = Sodium thiosulfate preserved plastic; V = VOA Vial Hydochloric Acid (HCl) Preserved; VS = VOA Vial Sulphuric Preserved; VSA = Sulphuric Preserved Amber Glass; H = HCl Preserved Plastic; HS = HCl Preserved Speciation Bottle; SP = Sulphuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; UA = Unpreserved Amber Glass; L=Lugol's iodine preserved white plastic bottle; SW= sulfuric acid preserved wide mouth glass jar

1115822

Completed by: ________
Checked by: ________

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Eurofins ARL Pty Ltd ABN: 91 05 0159 898

Eurofins Environment Testing Australia Pty Ltd ABN: 50 005 085 521

Eurofins ProMicro Pty Ltd ABN: 47 009 120 549

Eurofins Environment Testing NZ Ltd NZBN: 9429046024954

Perth	Melbourne	Geelong	Sydney	Canberra	Brisbane	Newcastle	Perth ProMicro	Auckland	Auckland (Focus)	Christchurch	Tauranga
46-48 Banksia Road	6 Monterey Road	19/8 Lewalan Street	179 Magowar Road	Unit 1,2 Dacre Street	1/21 Smallwood Place	1/2 Frost Drive	46-48 Banksia Road	35 O'Rorke Road	Unit C1/4 Pacific Rise,	43 Detroit Drive	1277 Cameron Road,
Welshpool	Dandenong South	Grovedale	Girraween	Mitchell	Murarrie	Mayfield West	Welshpool	Penrose,	Mount Wellington,	Rolleston,	Gate Pa,
WA 6106	VIC 3175	VIC 3216	NSW 2145	ACT 2911	QLD 4172	NSW 2304	WA 6106	Auckland 1061	Auckland 1061	Christchurch 7675	Tauranga 3112
+61 8 6253 4444	+61 3 8564 5000	+61 3 8564 5000	+61 2 9900 8400	+61 2 6113 8091	T: +61 7 3902 4600	+61 2 4968 8448	+61 8 6253 4444	+64 9 526 4551	+64 9 525 0568	+64 3 343 5201	+64 9 525 0568
NATA# 2377	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 1261	NATA# 2561	IANZ# 1327	IANZ# 1308	IANZ# 1290	IANZ# 1402
Site# 2370	Site# 1254	Site# 25403	Site# 18217	Site# 25466	Site# 20794 & 2780	Site# 25079	Site# 2554				

Sample Receipt Advice

Company name: Senversa Pty Ltd WA
Contact name: Ashton Betti
Project name: BURRUP - BASELINE ASSESSMENT
Project ID: P21705
Turnaround time: 5 Day
Date/Time received Jul 8, 2024 12:35 PM
Eurofins reference 1115822

Sample Information

✓	A detailed list of analytes logged into our LIMS, is included in the attached summary table.
✓	All samples have been received as described on the above COC.
✓	COC has been completed correctly.
✓	Attempt to chill was evident.
✓	Appropriately preserved sample containers have been used.
✓	All samples were received in good condition.
✓	Samples have been provided with adequate time to commence analysis in accordance with the relevant holding times.
✓	Appropriate sample containers have been used.
✓	Sample containers for volatile analysis received with zero headspace.
✗	Split sample sent to requested external lab.
✗	Some samples have been subcontracted.
N/A	Custody Seals intact (if used).

Notes

Contact

If you have any questions with respect to these samples, please contact your Analytical Services Manager:

Elden Garrett on phone : 0892519602 or by email: EldenGarrett@eurofins.com

Results will be delivered electronically via email to Ashton Betti - ashton.betti@senversa.com.au.

Note: A copy of these results will also be delivered to the general Senversa Pty Ltd WA email address.

Global Leader - Results you can trust

Company Name: Senversa Pty Ltd WA
Address: Level 18, 140 St Georges Terrace
Perth
WA 6000

Project Name: BURRUP - BASELINE ASSESSMENT
Project ID: P21705

Order No.: P21705
Report #: 1115822
Phone: 0863240200
Fax: 0396060074

Received: Jul 8, 2024 12:35 PM
Due: Jul 15, 2024
Priority: 5 Day
Contact Name: Ashton Betti

Eurofins Analytical Services Manager : Elden Garrett

Sample Detail						Acidity (as CaCO3)	Ionic Balance	Total Dissolved Solids (calculated from EC)*	Metals M8 filtered	Eurofins Suite B1	Eurofins Suite B11C: Na/K/Ca/Mg	Per- and Polyfluoroalkyl Substances (PFASs) - Trace	Total Dissolved Solids (TDS)	Eurofins Suite B19E	Eurofins Suite B11E
Perth Laboratory - NATA # 2377 Site # 2370						X	X	X	X	X	X		X	X	X
Melbourne Laboratory - NATA # 1261 Site # 1254												X			
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	QC204	Jul 05, 2024		Water	L24-Jl0021022	X	X	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1	1	1

Certificate of Analysis

NATA Accredited
Accreditation Number 1261
Site Number 1254

Accredited for compliance with ISO/IEC 17025 – Testing
NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration, inspection, proficiency testing scheme providers and reference materials producers reports and certificates.

Senversa Pty Ltd (WA)
Level 18, 140 St Georges Terrace
Perth
WA 6000

Attention:	**Ashton Betti**
Report	**1115822-W**
Project name	BURRUP - BASELINE ASSESSMENT
Project ID	P21705
Received Date	Jul 08, 2024

Client Sample ID **Sample Matrix** **Eurofins Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**QC204** **Water** **L24-Jl0021022** **Jul 05, 2024**
Total Recoverable Hydrocarbons			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.02	mg/L	< 0.02
TRH C15-C28	0.04	mg/L	< 0.04
TRH C29-C36	0.04	mg/L	< 0.04
TRH C10-C36 (Total)	0.04	mg/L	< 0.04
TRH C6-C10*	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1)^{N04}	0.02	mg/L	< 0.02
TRH >C10-C16	0.02	mg/L	< 0.02
TRH >C10-C16 less Naphthalene (F2)*^{N01}	0.02	mg/L	< 0.02
TRH >C16-C34	0.05	mg/L	< 0.05
TRH >C34-C40*	0.05	mg/L	< 0.05
TRH >C10-C40 (total)*	0.05	mg/L	< 0.05
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total*	0.003	mg/L	< 0.003
BTEX			
4-Bromofluorobenzene (surr.)	1	%	89
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene^{N02}	0.001	mg/L	< 0.001
Acidity (as CaCO3)	10	mg/L	43
Ammonia-N	0.02	mg/L	1.7
Chloride	5	mg/L	65000
Conductivity (at 25 °C)	10	uS/cm	140000
Filterable Reactive Phosphorus	0.01	mg/L	0.05
Ionic Balance	0	%	- 4.5
Nitrate-N	0.01	mg/L	0.02
Nitrite-N	0.01	mg/L	< 0.01
NOx-N	0.01	mg/L	0.02
Sulfate	1	mg/L	13000
Total Dissolved Solids	5	mg/L	83000

Client Sample ID **Sample Matrix** **Eurofins Sample No.** **Date Sampled** Test/Reference	LOR	Unit	**QC204** **Water** **L24-Jl0021022** **Jul 05, 2024**
Total Dissolved Solids (calculated from EC)*	10	mg/L	98000
Total Kjeldahl Nitrogen	0.2	mg/L	1.3
Total Nitrogen	0.2	mg/L	1.3
Total Phosphorus	0.01	mg/L	< 0.01
Alkalinity (speciated)			
Bicarbonate Alkalinity (as CaCO3)	5	mg/L	100
Carbonate Alkalinity (as CaCO3)	5	mg/L	< 5
Hydroxide Alkalinity (as CaCO3)	5	mg/L	< 5
Total Alkalinity (as CaCO3)	5	mg/L	100
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	0.011
Cadmium (filtered)	0.0001	mg/L	< 0.002
Chromium (filtered)	0.001	mg/L	< 0.01
Copper (filtered)	0.001	mg/L	< 0.01
Lead (filtered)	0.001	mg/L	< 0.01
Mercury (filtered)	0.0001	mg/L	< 0.001
Nickel (filtered)	0.001	mg/L	< 0.01
Zinc (filtered)	0.005	mg/L	< 0.05
Eurofins Suite B11C: Na/K/Ca/Mg			
Calcium	0.5	mg/L	1200
Magnesium	0.5	mg/L	3800
Potassium	0.5	mg/L	1200
Sodium	0.5	mg/L	35000
PFASs Summations			
Sum (PFHxS + PFOS)*	0.001	ug/L	< 0.001
Sum of enHealth PFAS (PFHxS + PFOS + PFOA)*	0.001	ug/L	< 0.001
Sum of PFASs (n=30)*	0.005	ug/L	0.122
Sum of US EPA PFAS (PFOS + PFOA)*	0.001	ug/L	< 0.001
Sum of WA DWER PFAS (n=10)*	0.005	ug/L	0.122
Perfluoroalkyl sulfonamido substances- Trace			
Perfluorooctane sulfonamide (FOSA)^{N11}	0.005	ug/L	< 0.005
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)^{N11}	0.005	ug/L	< 0.005
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)^{N11}	0.005	ug/L	< 0.005
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)^{N11}	0.005	ug/L	< 0.005
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)^{N11}	0.005	ug/L	< 0.005
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)^{N11}	0.005	ug/L	< 0.005
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)^{N11}	0.005	ug/L	< 0.005
13C8-FOSA (surr.)	1	%	36
D3-N-MeFOSA (surr.)	1	%	46
D5-N-EtFOSA (surr.)	1	%	63
D7-N-MeFOSE (surr.)	1	%	34
D9-N-EtFOSE (surr.)	1	%	43
D5-N-EtFOSAA (surr.)	1	%	56
D3-N-MeFOSAA (surr.)	1	%	47

Client Sample ID			**QC204**
Sample Matrix			**Water**
Eurofins Sample No.			**L24-Jl0021022**
Date Sampled			**Jul 05, 2024**
Test/Reference	LOR	Unit	
Perfluoroalkyl carboxylic acids (PFCAs) - Trace			
Perfluorobutanoic acid (PFBA)[N11]	0.005	ug/L	0.035
Perfluoropentanoic acid (PFPeA)[N11]	0.001	ug/L	0.054
Perfluorohexanoic acid (PFHxA)[N11]	0.001	ug/L	[N09]0.022
Perfluoroheptanoic acid (PFHpA)[N11]	0.001	ug/L	[N09]0.004
Perfluorooctanoic acid (PFOA)[N11]	0.001	ug/L	< 0.001
Perfluorononanoic acid (PFNA)[N11]	0.001	ug/L	< 0.001
Perfluorodecanoic acid (PFDA)[N11]	0.001	ug/L	< 0.001
Perfluorotridecanoic acid (PFTrDA)[N15]	0.001	ug/L	< 0.001
Perfluoroundecanoic acid (PFUnDA)[N11]	0.001	ug/L	< 0.001
Perfluorododecanoic acid (PFDoDA)[N11]	0.001	ug/L	< 0.001
Perfluorotetradecanoic acid (PFTeDA)[N11]	0.001	ug/L	< 0.001
13C4-PFBA (surr.)	1	%	52
13C5-PFPeA (surr.)	1	%	83
13C5-PFHxA (surr.)	1	%	105
13C4-PFHpA (surr.)	1	%	97
13C8-PFOA (surr.)	1	%	98
13C5-PFNA (surr.)	1	%	70
13C6-PFDA (surr.)	1	%	58
13C2-PFUnDA (surr.)	1	%	60
13C2-PFDoDA (surr.)	1	%	80
13C2-PFTeDA (surr.)	1	%	48
Perfluoroalkyl sulfonic acids (PFSAs)- Trace			
Perfluorobutanesulfonic acid (PFBS)[N11]	0.001	ug/L	0.007
Perfluorononanesulfonic acid (PFNS)[N15]	0.001	ug/L	< 0.001
Perfluoropropanesulfonic acid (PFPrS)[N15]	0.001	ug/L	< 0.001
Perfluoropentanesulfonic acid (PFPeS)[N15]	0.001	ug/L	< 0.001
Perfluorohexanesulfonic acid (PFHxS)[N11]	0.001	ug/L	< 0.001
Perfluoroheptanesulfonic acid (PFHpS)[N15]	0.001	ug/L	< 0.001
Perfluorooctanesulfonic acid (PFOS)[N11]	0.001	ug/L	< 0.001
Perfluorodecanesulfonic acid (PFDS)[N15]	0.001	ug/L	< 0.001
13C3-PFBS (surr.)	1	%	103
18O2-PFHxS (surr.)	1	%	92
13C8-PFOS (surr.)	1	%	61
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace			
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)[N11]	0.001	ug/L	< 0.001
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)[N11]	0.005	ug/L	< 0.005
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)[N11]	0.001	ug/L	< 0.001
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)[N11]	0.001	ug/L	< 0.001
13C2-4:2 FTSA (surr.)	1	%	88
13C2-6:2 FTSA (surr.)	1	%	64
13C2-8:2 FTSA (surr.)	1	%	96
13C2-10:2 FTSA (surr.)	1	%	54

Sample History

Where samples are submitted/analysed over several days, the last date of extraction is reported.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Welshpool	Jul 15, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Jul 15, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Welshpool	Jul 15, 2024	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Welshpool	Jul 15, 2024	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Acidity (as CaCO3)	Welshpool	Jul 15, 2024	14 Days
- Method: LTM-INO-4210 Acidity			
Ionic Balance	Welshpool	Jul 09, 2024	28 Day
- Method: -			
Total Dissolved Solids (calculated from EC)*	Welshpool	Jul 15, 2024	28 Days
- Method: APHA 4110 Total Dissolved Solids			
Metals M8 filtered	Welshpool	Jul 15, 2024	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins Suite B11C: Na/K/Ca/Mg	Welshpool	Jul 15, 2024	180 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Ammonia-N	Welshpool	Jul 09, 2024	28 Days
- Method: ARL303 - Ammonia in Water by Discrete Analyser			
Filterable Reactive Phosphorus	Welshpool	Jul 09, 2024	28 Days
- Method: ARL309 - Filterable Reactive Phosphorus in Water by Discrete Analyser			
Nitrate-N	Welshpool	Jul 09, 2024	28 Days
- Method: ARL313/319 - NOx in Water by Discrete Analyser			
Nitrite-N	Welshpool	Jul 09, 2024	2 Days
- Method: ARL311 - Nitrite in Water by Discrete Analyser			
NOx-N	Welshpool	Jul 09, 2024	28 Days
- Method: ARL313/319 - NOx in Water by Discrete Analyser			
Total Kjeldahl Nitrogen	Welshpool	Jul 09, 2024	28 Day
- Method: ARL No. 330 - Persulfate Method for Simultaneous Determination of TN & TP			
Total Nitrogen	Welshpool	Jul 15, 2024	28 Days
- Method: ARL No. 330 - Persulfate Method for Simultaneous Determination of TN & TP			
Total Phosphorus	Welshpool	Jul 15, 2024	28 Days
- Method: ARL308 - Total Phosphorus in Water by Discrete Analyser			
Chloride	Welshpool	Jul 09, 2024	28 Days
- Method: ARL305 - Chloride in Water by Discrete Analyser			
Sulfate	Welshpool	Jul 09, 2024	28 Days
- Method: ARL301 - Sulfate in Water by Discrete Analyser			
Alkalinity (speciated)	Welshpool	Jul 15, 2024	14 Days
- Method: LTM-INO-4250 Alkalinity by Electrometric Titration			
Conductivity (at 25 °C)	Welshpool	Jul 15, 2024	28 Days
- Method: LTM-INO-4030 Conductivity			
Total Dissolved Solids	Welshpool	Jul 15, 2024	7 Days
- Method: ARL No. 017 - Total Dissolved Solids			
Per- and Polyfluoroalkyl Substances (PFASs) - Trace			
PFASs Summations	Melbourne	Jul 09, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			
Perfluoroalkyl sulfonamido substances- Trace	Melbourne	Jul 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			
Perfluoroalkyl carboxylic acids (PFCAs) - Trace	Melbourne	Jul 10, 2024	28 Days
- Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level			

Description	Testing Site	Extracted	Holding Time
Perfluoroalkyl sulfonic acids (PFSAs)- Trace - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level	Melbourne	Jul 10, 2024	28 Days
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace - Method: LTM-ORG-2100 Per- and Polyfluoroalkyl Substances (PFAS) - low level	Melbourne	Jul 10, 2024	28 Days

Company Name:	Senversa Pty Ltd WA	**Order No.:**	P21705	**Received:**	Jul 8, 2024 12:35 PM
Address:	Level 18, 140 St Georges Terrace Perth WA 6000	**Report #:**	1115822	**Due:**	Jul 15, 2024
		Phone:	0863240200	**Priority:**	5 Day
		Fax:	0396060074	**Contact Name:**	Ashton Betti
Project Name:	BURRUP - BASELINE ASSESSMENT				
Project ID:	P21705				

Eurofins Analytical Services Manager : Elden Garrett

Sample Detail						Acidity (as CaCO3)	Ionic Balance	Total Dissolved Solids (calculated from EC)*	Metals M8 filtered	Eurofins Suite B1	Eurofins Suite B11C: Na/K/Ca/Mg	Per- and Polyfluoroalkyl Substances (PFASs) - Trace	Total Dissolved Solids (TDS)	Eurofins Suite B19E	Eurofins Suite B11E
Perth Laboratory - NATA # 2377 Site # 2370						X	X	X	X	X	X		X	X	X
Melbourne Laboratory - NATA # 1261 Site # 1254												X			
External Laboratory															
No	**Sample ID**	**Sample Date**	**Sampling Time**	**Matrix**	**LAB ID**										
1	QC204	Jul 05, 2024		Water	L24-Jl0021022	X	X	X	X	X	X	X	X	X	X
Test Counts						1	1	1	1	1	1	1	1	1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follow guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013. They are included in this QC report where applicable. Additional QC data may be available on request.
2. Unless otherwise stated, all soil/sediment/solid results are reported on a dry weight basis.
3. Unless otherwise stated, all biota/food results are reported on a wet weight basis on the edible portion.
4. For CEC results where the sample's origin is unknown or environmentally contaminated, the results should be used advisedly.
5. Actual LORs are matrix dependent. Quoted LORs may be raised where sample extracts are diluted due to interferences.
6. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds where annotated.
7. SVOC analysis on waters is performed on homogenised, unfiltered samples unless noted otherwise.
8. Samples were analysed on an 'as received' basis.
9. Information identified in this report with **blue** colour indicates data provided by customers that may have an impact on the results.
10. This report replaces any interim results previously issued.

Holding Times

Please refer to the 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours before sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and despite any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the sampling date; therefore, compliance with these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether, the holding time is seven days; however, for all other VOCs, such as BTEX or C6-10 TRH, the holding time is 14 days.

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ppm: parts per million

µg/L: micrograms per litre

ppb: parts per billion

%: Percentage

org/100 mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100 mL: Most Probable Number of organisms per 100 millilitres

CFU: Colony Forming Unit

Colour: Pt-Co Units (CU)

Terms

APHA	American Public Health Association
CEC	Cation Exchange Capacity
COC	Chain of Custody
CP	Client Parent - QC was performed on samples pertaining to this report
CRM	Certified Reference Material (ISO17034) - reported as percent recovery.
Dry	Where moisture has been determined on a solid sample, the result is expressed on a dry weight basis.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
LOR	Limit of Reporting.
LCS	Laboratory Control Sample - reported as percent recovery.
Method Blank	In the case of solid samples, these are performed on laboratory-certified clean sands and in the case of water samples, these are performed on de-ionised water.
NCP	Non-Client Parent - QC performed on samples not pertaining to this report, QC represents the sequence or batch that client samples were analysed within.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
SRA	Sample Receipt Advice
Surr - Surrogate	The addition of a similar compound to the analyte target is reported as percentage recovery. See below for acceptance criteria.
TBTO	Tributyltin oxide (*bis*-tributyltin oxide) - individual tributyltin compounds cannot be identified separately in the environment; however, free tributyltin was measured, and its values were converted stoichiometrically into tributyltin oxide for comparison with regulatory limits.
TCLP	Toxicity Characteristic Leaching Procedure
TEQ	Toxic Equivalency Quotient or Total Equivalence
QSM	US Department of Defense Quality Systems Manual Version 6.0
US EPA	United States Environmental Protection Agency
WA DWER	Sum of PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC - Acceptance Criteria

The acceptance criteria should only be used as a guide and may be different when site-specific Sampling Analysis and Quality Plan (SAQP) have been implemented.

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is ≤30%; however, the following acceptance guidelines are equally applicable:

Results <10 times the LOR:	No Limit
Results between 10-20 times the LOR:	RPD must lie between 0-50%
Results >20 times the LOR:	RPD must lie between 0-30%

NOTE: pH duplicates are reported as a range, not as RPD

Surrogate Recoveries: Recoveries must lie between 20-130% for Speciated Phenols & 50-150% for PFAS. SVOCs recoveries 20 – 150%, VOC recoveries 50 – 150%

PFAS field samples containing surrogate recoveries above the QC limit designated in QSM 6.0, where no positive PFAS results have been reported or reviewed, and no data was affected.

QC Data General Comments

1. Where a result is reported as less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown are not data from your samples.
3. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore, laboratory analysis is unlikely to be completed within holding time.Analysis will begin as soon as possible after sample receipt.
4. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of recovery, the term "INT" appears against that analyte.
5. For Matrix Spikes and LCS results, a dash "-" in the report means that the specific analyte was not added to the QC sample.
6. Duplicate RPDs are calculated from raw analytical data; thus, it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.02			0.02	Pass	
TRH C15-C28	mg/L	< 0.04			0.04	Pass	
TRH C29-C36	mg/L	< 0.04			0.04	Pass	
TRH C6-C10*	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.02			0.02	Pass	
TRH >C16-C34	mg/L	< 0.05			0.05	Pass	
TRH >C34-C40*	mg/L	< 0.05			0.05	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total*	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.001			0.001	Pass	
Method Blank							
Ammonia-N	mg/L	< 0.02			0.02	Pass	
Chloride	mg/L	< 5			5	Pass	
Filterable Reactive Phosphorus	mg/L	< 0.01			0.01	Pass	
Nitrite-N	mg/L	< 0.01			0.01	Pass	
Sulfate	mg/L	< 1			1	Pass	
Total Dissolved Solids	mg/L	< 5			5	Pass	
Total Nitrogen	mg/L	< 0.2			0.2	Pass	
Total Phosphorus	mg/L	< 0.01			0.01	Pass	
Method Blank							
Alkalinity (speciated)							
Bicarbonate Alkalinity (as CaCO3)	mg/L	< 5			5	Pass	
Hydroxide Alkalinity (as CaCO3)	mg/L	< 5			5	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0001			0.0001	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
Method Blank							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	mg/L	< 0.5			0.5	Pass	
Magnesium	mg/L	< 0.5			0.5	Pass	
Potassium	mg/L	< 0.5			0.5	Pass	
Sodium	mg/L	< 0.5			0.5	Pass	
Method Blank							
Perfluoroalkyl sulfonamido substances- Trace							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Perfluorooctane sulfonamide (FOSA)	ug/L	< 0.005			0.005	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	ug/L	< 0.005			0.005	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	ug/L	< 0.005			0.005	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	ug/L	< 0.005			0.005	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	ug/L	< 0.005			0.005	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	ug/L	< 0.005			0.005	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	ug/L	< 0.005			0.005	Pass	
Method Blank							
Perfluoroalkyl carboxylic acids (PFCAs) - Trace							
Perfluorobutanoic acid (PFBA)	ug/L	< 0.005			0.005	Pass	
Perfluoropentanoic acid (PFPeA)	ug/L	< 0.001			0.001	Pass	
Perfluorohexanoic acid (PFHxA)	ug/L	< 0.001			0.001	Pass	
Perfluoroheptanoic acid (PFHpA)	ug/L	< 0.001			0.001	Pass	
Perfluorooctanoic acid (PFOA)	ug/L	< 0.001			0.001	Pass	
Perfluorononanoic acid (PFNA)	ug/L	< 0.001			0.001	Pass	
Perfluorodecanoic acid (PFDA)	ug/L	< 0.001			0.001	Pass	
Perfluorotridecanoic acid (PFTrDA)	ug/L	< 0.001			0.001	Pass	
Perfluoroundecanoic acid (PFUnDA)	ug/L	< 0.001			0.001	Pass	
Perfluorododecanoic acid (PFDoDA)	ug/L	< 0.001			0.001	Pass	
Perfluorotetradecanoic acid (PFTeDA)	ug/L	< 0.001			0.001	Pass	
Method Blank							
Perfluoroalkyl sulfonic acids (PFSAs)- Trace							
Perfluorobutanesulfonic acid (PFBS)	ug/L	< 0.001			0.001	Pass	
Perfluorononanesulfonic acid (PFNS)	ug/L	< 0.001			0.001	Pass	
Perfluoropropanesulfonic acid (PFPrS)	ug/L	< 0.001			0.001	Pass	
Perfluoropentanesulfonic acid (PFPeS)	ug/L	< 0.001			0.001	Pass	
Perfluorohexanesulfonic acid (PFHxS)	ug/L	< 0.001			0.001	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	ug/L	< 0.001			0.001	Pass	
Perfluorooctanesulfonic acid (PFOS)	ug/L	< 0.001			0.001	Pass	
Perfluorodecanesulfonic acid (PFDS)	ug/L	< 0.001			0.001	Pass	
Method Blank							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	ug/L	< 0.001			0.001	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	ug/L	< 0.005			0.005	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	ug/L	< 0.001			0.001	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	ug/L	< 0.001			0.001	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons							
TRH C6-C9	%	97			70-130	Pass	
TRH C10-C14	%	99			70-130	Pass	
TRH C6-C10*	%	104			70-130	Pass	
TRH >C10-C16	%	97			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	106			70-130	Pass	
Toluene	%	113			70-130	Pass	
Ethylbenzene	%	117			70-130	Pass	
m&p-Xylenes	%	110			70-130	Pass	
o-Xylene	%	113			70-130	Pass	
Xylenes - Total*	%	111			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	115			70-130	Pass	
LCS - % Recovery							

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Total Dissolved Solids	%	100			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	101			80-120	Pass	
Cadmium (filtered)	%	100			80-120	Pass	
Chromium (filtered)	%	95			80-120	Pass	
Copper (filtered)	%	91			80-120	Pass	
Lead (filtered)	%	93			80-120	Pass	
Mercury (filtered)	%	101			80-120	Pass	
Nickel (filtered)	%	99			80-120	Pass	
Zinc (filtered)	%	100			80-120	Pass	
LCS - % Recovery							
Eurofins Suite B11C: Na/K/Ca/Mg							
Calcium	%	95			80-120	Pass	
Magnesium	%	102			80-120	Pass	
Potassium	%	102			80-120	Pass	
Sodium	%	104			80-120	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonamido substances- Trace							
Perfluorooctane sulfonamide (FOSA)	%	94			50-150	Pass	
N-methylperfluoro-1-octane sulfonamide (N-MeFOSA)	%	83			50-150	Pass	
N-ethylperfluoro-1-octane sulfonamide (N-EtFOSA)	%	99			50-150	Pass	
2-(N-methylperfluoro-1-octane sulfonamido)-ethanol(N-MeFOSE)	%	110			50-150	Pass	
2-(N-ethylperfluoro-1-octane sulfonamido)-ethanol(N-EtFOSE)	%	101			50-150	Pass	
N-ethyl-perfluorooctanesulfonamidoacetic acid (N-EtFOSAA)	%	89			50-150	Pass	
N-methyl-perfluorooctanesulfonamidoacetic acid (N-MeFOSAA)	%	94			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl carboxylic acids (PFCAs) - Trace							
Perfluorobutanoic acid (PFBA)	%	108			50-150	Pass	
Perfluoropentanoic acid (PFPeA)	%	106			50-150	Pass	
Perfluorohexanoic acid (PFHxA)	%	88			50-150	Pass	
Perfluoroheptanoic acid (PFHpA)	%	87			50-150	Pass	
Perfluorooctanoic acid (PFOA)	%	84			50-150	Pass	
Perfluorononanoic acid (PFNA)	%	87			50-150	Pass	
Perfluorodecanoic acid (PFDA)	%	88			50-150	Pass	
Perfluorotridecanoic acid (PFTrDA)	%	69			50-150	Pass	
Perfluoroundecanoic acid (PFUnDA)	%	88			50-150	Pass	
Perfluorododecanoic acid (PFDoDA)	%	96			50-150	Pass	
Perfluorotetradecanoic acid (PFTeDA)	%	92			50-150	Pass	
LCS - % Recovery							
Perfluoroalkyl sulfonic acids (PFSAs)- Trace							
Perfluorobutanesulfonic acid (PFBS)	%	96			50-150	Pass	
Perfluorononanesulfonic acid (PFNS)	%	79			50-150	Pass	
Perfluoropropanesulfonic acid (PFPrS)	%	98			50-150	Pass	
Perfluoropentanesulfonic acid (PFPeS)	%	94			50-150	Pass	
Perfluorohexanesulfonic acid (PFHxS)	%	88			50-150	Pass	
Perfluoroheptanesulfonic acid (PFHpS)	%	100			50-150	Pass	
Perfluorooctanesulfonic acid (PFOS)	%	89			50-150	Pass	
Perfluorodecanesulfonic acid (PFDS)	%	51			50-150	Pass	
LCS - % Recovery							
n:2 Fluorotelomer sulfonic acids (n:2 FTSAs)- Trace							
1H.1H.2H.2H-perfluorohexanesulfonic acid (4:2 FTSA)	%	84			50-150	Pass	
1H.1H.2H.2H-perfluorooctanesulfonic acid(6:2 FTSA)	%	101			50-150	Pass	
1H.1H.2H.2H-perfluorodecanesulfonic acid (8:2 FTSA)	%	91			50-150	Pass	
1H.1H.2H.2H-perfluorododecanesulfonic acid (10:2 FTSA)	%	95			50-150	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons				Result 1					
TRH C6-C9	L24-Jl0032082	NCP	%	101			70-130	Pass	
TRH C10-C14	L24-Jl0017994	NCP	%	102			70-130	Pass	
TRH C6-C10*	L24-Jl0032082	NCP	%	100			70-130	Pass	
TRH >C10-C16	L24-Jl0017994	NCP	%	99			70-130	Pass	
Spike - % Recovery									
BTEX				Result 1					
Benzene	L24-Jl0032082	NCP	%	85			70-130	Pass	
Toluene	L24-Jl0032082	NCP	%	75			70-130	Pass	
Ethylbenzene	L24-Jl0032082	NCP	%	78			70-130	Pass	
m&p-Xylenes	L24-Jl0032082	NCP	%	78			70-130	Pass	
o-Xylene	L24-Jl0032082	NCP	%	74			70-130	Pass	
Xylenes - Total*	L24-Jl0032082	NCP	%	77			70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
Naphthalene	L24-Jl0032082	NCP	%	93			70-130	Pass	
Spike - % Recovery									
				Result 1					
Ammonia-N	L24-Jl0021142	NCP	%	105			80-120	Pass	
Chloride	L24-Jl0018739	NCP	%	99			70-130	Pass	
Filterable Reactive Phosphorus	L24-Jl0021142	NCP	%	109			80-120	Pass	
Nitrate-N	L24-Jl0018739	NCP	%	112			70-130	Pass	
Nitrite-N	L24-Jl0018739	NCP	%	98			80-120	Pass	
NOx-N	L24-Jl0018739	NCP	%	106			80-120	Pass	
Sulfate	L24-Jl0018739	NCP	%	116			70-130	Pass	
Total Nitrogen	L24-Jl0025456	NCP	%	108			70-130	Pass	
Total Phosphorus	L24-Jl0025456	NCP	%	83			80-120	Pass	
Spike - % Recovery									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1					
Calcium	L24-Jl0032587	NCP	%	88			75-125	Pass	
Magnesium	L24-Jl0032587	NCP	%	91			75-125	Pass	
Potassium	L24-Jl0032587	NCP	%	93			75-125	Pass	
Sodium	L24-Jl0032587	NCP	%	83			75-125	Pass	
Test	**Lab Sample ID**	**QA Source**	**Units**	**Result 1**			**Acceptance Limits**	**Pass Limits**	**Qualifying Code**
Duplicate									
Total Recoverable Hydrocarbons				Result 1	Result 2	RPD			
TRH C6-C9	L24-Jl0031340	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	L24-Jl0021166	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C15-C28	L24-Jl0021166	NCP	mg/L	< 0.04	< 0.04	<1	30%	Pass	
TRH C29-C36	L24-Jl0021166	NCP	mg/L	< 0.04	< 0.04	<1	30%	Pass	
TRH C6-C10*	L24-Jl0031340	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C10-C16	L24-Jl0021166	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C16-C34	L24-Jl0021166	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH >C34-C40*	L24-Jl0021166	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	L24-Jl0031340	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	L24-Jl0031340	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	L24-Jl0031340	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	L24-Jl0031340	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	L24-Jl0031340	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total*	L24-Jl0031340	NCP	mg/L	< 0.003	< 0.003	<1	30%	Pass	

Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	L24-Jl0031340	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Duplicate									
				Result 1	Result 2	RPD			
Ammonia-N	L24-Jl0021141	NCP	mg/L	< 0.02	< 0.02	<1	20%	Pass	
Chloride	L24-Jl0021141	NCP	mg/L	< 5	< 5	<1	30%	Pass	
Conductivity (at 25 °C)	L24-Jl0021166	NCP	uS/cm	960	970	1.6	30%	Pass	
Filterable Reactive Phosphorus	L24-Jl0021141	NCP	mg/L	< 0.01	< 0.01	<1	20%	Pass	
Nitrate-N	L24-Jl0021141	NCP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
Nitrite-N	L24-Jl0021141	NCP	mg/L	< 0.01	< 0.01	<1	20%	Pass	
NOx-N	L24-Jl0021141	NCP	mg/L	< 0.01	< 0.01	<1	20%	Pass	
Sulfate	L24-Jl0021141	NCP	mg/L	< 1	< 1	<1	30%	Pass	
Total Dissolved Solids	L24-Jl0021166	NCP	mg/L	570	580	1.6	30%	Pass	
Total Nitrogen	L24-Jl0021022	CP	mg/L	1.3	1.3	5.8	30%	Pass	
Total Phosphorus	L24-Jl0021022	CP	mg/L	< 0.01	< 0.01	<1	20%	Pass	
Duplicate									
Eurofins Suite B11C: Na/K/Ca/Mg				Result 1	Result 2	RPD			
Calcium	L24-Jl0032586	NCP	mg/L	70	69	<1	30%	Pass	
Magnesium	L24-Jl0032586	NCP	mg/L	64	63	1.6	30%	Pass	
Potassium	L24-Jl0032586	NCP	mg/L	< 0.5	< 0.5	<1	30%	Pass	
Sodium	L24-Jl0032586	NCP	mg/L	130	130	2.8	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
N09	Quantification of linear and branched isomers has been conducted as a single total response using the relative response factor for the corresponding linear/branched standard.
N11	Isotope dilution is used for calibration of each native compound for which an exact labelled analogue is available (Isotope Dilution Quantitation). The isotopically labelled analogues allow identification and recovery correction of the concentration of the associated native PFAS compounds.
N15	Where the native PFAS compound does not have labelled analogue then the quantification is made using the Extracted Internal Standard Analyte with the closest retention time to the analyte and no recovery correction has been made (Internal Standard Quantitation).

Authorised by:

Elden Garrett	Analytical Services Manager
Carroll Lee	Senior Analyst-PFAS
Douglas Todd	Senior Analyst-Metal
John Horwood	Senior Analyst-Organic
John Horwood	Senior Analyst-Volatile
Lauren Killin	Senior Analyst-Inorganic
Sam Becker	Senior Analyst-Inorganic

Glenn Jackson
Managing Director

Final Report – this report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please click here.

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Appendix B: Perdaman Pipeline Flora and Fauna Survey (ELA 2024)

Perdaman Pipeline Flora and Fauna Survey

DBNGP (WA) Nominees Pty Ltd

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DOCUMENT TRACKING

Project Name	Perdaman Pipeline Flora and Fauna Survey
Project Number	23PER6340
Project Manager	Jeni Morris
Prepared by	Jess Tomlinson, Jeni Morris
Reviewed by	Jeff Cargill
Approved by	Jeff Cargill
Status	**Final**
Version Number	**V2**
Last saved on	**23 August 2024**

This report should be cited as 'Eco Logical Australia 2024. *Perdaman Pipeline Flora and Fauna Survey*. Prepared for DBNGP WA Nominees Pty Ltd.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from DBNGP (WA) Nominees Pty Ltd .

Contents

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Abbreviations

Abbreviation	Description
BAM Act	State *Biosecurity and Agriculture Management Act 2007*
BC Act	State *Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
CR	Critically Endangered
DAFWA	Department of Agriculture and Food Western Australia
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPIRD	Department of Primary Industries and Regional Development
DRF	Declared Rare Flora
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia
EP Act	State *Environmental Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally Sensitive Area
GDE	Groundwater Dependent Ecosystem
ha	hectare
IBRA	Interim Biogeographic Regionalisation for Australia
km	kilometre
m	metre
MI	Migratory
mm	millimetre
P	Priority
PDWSA	Public Drinking Water Source Areas
PEC	Priority Ecological Community
TEC	Threatened Ecological Community
WA	Western Australia
WAH	Western Australian Herbarium
WAM	Western Australian Museum
WoNS	Weeds of National Significance

Executive Summary

Eco Logical Australia was engaged to conduct a Detailed and Targeted flora and vegetation survey and Basic fauna survey for the proposed Perdaman Pipeline, located on the Burrup Peninsula in the Pilbara region of Western Australia, to provide an assessment of environmental values of the survey area and to support the environmental assessment and approval process.

A desktop assessment was undertaken to assess the potential presence of significant flora and fauna species and ecological communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the State *Biodiversity Conservation Act 2016* or by the Department of Biodiversity, Conservation and Attractions. Prior to the field survey, a total of three conservation significant flora species were identified as possibly occurring in the survey area, with one species considered as having the potential to occur and two species assessed as being unlikely to occur. A total of 64 conservation significant fauna species were identified pre-survey as possibly occurring, with 29 species considered as having the potential to occur and 35 species considered as being unlikely to occur or as not occurring. A total of two conservation significant ecological communities were identified as possibly occurring, with both considered as being unlikely to occur in the survey area.

A Detailed flora and vegetation survey and Basic fauna survey was conducted by Jeni Morris (Senior Ecologist) and Glenn Maslen (Senior Environmental Scientist) on 26 March 2024. The flora and vegetation survey was conducted in accordance with the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016), and the Basic fauna survey was conducted in accordance with the Environmental Protection Authority *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (2020).

A total of 10 flora species (nine native and one introduced) from eight genera and five families were recorded within the survey area. No Threatened (Declared Rare) flora species listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the State *Biodiversity Conservation Act 2016,* or Priority flora species listed by Department of Biodiversity, Conservation and Attractions were recorded from within the survey area. Of the three conservation listed flora species identified from the desktop assessment as possibly occurring, a post-survey likelihood of occurrence assessment determined that all are considered as being unlikely to occur, based on a lack of suitable habitat present for these species and adequacy of survey effort.

One introduced (weed) flora species was recorded within the survey area, namely **Cenchrus ciliaris* (Buffel grass). **C. ciliaris* is listed under the State *Biosecurity and Agriculture Management Act 2007* as Permitted (s-11), with no specific conditions for control required. This species was recorded at a 0.1% cover within vegetated areas of the survey area.

One broad vegetation type (VT01) was identified within the survey area, occurring across 0.21 hectares in the western portion of the survey area. This vegetation type consisted of low sparse chenopod shrubland primarily comprised of *Tecticornia halocnemoides, Tecticornia indica* subsp. *leiostachya*, and *Trianthema turgidifolium*. The remaining 1.22 hectares of the survey area is described as 'Mudflat' and had no vegetation present. No vegetation types delineated within the current survey area were inferred to represent any known or potential conservation significant communities listed under the

Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the State *Biodiversity Conservation Act 2016* or by the Department of Biodiversity, Conservation and Attractions.

All vegetation within the survey area was classed as being in Poor condition, based on the Trudgen (1988) vegetation scale outlined in the Environment Protection Agency: *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016; 0.21 hectares). Areas of Mudflat (1.22 hectares) were not assigned a vegetation condition. Disturbances recorded within the survey area included previous clearing, and impacts from adjacent cleared areas (weed invasion, dust).

No fauna species, including direct (observations) or indirect (scats, tracks, diggings) evidence of conservation significant fauna species listed under the EPBC Act, BC Act or by DBCA was recorded within the survey area.

Of the 64 conservation significant fauna species identified from the desktop assessment as possibly occurring within the survey area, a post-survey likelihood of occurrence assessment determined that eight are considered as having the potential to occur, based on availability of suitable habitat and proximity of previous records, namely *Calidris ferruginea* (Curlew Sandpiper, listed as Critically Endangered and Migratory under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and as Critically Endangered under the State *Biodiversity Conservation Act 2016*), *Tringa nebularia* (Common Greenshank; listed as Endangered and Migratory under Commonwealth legislation and Migratory under State legislation), *Xenus cinereus* (Terek Sandpiper; listed as Vulnerable and Migratory under Commonwealth legislation and Migratory under State legislation), and five species listed as Migratory under Commonwealth and State legislation, namely *Gelochelidon nilotica* (Gull-billed tern), *Hydroprogne caspia* (Caspian Tern), *Limosa lapponica* (Bar-tailed godwit), *Pluvialis fulva* (Pacific Golden Plover) and *Tringa stagnatilis* (Marsh Sandpiper).

Two fauna habitats were identified within the survey area, namely 'Mudflat' and 'Low chenopod shrubland'. Mudflats within the survey area may provide foraging habitat to a range of migratory waders when inundated seasonally (e.g., during king tides), including the aforementioned conservation listed bird species.

1. Introduction

1.1. Project background

The Perdaman Lateral Project is located within the Burrup Peninsula of the Pilbara region of Western Australia, approximately 20 kilometres (km) north of Karratha and 8 km north of Dampier. DBNGP (WA) Nominees Pty Ltd (DBP) are the Proponent for the project and are proposing to construct a 550 m long pipeline, and supporting infrastructure, to transport natural gas from the existing Dampier to Bunbury Natural Gas Pipeline (DBNGP) to the proposed Perdaman Urea Plant development (Project Ceres).

Eco Logical Australia (ELA) was engaged to conduct a Detailed and Targeted flora and vegetation survey and Basic fauna survey for the proposed pipeline (the survey area), to provide an assessment of environmental values of the survey area and to support the environmental assessment and approval process. The survey area is approximately 680 m long and up to 30 m wide, totalling 1.43 hectares (ha; **Figure 1**).

The following report summarises results of the desktop assessment and field survey and defines the flora, vegetation, and fauna of the survey area, and defines its significance in terms of conservation values. The results of the ecological surveys will be used to assist the environmental assessment and approval process.

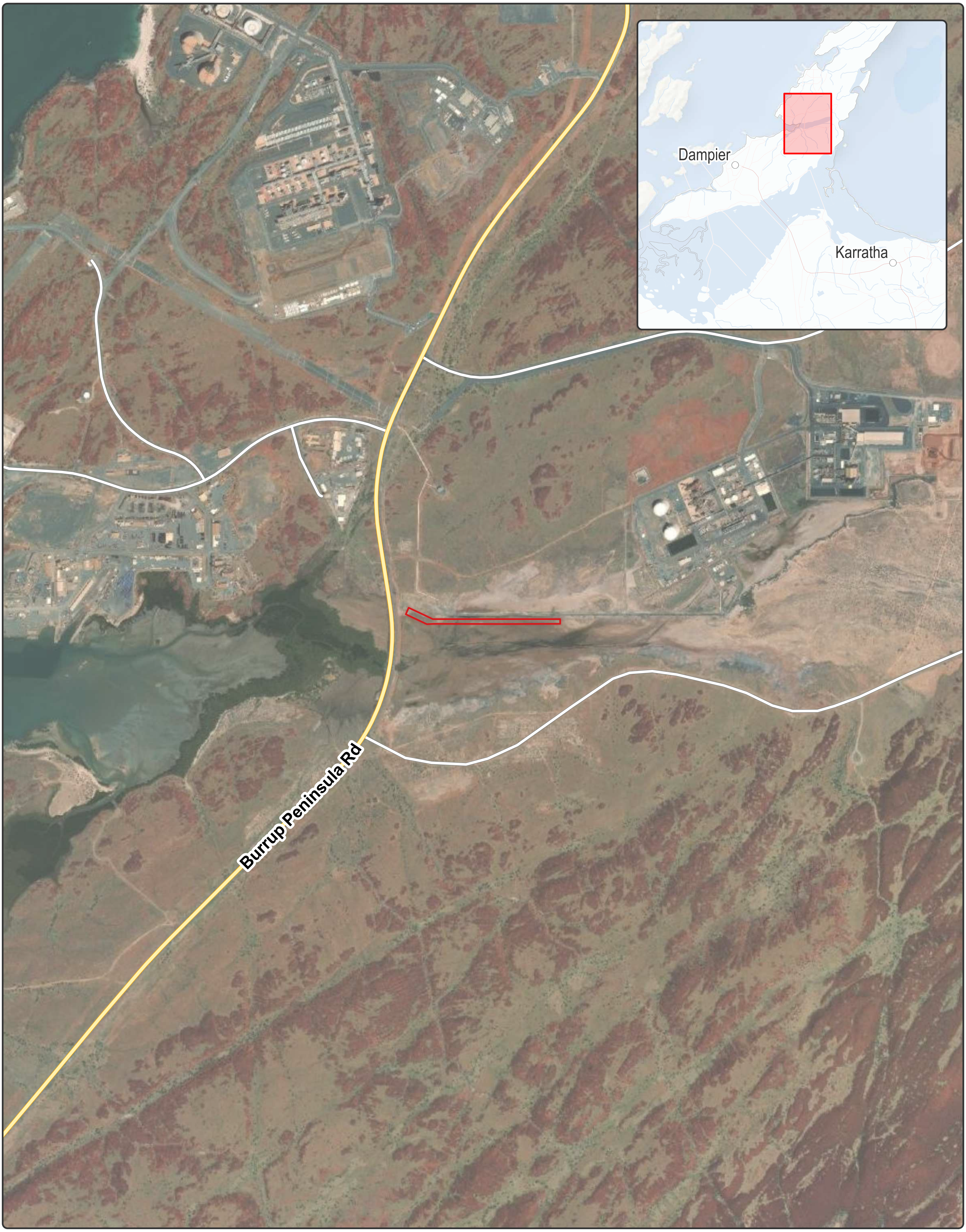

Figure 1: Project location

🟥 Survey area

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 2/05/2024

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2. Methodology

2.1. Desktop review

A desktop review was undertaken to inform the field survey and to identify the likelihood of occurrence of conservation significant flora and fauna species and ecological communities within the survey area. The desktop review consisted of database searches and a review of literature from surveys previously undertaken in the vicinity of the survey area.

2.1.1. Database searches

The following Commonwealth and State databases were searched for information relating to conservation listed flora, fauna and ecological communities in order to compile and summarise existing data to inform the field survey. Database searches undertaken around the central coordinates m E 476386; N 7718680 are provided in **Table 1** below. Applied buffers below are considered suitable based on flora and fauna assemblages expected to occur within the survey area.

Table 1: Database searches undertaken for the survey area

Database	Reference	Buffer
EPBC Act Protected Matters Search Tool (PMST) for MNES, including any Threatened species and communities listed under the EPBC Act	DCCEEW 2024a	5
Department of Biodiversity, Conservation and Attractions (DBCA) Threatened and Priority flora database searches for Declared Rare Flora (DRF) listed under the latest WA Wildlife Conservation (Rare Flora) Notice and Priority Flora.	DBCA 2024a	5
DBCA Threatened and Priority fauna database searches for Scheduled fauna listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or latest WA Wildlife Conservation (Specially Protected Fauna) Notice and Priority Fauna.	DBCA 2024b	5
DBCA Threatened and Priority Ecological Communities' database search.	DBCA 2024c	5

In addition, the following documents were reviewed:

- Animal Plant Mineral Pty Ltd (2018). *Perdaman Urea Project Pre-Wet Season Biological Survey.*

2.1.2. Likelihood of occurrence assessment

A likelihood of occurrence assessment was undertaken to identify conservation listed flora and fauna species that possibly occur within the survey area, identified from a review of key datasets and literature, as specified above. Aquatic and marine species (mammals) were not considered in the likelihood of occurrence assessment as the survey area does not contain core habitat that these species solely rely on for survival. Conservation codes, categories and criteria for flora and fauna protected under the EPBC Act and the State *Biodiversity Conservation Act 2016* (BC Act) are provided in **Appendix A**. Criteria used for this assessment is presented in **Appendix B**.

2.2. Field survey

2.2.1. Survey team and timing

The field survey was conducted by Jeni Morris (Senior Ecologist) and Glenn Maslen (Senior Environmental Scientist) on 26 March 2024.

Field staff had valid scientific licences to conduct flora and vegetation surveys and to take Threatened and Priority flora in WA at the time of the survey (**Table 2**). No licences were required for the Basic fauna survey. The survey timing was consistent with the Environmental Protection Authority (EPA) recommendations for undertaking Detailed and flora and vegetation surveys in the Pilbara region i.e., 6-8 weeks post wet season (March to June; EPA 2016). No rainfall was recorded at the time of the field survey (Bureau of Meteorology [BoM] 2024a).

Table 2: Survey team qualifications

Staff	Role	Qualifications	Licence
Jeni Morris	Senior Ecologist, Project manager	BSc. Conservation and Wildlife Biology	Flora taking licence: FB62000070-2 Threatened Flora Licence: TFL 178-2122
Glenn Maslen	Senior Environmental Scientist	BSc. Environmental Science	Flora taking licence: FB62000376 Threatened Flora Licence: TFL 2324-0100

2.2.2. Detailed flora and vegetation survey

A single season Detailed flora and vegetation survey was undertaken across the survey area in accordance with EPA *Technical Guidance for flora and vegetation* (EPA 2016). The survey included:

- Mapping and describing vegetation types, including the presence of any Threatened or Priority Ecological Communities (TECs or PECs) and any vegetation of ecological importance and compiling a species inventory;
- Vegetation condition mapping adapted from Trudgen (1988; EPA 2016);
- The location of any identified Weeds of National Significance (WoNS) or Declared Pests listed under the State *Biosecurity and Agriculture Management Act 2007* (BAM Act); and
- Targeted searches for conservation significant flora listed under the EPBC Act, BC Act or by DBCA.

The survey involved the use of a 20 x 125 m quadrat as recommended for the Pilbara bioregion (total 2,500m^2; EPA 2016). Quadrats were not permanently marked. Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. Photos were taken from the north-western corner of each quadrat. Only one quadrat was able to be established within the survey area, due to the size of the survey area and restricted extent of vegetation present (i.e. a single quadrat covered the extent of vegetation present within the survey area; **Figure 2**). The following data were recorded within each quadrat:

- Vegetation structure and classes, cover of all species and dominant species list for each vegetation type (in accordance with the National Vegetation Information System Level V structure and floristics);
- Vegetation condition, in accordance with the scale outlined in EPA (2016) adapted from Keighery (1994);
- Full species inventory (angiosperm and gymnosperm) of both native and introduced species across the subject site; and

- Relevant site data including coordinates, site photograph, soil, geology, drainage, slope and any other relevant observational data.

Where relevant, opportunistic sampling of species not recorded within the quadrat was undertaken to supplement the existing list of species recorded from within the survey area. Any encountered WoNS or Declared Pest plants listed under the BAM Act were recorded and mapped.

2.2.3. Targeted flora survey

A targeted survey was also undertaken to assess the presence of conservation significant flora and ecological communities within areas considered suitable habitat. Potentially occurring species, communities and associated suitable habitat were determined during the desktop likelihood assessment. The targeted flora survey involved personnel walking systematic traverses, with spacing dependent on the presence of suitable habitat for target species and communities. All encountered conservation significant flora and vegetation were recorded by taking the coordinates of each individual and/or a centroid coordinate location for a group of individuals (>100) within a 20 m radial circumference, using a handheld GPS unit. Track logs as shown in **Figure 2** attest to the time and effort expended.

2.2.4. Flora identification and nomenclature

Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For conservation significant identified in the field, the following were recorded:

- A colour photograph;
- GPS location;
- Population size estimate;
- Location of population boundaries;
- Associated habitat/landscape element;
- Time and date observed;
- Observer details; and
- A voucher specimen suitable for use as a reference specimen (if appropriate to do so for conservation significant flora).

Flora specimen identification following the field survey was undertaken by ELA taxonomic specialists at the Western Australian Herbarium (WAH). Suitable material that meets WAH specimen lodgement requirements, such as flowering material and range extensions, will be submitted along with Threatened and Priority flora report forms to DBCA, as required by conditions of collection licences issued under the BC Act.

Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (DBCA and WAH 2024).

2.2.5. Flora and vegetation data analysis

Due to the restricted extent of vegetation within the survey area, establishment of a single quadrat was considered adequate to describe the vegetation present. As such, detailed data analysis (e.g. cluster analysis, species accumulation curves), were not undertaken.

2.2.6. Basic fauna survey

The Basic fauna survey was conducted in accordance with *EPA Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020).

The Basic fauna survey involved personnel walking transects through the survey area, delineating and mapping fauna habitats and recording opportunistic sightings of fauna. Fauna habitats were assessed for their ability to support and sustain populations of fauna, along with an assessment of the likelihood of occurrence of conservation significant fauna species. The habitat characteristics and fauna database records used in assessing likelihood of occurrence for fauna included:

- Vegetation community, structure and condition;
- Soil and landform type;
- Extent and connectivity of bushland;
- Fauna species habitat preferences;
- Proximity of conservation significant fauna records; and
- Signs of species presence.

Opportunistic recordings of fauna species were made at all times during the field survey. These included visual sightings of active fauna such as reptiles and birds; records of bird calls; and signs of species presence such as tracks, diggings, burrows, scats and any other signs of fauna activity.

Nomenclature used for the vertebrate fauna species within this report follows the Western Australian Museum (WAM) *Checklist of the Vertebrates of Western Australia* (WAM 2024).

2.3. Limitations

The EPA Technical Guidance documents (EPA 2016; EPA 2020) recommend including a discussion of the constraints and limitations of the survey methods used. An assessment of potential constraints and limitations of this survey are summarised in **Table 3**. No potential constraints were identified.

Table 3: Survey limitations

Potential survey limitation	Impact on survey
Sources of information and availability of contextual information (i.e., pre-existing background versus new material).	**Not a constraint**. Previous reports for the region were provided where applicable. Broad-scale vegetation mapping (Beard 1979) at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. Available information was sufficient to provide context at varying scales and therefore were not considered a limitation.
Scope (i.e., what life forms, etc., were sampled).	**Not a constraint**. As per the requirements of the scope, a Detailed and Targeted flora and vegetation survey and a Basic fauna survey, conducted in accordance with relevant State and Federal legislation and EPA guidance documents, was adequately met.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Not a constraint**. Proportion of flora species collected was adequate to meet the requirements of the level of survey undertaken. Foot traverses were undertaken across the survey area to compile a species list in order to meet the objectives of the survey.
Completeness and further work which might be needed (i.e., was the relevant survey area fully surveyed).	**Not a constraint**. The survey area was fully covered to meet requirements outlined in the scope of works. The survey area was able to be fully surveyed. One 20 x 125m quadrat (total 2500m^2) was established within the survey area due to the size of the survey area and restricted extent of vegetation present. This effort was considered adequate to accurately analyse and discriminate sites based on species composition and subsequently delineate vegetation type boundaries. Transects were spaced

Potential survey limitation	Impact on survey
	adequately to sample the range of flora and fauna species present within the survey area.
Mapping reliability.	**Not a constraint**. Delineation and mapping of vegetation types was adequate based on requirements of a Detailed and Targeted survey. The transition between vegetation types is often discontinuous, therefore delineation of individual vegetation types was undertaken in the field and based on subtle variations of mid-understory species composition and landform position.
Timing, weather, season, cycle.	**Not a limitation.** The survey was undertaken in the appropriate season for the Eremaean botanical province, i.e., post wet season (March to June), as specified by the EPA Technical Guidance (EPA 2016; EPA 2020).
Disturbances (fire, flood, accidental human intervention, etc.).	**Not a limitation.** Disturbances within the survey area included clearing, tracks and weeds. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Intensity (in retrospect, was the intensity adequate).	**Not a limitation**. The survey effort was adequately met. The area was searched for conservation significant flora and fauna species by field staff undertaking meandering transects spaced adequately apart across the survey area. This method provides an accurate assessment of habitat characteristics and likelihood of conservation significant species. The number of quadrats established was sufficient to determine the vegetation communities present (including their structurally and compositionally dominant species) and to identify any vegetation of conservation significance.
Resources (i.e., were there adequate resources to complete the survey to the required standard).	**Not a limitation**. The number of personnel conducting this field survey in the given time was adequate to undertake the required level of survey. Additional resources, including equipment available, additional support and personnel were adequate.
Access problems (i.e., ability to access survey area).	**Not a limitation**. The survey area was adequately able to be accessed.
Experience levels (e.g., degree of expertise in plant identification to taxon level).	**Not a limitation**. The personnel conducting this field survey were all suitably qualified to identify specimens, having previously undertaken flora and fauna surveys in the Pilbara bioregion of WA.

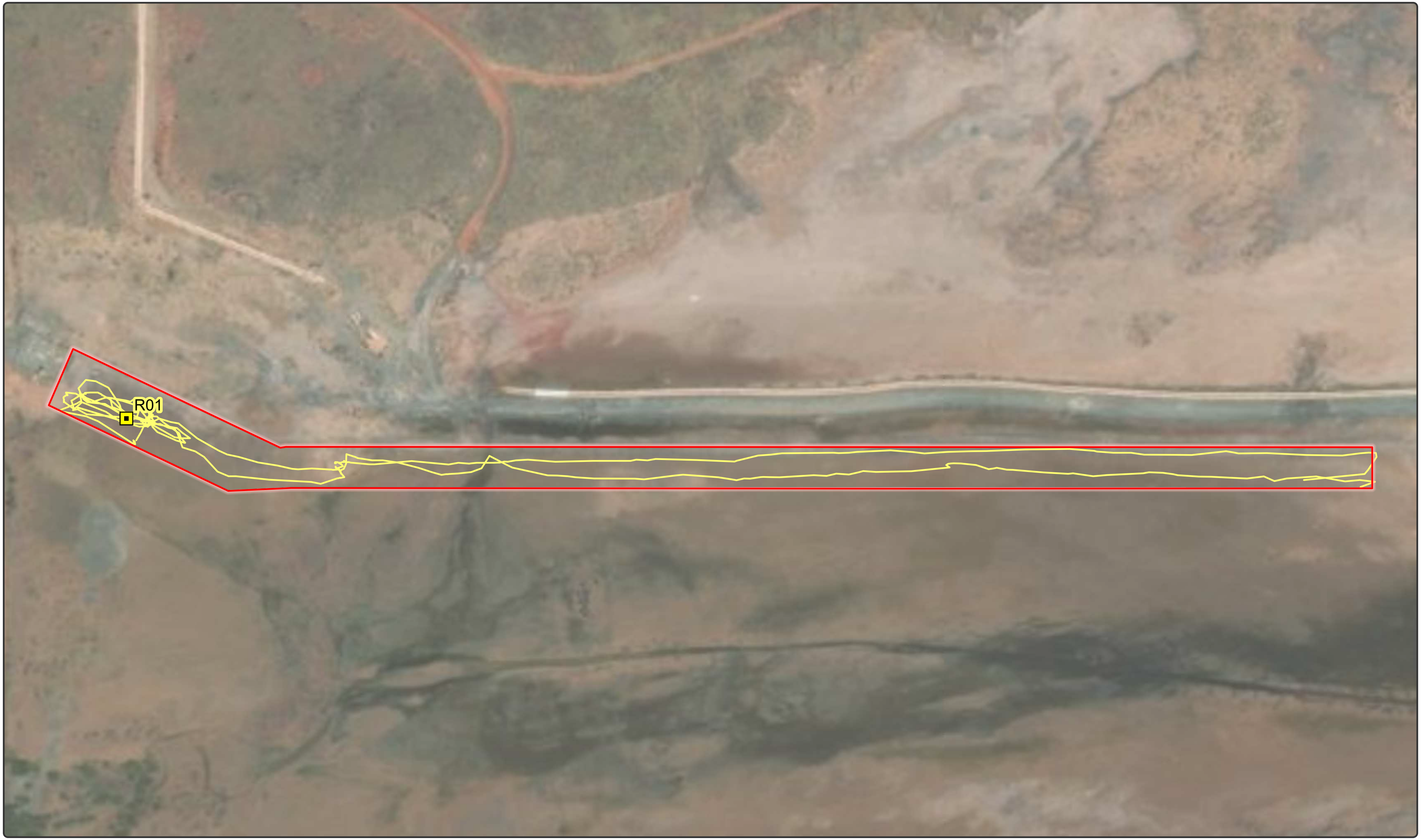

Figure 2: Survey effort

🟥 Survey area

■ Quadrat

— Traverse

N

0 20 40 80

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 21/05/2024

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3. Results

3.1. Desktop review

3.1.1. Climate

The survey area has a hot, semi-arid climate with hot wet summers and warm dry winters. Based on climate data from the nearby BoM Karratha Aero weather station (station number 4083, rainfall data 1971-present, located approximately 8.5 kilometres [km] to the south of the survey area), the survey area receives an annual average rainfall of 294.6 millimetres (mm), with most of the rainfall occurring during the months of January, February, and March (BoM 2024a; **Figure 3**). In the 12 months preceding the field survey in March 2023, the survey area received a total of 290 mm of rainfall, which is slightly higher than the long-term average (BoM 2024a; **Figure 3**). A total of 26 mm of rainfall was recorded in the three months prior to the field survey, which is substantially lower than the long-term average for the same time period (133.8 mm; BoM 2024a).

Temperature data for the survey area was available from the Karratha weather station. Mean maximum air temperatures of the survey area range from 36.2°C in March to 26.5°C in June and July, while mean minimum temperatures of the survey area range from 26.9°C in January to 13.9°C in July (BoM 2024a; **Figure 3**).

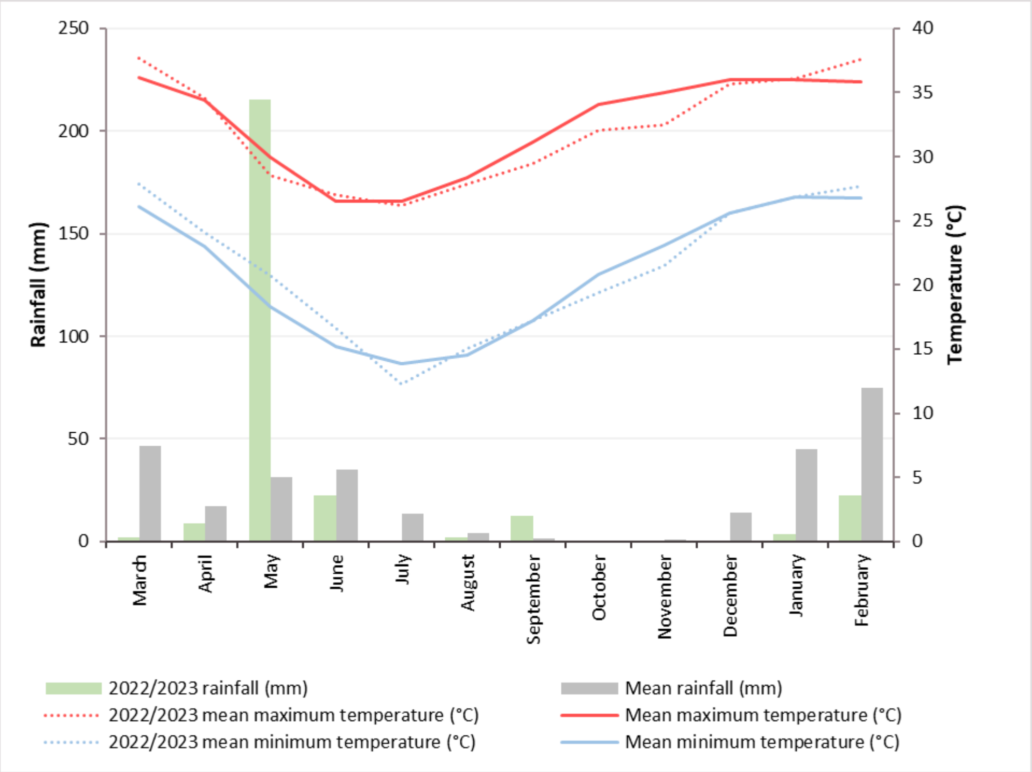

Figure 3: Rainfall and temperature data of survey area (BoM 2024a)

3.1.2. Interim Biogeographic Regionalisation for Australia

The Interim Biogeographic Regionalisation for Australia (IBRA) currently classifies 89 bioregions across Australia, based on a range of biotic and abiotic factors such as climate, vegetation, fauna, geology and landform (Thackway and Cresswell 1995; Department of Climate Change, Energy, the Environment and Water [DCCEEW] 2024). These bioregions are currently further refined into 419 subregions representing more localised and homogenous geomorphological units in each bioregion (DCCEEW 2024b). IBRA divides WA into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform and vegetation.

The survey area is located in the Pilbara bioregion, and the Roebourne subregion. The Roebourne subregion is described as Quaternary alluvial and older colluvial coastal and sub-coastal plains with vegetation described as grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia* species and ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, Sporobolus and mangal occur on marine alluvial flats and river deltas (Kendrick and Stanley 2001).

3.1.3. Rangelands land systems mapping

Rangeland Land Systems mapping prepared by the Department of Primary Industries and Regional Development (DPIRD; formerly Department of Agriculture and Food Western Australia [DAFWA]; DPIRD 2024), provides a comprehensive and standardised description of landscapes, soils and vegetation of the Kimberley region of Western Australia at a regional scale (Payne and Schoknecht 2011). These surveys describe the biophysical characteristics of each region and subsequently divide each region into land systems; land systems being defined as repeating patterns of topography, soils and vegetation.

Two Rangelands land system have been mapped across the survey area, namely the Granitic Land System and the Littoral Land System (**Table 4**; **Figure 4**).

Table 4: Soil landscape systems of the survey area

Land system	Description	State land type	Extent (ha) within the Roebourne subregion	Extent (ha) within survey area	Proportion of extent within the survey area (%)
Granitic Land System	Rugged granitic hills supporting shrubby hard and soft spinifex grasslands.	Hills and ranges; Spinifex grasslands	8,794.7	0.00003	Negligible
Littoral Land System	Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches, supporting samphire low shrublands, sparse acacia shrublands and mangrove forests.	Coastal plains, beaches, dunes, mudflats and cliffs; Various coastal vegetation	212,304.9	1.43	Negligible

3.1.4. Beard's (1979) vegetation mapping

Vegetation type and extent have been mapped at a regional scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:1,000,000, DPIRD (DAFWA) has compiled a list of vegetation extent and types across WA (Shepherd *et al*. 2002).

One pre-European vegetation association has been mapped across the survey area, namely Abydos Plain – Roebourne 117, described as 'Hummock grasslands, grass steppe; soft spinifex' (**Table 5**; **Figure 5**). This vegetation association has 92.03% of its total pre-European extent remaining within the Roebourne subregion (Government of Western Australia 2019).

Table 5: Beard's (1979) vegetation associations of the survey area

Vegetation association	Description	Pre-European extent (ha) within the Roebourne subregion	Current extent (ha) within the Roebourne subregion	Proportion of pre-European extent remaining (%)	Proportion of current extent within the survey area (%)
Abydos Plain – Roebourne 117	Hummock grasslands, grass steppe; soft spinifex'	50,962.94	46,901.57	92.03	0.003

3.1.5. Hydrology

The survey area is located in the Port Hedland Coast basin in the Coastal catchment area and is located within a saline coastal flat (Department of Water and Environmental Regulation [DWER] 2018; **Figure 6**). It lies adjacent to the north of a minor watercourse (non-perennial corrector; DWER 2018; **Figure 6**). The survey area occurs adjacent to the east of mangrove flats.

The survey area does not lie in any public drinking water source areas (PDWSA), nor significant or important wetlands, nor do any occur within a 5 km radius (DWER 2018). There are no known Groundwater Dependent Ecosystems (GDEs) mapped within the survey area (BoM 2024b).

3.1.6. Previous surveys undertaken in the vicinity of the survey area

An overview of previous surveys undertaken in the vicinity of the survey area is presented in **Table 6** below.

Table 6: Summary of previous surveys undertaken in the vicinity of the survey area

Title	Author (Year)	Distance from survey area	Conservation significant species or communities recorded
Perdaman Urea Project Pre and Post- Wet Season Biological Survey	Animal Plant Mineral Pty Ltd (2019)	Occurs within the current survey area	Nil

3.1.7. Flora and fauna species of conservation significance

An initial three conservation listed flora species and 64 conservation listed fauna species were identified as possibly occurring within the survey area, based on the database searches undertaken in Section 3.1.5 and using criteria outlined in **Appendix B**.

Conservation significant flora species identified from database searches undertaken include three Priority (P) 3 species. The closest occurrence of a conservation listed flora species in proximity to the survey area is *Stackhousia clementii* (P3), located approximately 800 m to the east of the survey area (**Figure 7**). Prior to the field survey, a likelihood of occurrence assessment determined that of the three flora species identified, *Stackhousia clementii* was considered as having the potential to occur, based on the habitat preferences of this species and proximity of records to the survey area. The remaining two species were considered as unlikely to occur. The flora likelihood of occurrence assessment table is presented in **Appendix C**.

Conservation significant fauna species identified from database searches include 59 Federal and State listed species, four State only listed species, four Priority listed species and one specially protected species. The closest occurrence of a conservation listed fauna species in proximity to the survey area is *Liasis olivaceus barroni* (Pilbara Olive Python), located approximately 700 m to the north of the survey area (**Figure 8**). Prior to the field survey, a likelihood of occurrence assessment determined that of the 64 fauna species identified, 29 were considered as having the potential to occur, based on the habitat preferences of this species and proximity of records to the survey area. The remaining 35 species were considered as either unlikely or not occurring. The fauna likelihood of occurrence assessment table is presented in **Appendix D**.

Aquatic and marine species (e.g., Dugong) were not considered in the likelihood of occurrence assessment as the survey area does not contain core habitat that these species solely rely on for survival.

3.1.8. Areas of conservation significance

Environmentally Sensitive Areas (ESAs) are defined in the Environmental Protection (Environmentally Sensitive Areas) Notice 2005 under section 51B of the State *Environmental Protection Act 1986* (EP Act). ESAs include areas declared as World Heritage, included on the Register of the National Estate[1] defined wetlands, and vegetation containing rare (Threatened) flora and TECs. One ESA occurs within a 5 km radius of the survey area, namely Murujuga National Park, located approximately 1 km to the north and south of the survey area (DBCA 2021).

PECs are biological flora or fauna communities that are recognised to be of significance, but do not meet the criteria for a TEC. There are five categories of PECs, none of which are currently protected under legislation. A DBCA Threatened and Priority Communities database search identified two known occurrences of a PEC within 5 km of the survey area (**Table 7; Figure 9**).

There are no known occurrences of ESAs, TECs or PECs located within the survey area (DBCA 2021; DBCA 2024c). Of the two known occurrences of a PEC within 5 km of the survey area, a pre-survey likelihood of occurrence assessment determined that both are considered as being unlikely to occur, based on anticipated vegetation and landform of the survey area. The ecological community likelihood of occurrence assessment is provided in **Appendix E**.

Table 7: PECs identified within a 5 km radius of the survey area (DBCA 2024c)

Community name	Listing	Closest occurrence to survey area
Burrup Peninsula rock pile communities	P1	300 m to the east
Burrup Peninsula rock pool communities	P1	1 km to the southeast

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[1] Note the Register of National Estate was closed in 2007 and is no longer a statutory list. The Register of National Estate has been replaced by the National Heritage List under the EPBC Act.

Figure 4: Land system mapping of the survey area

🟥 Survey area

Rangelands land systems:

🟧 Granitic Land System

🟨 Littoral Land System

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 2/05/2024

Figure 5: Beard's (1979) vegetation associations of the survey area

□ Survey area

Beard's (1979) vegetation association:

🟪 Abydos Plain - Roebourne 117

N

0 1 2 4
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 2/05/2024

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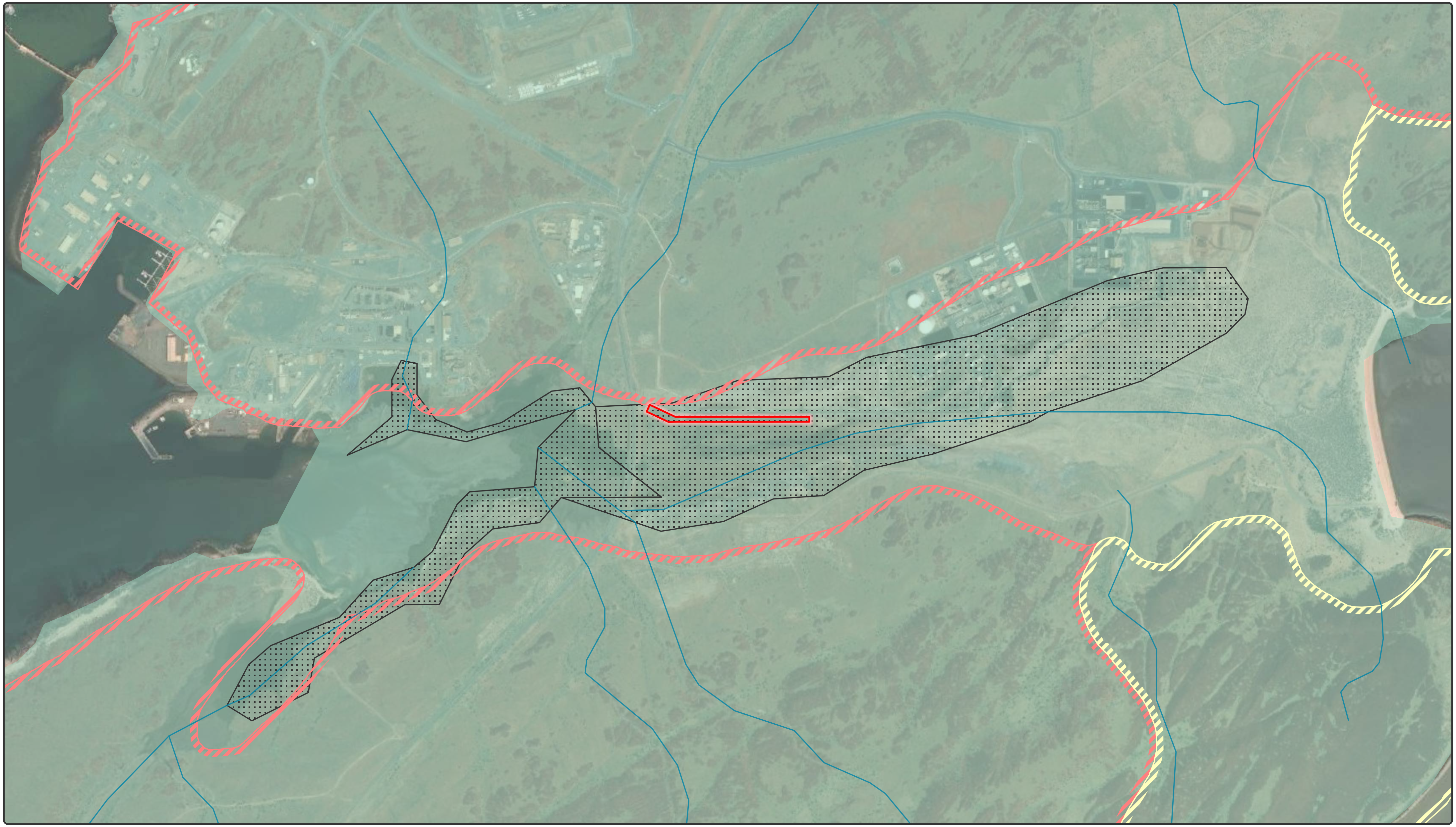

Figure 6: Hydrology of the survey area

- 🟥 Survey area
- ▨ Waterbodies (Statewide)

Drainage (Statewide):

- ∿ Minor watercourse

Catchments:

- 🟩 Coastal

Groundwater Dependent Ecosystems (GDE):

- ▨ Moderate potential GDE
- ▨ Low potential GDE

Datum/Projection:
GDA 1994 MGA Zone 50
23PER6340-JP Date: 2/05/2024

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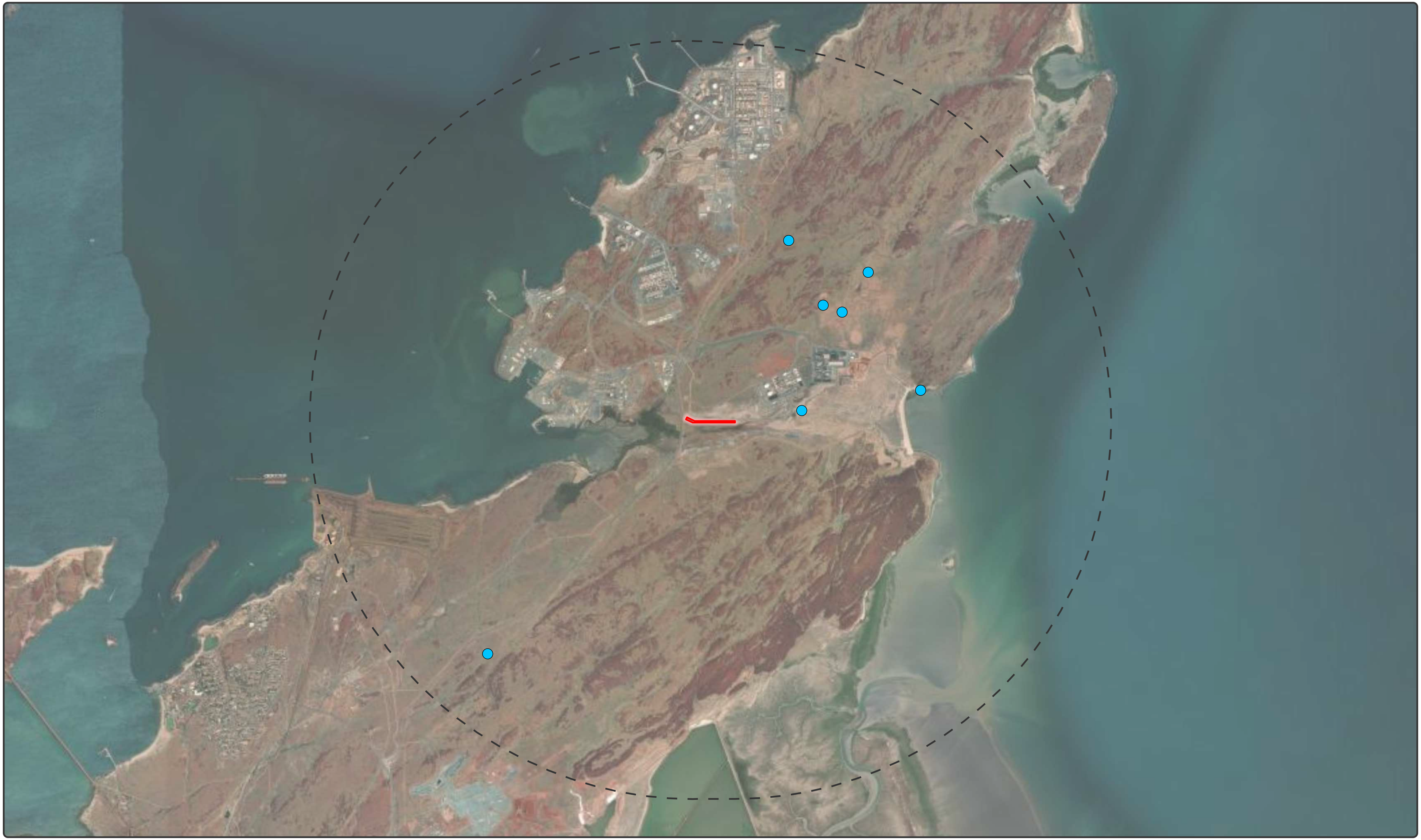
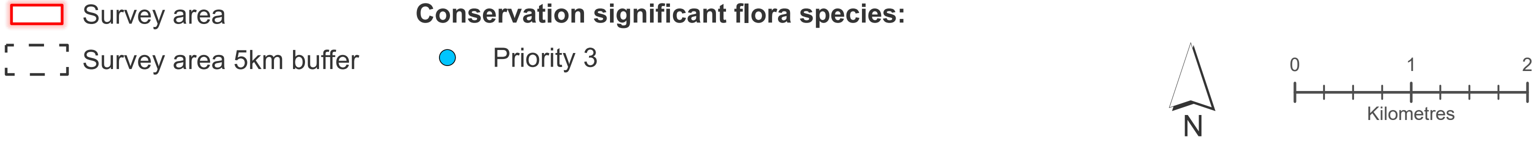


Figure 7: Conservation significant flora previously recorded within and in the vicinity of the survey area



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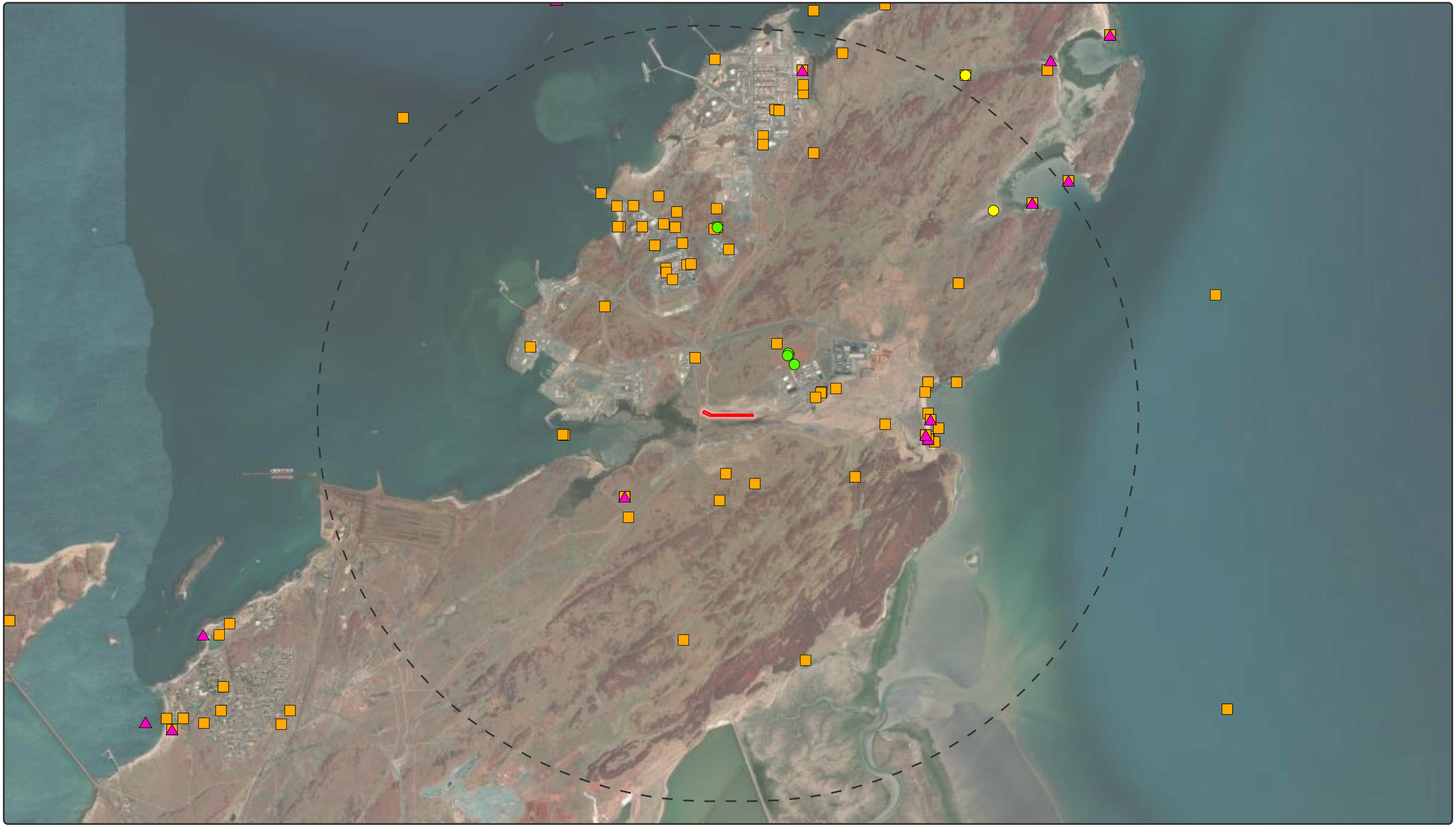

Figure 8: Conservation significant flora previously recorded within and in the vicinity of the survey area

🟥 Survey area

⬚ Survey area 5km buffer

Conservation significant fauna species:

🟧 Threatened

▲ Threatened & Priority 4

● Priority 1

● Priority 3

● Priority 4

Datum/Projection:
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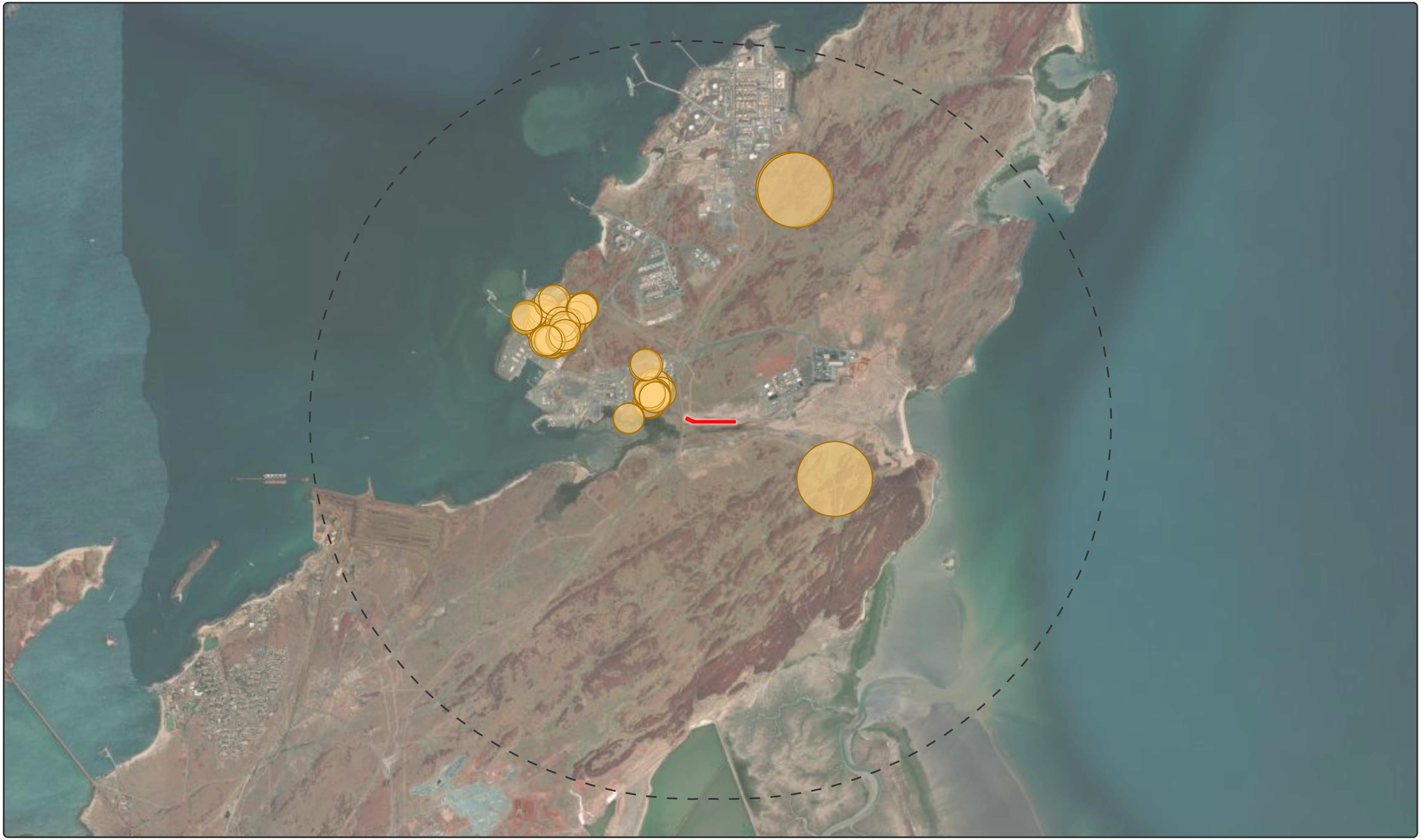

Figure 9: Conservation significant communities previously recorded within and in the vicinity of the survey area

🟥 Survey area

⬚ Survey area 5km buffer

Conservation significant ecological communities:

🟧 Priority 1

Datum/Projection:
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3.2. Flora and vegetation survey

3.2.1. Flora overview

A total of 10 flora species (nine native and one introduced) from eight genera and five families were recorded within the survey area. The majority of taxa recorded were representative of the Chenopodiaceae (four taxa) and Poaceae (three taxa) families. Tecticornia was the best represented genera throughout the survey area with three taxa recorded. Floristic relevé data is presented in **Appendix F** and a flora species by site matrix is presented in **Appendix A**.

3.2.2. Conservation significant flora

No Threatened (Declared Rare) flora species listed under the EPBC Act or BC Act or Priority species listed by DBCA were recorded from within the survey area. Of the three conservation listed flora species identified from the desktop assessment as possibly occurring, a post-survey likelihood of occurrence assessment determined that all are considered as being unlikely to occur, based on a lack of suitable habitat present for these species and adequacy of survey effort. The flora likelihood of occurrence assessment is presented in **Appendix C**.

3.2.3. Introduced flora

One introduced (weed) flora species was recorded within the survey area, namely **Cenchrus ciliaris* (Buffel grass). **C. ciliaris* is listed under the BAM Act as Permitted (s-11), with no specific conditions for control required. This species was recorded at a 0.1% cover within vegetated areas of the survey area.

3.2.4. Vegetation types

One broad vegetation type (VT01) was identified within the survey area, occurring across 0.21 ha in the western portion of the survey area (Table 8; **Figure 10**). This vegetation type consisted of low sparse chenopod shrubland primarily comprised of *Tecticornia halocnemoides, Tecticornia indica* subsp. *leiostachya*, and *Trianthema turgidifolium*. The remaining 1.22 ha of the survey area is described as ‘Mudflat’ and had no vegetation present (**Figure 10**).

Table 8: Vegetation types recorded within the survey area

Vegetation type	Description	Associated species	Area ha (% of survey area)	Photo
Vegetation type 1 (VT01)	*Tecticornia halocnemoides, Tecticornia indica* subsp. *leiostachya, Trianthema turgidifolium* low sparse chenopod shrubland	*Eragrostis tenellula, Tecticornia pergranulata, Neobassia astrocarpa, Eriachne* sp., **Cenchrus ciliaris, Cyperus bulbosus, Arivela viscosa*	0.21 ha (14.5)	
		Mudflat	1.22 (85.5)	
		Total	**1.43 (100)**	

3.2.5. Conservation significant ecological communities

No vegetation types delineated within the current survey area were inferred to represent any known or potential conservation significant communities listed under the EPBC Act, the BC Act or by DBCA.

Following the field survey, the two known occurrences of a PEC within 5 km of the survey area are considered as not occurring within the survey area, based on a lack of suitable species and habitats, and due to the restricted nature of PECs identified (restricted to rockpiles). The ecological community likelihood of occurrence assessment is provided in **Appendix E**.

3.2.6. Vegetation condition

All vegetation within the survey area was classed as being in Poor condition, based on the Trudgen (1988) vegetation scale outlined in the EPA: *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016; 0.21 ha; **Figure 11**). Areas of Mudflat (1.22 ha) were not assigned a vegetation condition. Disturbances recorded within the survey area included previous clearing, and impacts from adjacent cleared areas (weed invasion, dust).

Figure 10: Vegetation types recorded within the survey area

☐ Survey area

▨ Mudflat

Vegetation types:

▨ Vegetation type 1

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 11: Vegetation condition recorded within the survey area

Datum/Projection:
GDA 1994 MGA Zone 50

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3.3. Fauna survey

3.3.1. Fauna overview

No fauna species were recorded during the field survey.

3.3.2. Conservation significant fauna

No direct (observations) or indirect (scats, tracks, diggings) evidence of conservation significant fauna species listed under the EPBC Act, BC Act or by DBCA were recorded within the survey area.

Of the 64 conservation significant fauna species identified from the desktop assessment , a post-survey likelihood of occurrence assessment determined that eight are considered as having the potential to occur, based on availability of suitable habitat and proximity of previous records:

- *Calidris ferruginea* (Curlew Sandpiper; listed as Migratory [MI] and as Critically Endangered [CR] under the EPBC Act and BC Act);
- *Gelochelidon nilotica* (Gull-billed tern; listed as MI under the EPBC Act and BC Act);
- *Hydroprogne caspia* (Caspian Tern; listed as MI under the EPBC Act and BC Act);
- *Limosa lapponica* (Bar-tailed godwit; listed as MI under the EPBC Act and BC Act);
- *Tringa nebularia* (Common greenshank; listed as MI under the EPBC Act and BC Act and as Endangered [EN] under the EPBC Act);
- *Xenus cinereus* (Terek sandpiper; listed as MI under the EPBC Act and BC Act and as Vulnerable [VU] under the EPBC Act);
- *Pluvialis fulva* (Pacific Golden Plover; listed as MI under the EPBC Act and BC Act); and
- *Tringa stagnatilis* (Marsh Sandpiper; listed as MI under the EPBC Act and BC Act).

Each of these species has generally broad habitat requirements associated with coastal areas, inlets and saline areas (mudflats). Given mudflats present within the survey are likely to be seasonally inundated, these species cannot be ruled out as potentially occurring when conditions are appropriate. The remaining 56 fauna species were considered as unlikely to occur or do not occur within the survey area, based on habitat requirements and lack of suitable habitat present, distance and age of previous records and adequacy of survey effort. The fauna likelihood of occurrence assessment is presented in **Appendix D**.

3.3.3. Fauna habitat

Two fauna habitats were identified within the survey area, namely ‘Mudflat’ (0.21 ha; 85.5% of the survey area) and ‘Low chenopod shrubland’ (0.21 ha; 14.5% of the survey area).

Table 9: Fauna habitats recorded within the survey area

Fauna habitat	Description	Conservation listed fauna species that may utilise habitat	Area ha (% of survey area)	Photo
Mudflat	Species poor mudflat	*Calidris ferruginea* (Curlew Sandpiper), *Gelochelidon nilotica* (Gull-billed tern), *Hydroprogne caspia* (Caspian Tern), *Limosa lapponica* (Bar-tailed godwit), *Tringa nebularia* (Common greenshank), *Xenus cinereus* (Terek sandpiper)	1.22 ha (85.5)	
Low chenopod shrubland	Low sparse chenopods	N/A	0.21 (14.5)	
		Total	**1.43 (100)**	

Figure 12: Fauna habitats recorded within the survey area

🟥 Survey area

Fauna habitat type:

🟦 Low chenopod shrubland

⬛ Mudflat

Datum/Projection:
GDA 1994 MGA Zone 50

23PER6340-JP Date: 21/05/2024

4. Discussion

4.1. Flora and vegetation

A total of 10 flora species (nine native and one introduced) from eight genera and five families were recorded within the survey area. This low number is expected given the small size and degraded nature of the survey area. Of the three conservation listed flora species identified from the desktop assessment as possibly occurring, a post-survey likelihood of occurrence assessment determined that all are considered as being unlikely to occur, based on a lack of suitable habitat present for these species and adequacy of survey effort.

Vegetation within the survey area is described as low sparse chenopod shrubland, occurring only in the western extent of the survey area, with the remainder of the survey area consisting of bare mudflats. The survey area is considered as representing aspects of the Littoral land system on which it occurs, which is described as ‘Bare coastal mudflats (unvegetated), samphire flats, sandy islands, coastal dunes and beaches’.

No vegetation types delineated within the current survey area were inferred to represent any known or potential conservation significant communities listed under the EPBC Act, the BC Act or by DBCA.

Vegetation within the survey area is classed as being in Poor condition, with disturbances present including previous clearing, and impacts from adjacent cleared areas (weed invasion, dust). One weed species was recorded within the survey area, namely **Cenchrus ciliaris* (Buffel Grass), which was recorded within vegetated areas at a 0.1% cover.

**Cenchrus ciliaris* (Buffel Grass) is an invasive, tufted or sometimes stoloniferous perennial grass, up to 1.5 m high (DBCA and WAH 2024). This species is regarded as an environmental weed in Queensland, the Northern Territory and northern Western Australia, being regarded as one of the top ten environmental weeds in the Kimberley, Pilbara and Gascoyne regions (Identic 2016). This species is found on sandy soils, stony red loam and black cracking clay and is a weed of rangelands, grasslands, open woodlands, floodplains, roadsides and other disturbed areas in semi-arid, tropical, sub-tropical and warmer temperate regions (DBCA and WAH 2024; Identic 2016).

Figure 13: ****Cenchrus ciliaris* **(Image left: DBCA and WAH 2023, right: ELA 2024)**

4.2. Fauna

No fauna species were recorded within the survey area, likely due to the lack of vegetated areas present (lack of refuge), and due to the high level of disturbance in surrounding areas (noise from machinery in the area). No direct (observations) or indirect (scats, tracks, diggings) evidence of conservation significant fauna, including Threatened (Declared Rare) or Priority fauna species listed under the EPBC Act, WC Act or by DBCA were recorded.

Fauna habitats within the survey area are not considered as locally or regionally restricted, with samphire shrublands and saltplains recorded in nearby areas by Animal Plant Mineral Pty Ltd (2018). Mudflats within the survey area may provide foraging habitat to a range of migratory waders when inundated seasonally (e.g., during king tides), including the Critically Endangered Curlew Sandpiper (CR) or Migratory listed Gull-billed tern, Caspian Tern, Bar-tailed godwit, Common greenshank, Terek sandpiper, Pacific Golden Plover and Marsh Sandpiper. As such, these species are considered as having the potential to occur within the survey area.

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Appendix A Framework for conservation significant flora and fauna ranking

CATEGORIES OF THREATENED SPECIES UNDER THE ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT 1999 (EPBC ACT)

Threatened fauna and flora may be listed in any one of the following categories as defined in Section 179 of the EPBC Act. Species listed as 'conservation dependent' and 'extinct' are not Matters of National Environmental Significance and therefore do not trigger the EPBC Act.

Category	Definition
Extinct (EX)	There is no reasonable doubt that the last member of the species has died.
Extinct in the Wild (EW)	Taxa known to survive only in captivity or as a naturalised population well outside its past range; or taxa has not been recorded in its known and/or expected habitat at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CE)	Taxa considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	Taxa considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	Taxa considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	Taxa has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	Taxa has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category.
Data Deficient (DD)	There is inadequate information to make a direct, or indirect, assessment of taxa's risk extinction based on its distribution and/or population status.
Not Evaluated (NE)	Taxa has not yet been evaluated against the criteria.
Migratory (IA)	Not an IUCN category. Species are defined as migratory if they are listed in an international agreement approved by the Commonwealth Environment Minister, including: • the Bonn Convention (Convention on the Conservation of Migratory Species of Wild Animal) for which Australia is a range state; • the agreement between the Government of Australian and the Government of the People's Republic of China for the Protection of Migratory Birds and their environment (CAMBA); • the agreement between the Government of Japan and the Government of Australia for the Protection of Migratory Birds and Birds in Danger of Extinction and their Environment (JAMBA); or • the agreement between Australia and the Republic of Korea to develop a bilateral migratory bird agreement similar to the JAMBA and CAMBA in respect to migratory bird conservation and provides a basis for collaboration on the protection of migratory shorebirds and their habitat (ROKAMBA).

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

The Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Specially protected fauna or flora are species which have been adequately searched for and are deemed to be, in the wild, threatened, extinct or in need of special protection, and have been gazetted as such.

Threatened species (T)

Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act).

Threatened fauna is that subset of ‘Specially Protected Fauna’ listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.

Threatened flora is that subset of ‘Rare Flora’ listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.

The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.

Category	Code	Description
Critically Endangered species	CR	Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
Endangered species	EN	Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.
Vulnerable species	VU	Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Extinct species

Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild, as follows:

Category	Code	Description
Extinct species	EX	Species which have been adequately searched for and there is no reasonable doubt that the last individual has died. Published as Specially Protected under the Wildlife Conservation Act 1950, in Schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice for Presumed Extinct Fauna and Wildlife Conservation (Rare Flora) Notice for Presumed Extinct Flora.
Extinct in the wild species	EW	Species that "is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form", and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.

Specially protected species

Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.

Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.

Categories are detailed below.

Category	Code	Description
Migratory species	MI	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Species of special conservation interest (conservation dependent fauna)	CD	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
Other specially protected species	OS	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Priority species (P)

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Category	Code	Definition
Priority 1	P1	*Poorly-known species* Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
Priority 2	P2	*Poorly-known species* Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
Priority 3	P3	*Poorly-known species* Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4	P4	*Rare, Near Threatened and other species in need of monitoring* (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix B Likelihood of occurrence assessment criteria

Likelihood rating	Criteria
Recorded	The species has previously been recorded within study area from DBCA database search results and/or from previous surveys of the study area, and/or the species has been confirmed through a current vouchered specimen at WA Herbarium.
Likely	The species has not previously been recorded from within the study area. However, (to qualify requires one or more criteria to be met): • the species has been recorded in close proximity to the study area, and occurs in similar habitat to that which occurs within the study area • core habitat and suitable landforms for the species occurs within the study area either year-round or seasonally. In relation to fauna species, this could be that a host plant is seasonally present on site, or habitat features such as caves are present that may be used during particular times during its life cycle e.g. for breeding. In relation to both flora and fauna species, it may be there are seasonal wetlands present • there is a medium to high probability that a species uses the study area.
Potential	The species has not previously been recorded from within the study area. However, (one or more criteria requires to be met): • targeted surveys may locate the species based on records occurring in proximity to the study area and suitable habitat occurring in the study area • the study area has been assessed as having potentially suitable habitat through habitat modelling • the species is known to be cryptic and may not have been detected despite extensive surveys • the species is highly mobile and has an extensive foraging range so may not have been detected during previous surveys The species has been recorded in the study area by a previous consultant survey or there is historic evidence of species occurrence within the study area. However, (one or more criteria requires to be met): • doubt remains over taxonomic identification, or the majority of habitat does not appear suitable (although presence cannot be ruled out due to factors such as species ecology or distribution) • coordinates are doubtful.
Unlikely	The species has been recorded locally through DBCA database searches. However, it has not been recorded within the study area and • it is unlikely to occur due to the site lacking critical habitat, having at best marginally suitable habitat, and/or being severely degraded • it is unlikely to occur due to few historic record/s and no other current collections in the local area. The species has been recorded within the bioregion based on literature review but has not been recorded locally or within the study area through DBCA database searches. The species has not been recorded in the study area despite adequate survey efforts, such as a standardised methodology or targeted searching within potentially suitable habitat.
Does not occur (one or more criteria requires to be met).	The species is not known to occur within the IBRA bioregion based on current literature and distribution. The conspicuous species has not been recorded in the study area despite adequate survey efforts at an appropriate time of year to detect the species within potentially suitable habitat.

Likelihood rating	Criteria
	The study area lacks important habitat for a species that has highly selective habitat requirements. The species has been historically recorded within study area or locally; however, it is considered locally extinct due to significant habitat changes such as land clearing and/or introduced predators.

Appendix C Flora likelihood of occurrence assessment

Species	Conservation status		Habitat	Source	Likelihood of occurrence	
	EPBC Act	BC Act / DBCA			Pre-survey	Post-survey
Stackhousia clementii	-	P3	Skeletal soils. Sandstone hills.	DBCA 2024a	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely**. Suitable habitat for this species does not occur within the survey area.
Terminalia supranitifolia	-	P3	Among basalt rocks.	DBCA 2024a	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely**. Suitable habitat for this species does not occur within the survey area.
Vigna triodiophila	-	P3	Basalt rockpile habitats.	DBCA 2024a	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely**. Suitable habitat for this species does not occur within the survey area.

Appendix D Fauna likelihood of occurrence assessment

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Actitis hypoleucos	Common Sandpiper	Bird	Migratory	Migratory	PMST; DBCA	Wide range of coastal wetlands and some inland wetlands. Is mostly found around muddy margins or rocky shores and rarely on mudflats.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey Area is not suitable for this species.
Anous stolidus	Common Noddy	Bird	Migratory	Migratory	PMST	Islands, shoals or cays of coral or sand during the breeding season. The species remains in the pelagic zone (open ocean) during the non-breeding season. Foraging occurs offshore.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Apus pacificus	Fork-tailed Swift	Bird	Migratory	Migratory	PMST	Almost exclusively aerial, mostly occurring over inland plains.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Arenaria interpres	Ruddy Turnstone	Bird	Vulnerable Migratory	Migratory	PMST; DBCA	Coastal regions with exposed rock coastlines or coral reefs. It also lives near platforms and shelves, often with shallow	**Potential**. Suitable habitat for this species	**Unlikely.** Habitat within the Survey area is

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
						tidal pools and rocky, shingle or gravel beaches.	may occur within the survey area.	not suitable for this species.
Calidris acuminata	Sharp-tailed Sandpiper	Bird	Vulnerable Migratory	Migratory	PMST	Saline inland wetlands, damp grasslands, and tidal flats. Foraging occurs in wetlands or intertidal mudflats, and the vegetation of saltmarsh, grass or sedges.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Calidris alba	Sanderling	Bird	Migratory	Migratory	PMST	Coastal areas and tidal flats. May inhabit mangroves, ocean beaches and rocky shorelines. Foraging occurs in breaking waves on beaches, or on the edges of mudflats and shallow pools.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species. Records within 20 km are confined to Dampier Salt Fields.
Calidris canutus	Red Knot	Bird	Vulnerable Migratory	Endangered	PMST	Intertidal mudflats, sandflats and sandy beaches. Occasionally inhabits terrestrial saline wetlands. Foraging habitat includes intertidal mudflats or sandflats when exposed at low tide.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Calidris ferruginea	Curlew Sandpiper	Bird	Critically Endangered	Critically Endangered	PMST; DBCA	Curlew sandpipers mainly occur on intertidal mudflats in sheltered coastal areas, such as estuaries, bays, inlets and	**Potential**. Suitable habitat	**Potential.** Potentially

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
			Migratory			lagoons, and also around non-tidal swamps, lakes and lagoons near the coast, and ponds in saltworks and sewage farms. They are also recorded inland, though less often, including around ephemeral and permanent lakes, dams, waterholes and bore drains, usually with bare edges of mud or sand.	for this species may occur within the survey area.	suitable habitat may occur within the Survey area (seasonally). Records occur within 1km of the Survey area.
Calidris melanotos	Pectoral Sandpiper	Bird	Migratory	Migratory	PMST	Shallow, fresh to saline wetlands. Also inhabits grassy edges of shores and tidal marshes and muddy shores.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Calidris ruficollis	Red-necked Stint	Bird	Migratory	Migratory	PMST; DBCA	Coastal areas, including sheltered inlets, bays, lagoons and estuaries with intertidal mudflats, often near spits, islets and banks and, sometimes, on protected sandy or coralline shores.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Calidris subminuta	Long-toed Stint	Bird	Migratory	Migratory	PMST	Shallow freshwater or brackish wetlands, including lakes, swamps, rivers, streams, lagoons and sewage ponds.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Calidris tenuirostris	Great Knot	Bird	Vulnerable Migratory	Critically Endangered	PMST; DBCA	In Australasia, the species typically prefers sheltered coastal habitats, with large intertidal mudflats or sandflats. This includes inlets, bays, harbours, estuaries and lagoons.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Calonectris leucomelas	Streaked Shearwater	Bird	Migratory	Migratory	PMST	Open ocean.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Charadrius leschenaultii	Greater Sand Plover	Bird	Vulnerable Migratory	Vulnerable	PMST; DBCA	In the non-breeding grounds in Australasia, the species is almost entirely coastal, inhabiting littoral and estuarine habitats. They mainly occur on sheltered sandy, shelly or muddy beaches with large intertidal mudflats or sandbanks, as well as sandy estuarine lagoons.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Charadrius mongolus	Lesser Sand Plover	Bird	Endangered Migratory	Endangered	PMST; DBCA	The habitat of the Lesser Sand Plover is usually coastal, on the beaches of sheltered bays, in harbours and estuaries with large intertidal sand flats or mudflats. They are occasionally sighted on sandy ocean beaches; coral reefs, wave-cut rock platforms and rocky outcrops and	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
						sometimes in short saltmarsh or mangroves.		
Charadrius veredus	Oriental Plover	Bird	Migratory	Migratory	PMST	Inland open plains with sparse cover of short grass. Preferred foraging habitat includes short grass or hard, bare ground, although also occurs on mudflats or seaweed covered beaches.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Erythrotriorchis radiatus	Red Goshawk	Bird	Endangered	Vulnerable	PMST	Coastal and sub-coastal areas in wooded and forested lands.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Falco hypoleucos	Grey Falcon	Bird	Vulnerable	Vulnerable	PMST	Timbered lowland plains, particularly Acacia shrublands that cross tree-lined watercourses.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Fregata ariel	Lesser Frigatebird	Bird	Migratory	Migratory	PMST	Open ocean.	**Unlikely**. Suitable habitat for this species is unlikely to occur	**Does not occur.** No available habitat for this species is present.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
							within the survey area.	
Gelochelidon nilotica	Gull-billed Tern	Bird	Migratory	Migratory	PMST	Saltpans, coastal lagoons, mudflats, marshes and wet fields, overwintering on estuaries, saltpans, lagoons and saltmarshes, or in more inland sites such as large rivers, lakes, rice-fields, sewage ponds, reservoirs, saltpans and irrigation canals.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Potential.** Potentially suitable habitat may occur within the Survey area (seasonally). Records occur within 1km of the Survey area.
Glareola maldivarum	Oriental Pratincole	Bird	Migratory	Migratory	PMST	Grasslands and muddy floodplains. Also known to inhabit terrestrial wetlands and along the coast, including beaches, mudflats and islands.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Hirundo rustica	Barn Swallow	Bird	Migratory	Migratory	PMST	Freshwater wetlands, *Melaleuca* woodland, tussock grasslands, coastal lowlands and near water, town and cities.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Hydroprogne caspia	Caspian Tern	Bird	Migratory	Migratory	PMST	The Caspian Tern is mostly found in sheltered coastal embayments (harbours, lagoons, inlets, bays, estuaries and river	**Potential**. Suitable habitat for this species	**Potential** Potentially suitable habitat

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
						deltas) and those with sandy or muddy margins are preferred. They also occur on near-coastal or inland terrestrial wetlands that are either fresh or saline, especially lakes (including ephemeral lakes), waterholes, reservoirs, rivers and creeks.	may occur within the survey area.	may occur within the Survey area (seasonally). Records occur within 1km of the Survey area.
Limicola falcinellus	Broad-billed Sandpiper	Bird	Migratory	Migratory	PMST	Sheltered parts of the coast, favouring estuarine mudflats but also occurring on saltmarshes, shallow freshwater lagoons, saltworks and sewage farms.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species. Nearby records of this species are confined to large, intertidal mudflats.
Limosa lapponica	Bar-tailed Godwit	Bird	Migratory	Migratory	PMST; DBCA	The Bar-tailed Godwit is found mainly in coastal habitats such as large intertidal sandflats, banks, mudflats, estuaries, inlets, harbours, coastal lagoons and bays.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Potential.** Potentially suitable habitat may occur within the Survey area (seasonally). Records occur within 1km of the Survey area.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Limosa limosa	Black-tailed Godwit	Bird	Endangered Migratory	Migratory	PMST	Sheltered bays, lagoons, estuaries with large intertidal sandflats or mudflats. Also found in near-coastal wetlands, including river pools, swamps, saltmarsh, floodplains and lagoons.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely**. Habitat is marginal and degraded. One record 16km southwest of the Survey area in coastal (beach/large intertidal mudflat) habitat.
Macronectes giganteus	Southern Giant-Petrel	Bird	Endangered Migratory	Migratory	PMST	Open ocean.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Motacilla cinerea	Grey Wagtail	Bird	Migratory	Migratory	PMST	Rocky substrates along water courses as well as lakes and marshes.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Motacilla flava	Yellow Wagtail	Bird	Migratory	Migratory	PMST	Well-watered open grasslands and the fringes of wetlands.	**Unlikely**.	**Does not occur.**

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
							Suitable habitat for this species is unlikely to occur within the survey area.	No available habitat for this species is present.
Numenius madagascariensis	Eastern Curlew	Bird	Critically Endangered Migratory	Critically Endangered	PMST; DBCA	Roosting habitat consists primarily of sheltered coasts especially estuaries, bays, harbours, inlets, and coastal lagoons with large intertidal mudflats or sandflats.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Numenius phaeopus	Whimbrel	Bird	Migratory	Migratory	PMST; DBCA	The Whimbrel is often found on the intertidal mudflats of sheltered coasts.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Pandion haliaetus	Osprey	Bird	Migratory	Migratory	PMST; DBCA	Eastern Ospreys occur in littoral and coastal habitats and terrestrial wetlands of tropical and temperate Australia and offshore islands. They are mostly found in coastal areas but occasionally travel inland along major rivers, particularly in northern Australia. They require extensive areas of open fresh, brackish or saline water for foraging. They frequent a variety of wetland habitats including inshore waters, reefs, bays, coastal cliffs, beaches,	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
						estuaries, mangrove swamps, broad rivers, reservoirs and large lakes and waterholes.		
Pezoporus occidentalis	Night Parrot	Bird	Endangered	Critically Endangered	PMST	Roosting and nesting sites include clumps of dense vegetation, primarily old and large spinifex (*Triodia*) clumps.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Phaethon lepturus	White-tailed Tropicbird	Bird	Migratory	Migratory	PMST	Marine habitats in tropical waters.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Phaethon lepturus fulvus	Christmas Island White-tailed Tropicbird	Bird	Endangered	-	PMST	Warm tropical ocean waters.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Phaethon rubricauda westralis	Red-tailed Tropicbird	Bird	Endangered	-	PMST	Tropical and subtropical waters of the Indian Ocean.	**Unlikely**. Suitable habitat for this species is	**Does not occur.** No available habitat for this

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
							unlikely to occur within the survey area.	species is present.
Phalaropus lobatus	Red-necked Phalarope	Bird	Migratory	Migratory	PMST	Inland and coastal lakes and swamps.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Pluvialis fulva	Pacific Golden Plover	Bird	Migratory	Migratory	PMST	Beaches, mudflats and sandflats in sheltered areas including harbours, estuaries and lagoons.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Potential** Marginal potentially suitable habitat is present (seasonally), however is highly degraded and adjacent to activity. Majority of records are coastal/intertidal mudflats.
Pluvialis squatarola	Grey Plover	Bird	Vulnerable Migratory	Migratory	PMST; DBCA	Grey Plovers usually forage on large areas of exposed mudflats and beaches of	**Potential**. Suitable habitat for this species	**Unlikely.** Habitat within the Survey area is

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
						sheltered coastal shores such as inlets, estuaries and lagoons.	may occur within the survey area.	not suitable for this species.
Rostratula australis	Australian Painted Snipe	Bird	Endangered Migratory	Endangered	PMST	Shallow terrestrial freshwater wetlands, including lakes, swamps, claypans, dams, bore drains and sewage farms, typically covered with rushes, reeds, grasses, low scrub or samphire.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area may be marginally suitable however is degraded and without vegetative coverage. No records within ~20km of Survey area.
Sterna dougallii	Roseate Tern	Bird	Migratory	Migratory	PMST	Coastal and marine areas, including rocky and sandy beaches and offshore islands. Foraging typically occurs along coral reefs, including within lagoons and along the seaweed margin.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Sternula albifrons	Little Tern	Bird	Migratory	Migratory	PMST	Banks, ridges and sand-spits of sheltered coastal environments. Foraging occurs in the shallow waters of lagoons, lakes and estuaries, and open coastline.	**Unlikely**. Suitable habitat for this species is unlikely to occur	**Unlikely.** Habitat within the Survey area is

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
							within the survey area.	not suitable for this species.
Sternula nereis nereis	Australian Fairy Tern	Bird	Vulnerable	Vulnerable	PMST	Beaches, spits, wetlands and offshore, estuarine or lacustrine islands.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species. No records within ~20km of Survey area.
Tringa brevipes	Grey-tailed Tattler	Bird	Migratory	Migratory Priority 4	PMST; DBCA	It has been found around shores of rock, shingle, gravel or shells and also on intertidal mudflats in embayments, estuaries and coastal lagoons, especially fringed with mangroves.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely.** Habitat within the Survey area is not suitable for this species.
Tringa nebularia	Common Greenshank	Bird	Endangered Migratory	Migratory	PMST; DBCA	Inland wetlands and sheltered coastal habitats of varying salinity. It occurs in sheltered coastal habitats, typically with large mudflats and saltmarsh, mangroves or seagrass.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Potential.** Potentially suitable habitat may occur within the Survey area (seasonally). Records occur within 1km of the Survey area.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Tringa stagnatilis	Marsh Sandpiper	Bird	Migratory	Migratory	PMST	Permanent or ephemeral wetlands including swamps, lagoons, billabongs, saltpans, saltmarshes, estuaries, inundated floodplains and intertidal mudflats.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Potential** Marginal potentially suitable habitat is present (seasonally), however is highly degraded and adjacent to activity. Majority of records are coastal/intertidal mudflats.
Tringa totanus	Common Redshank	Bird	Migratory	Migratory	PMST	Sheltered coastal wetlands including bays, river estuaries, lagoons, inlets and saltmarsh.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely** No records occurring within ~20km of the Survey area. No suitable habitat for this species is present.
Xenus cinereus	Terek Sandpiper	Bird	Vulnerable Migratory	Migratory	PMST; DBCA	The Terek Sandpiper mostly forages in the open, on soft wet intertidal mudflats or in sheltered estuaries, embayments, harbours or lagoons. The species has also been recorded on islets, mudbanks,	**Potential**. Suitable habitat for this species may occur within the survey area.	**Potential.** Potentially suitable habitat may occur within

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
						sandbanks and spits, and near mangroves and occasionally in samphire (*Halosarcia* spp.).		the Survey area (seasonally). Records occur within 1 km of the Survey area.
Thalasseus bergii	Crested tern	Bird	Migratory	Migratory	DBCA	Forages in shallow waters of lagoons and barrier reefs, in estuaries, along beaches, and also well out to sea. Rests on buoys or on rocks video and sandbars.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely**. Habitat within the survey area is not suitable for this species.
Dasyurus hallucatus	Northern Quoll	Mammal	Endangered	Endangered	PMST; DBCA	In the Kimberley, records are scattered discontinuously from just south of Derby across to Wyndham. The Northern Quoll occupies a diversity of habitats across its range which includes rocky areas, eucalypt forest and woodlands, rainforests, sandy lowlands and beaches, shrubland, grasslands and desert.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Macroderma gigas	Ghost Bat	Mammal	Vulnerable	Vulnerable	PMST	Roosting occurs in caves, rock crevices and old mines. Preferred foraging habitat includes productive plain areas with thin mature woodland over patchy or clumped tussock or hummock grass (*Triodia* spp.).	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Rhinonicteris aurantia	Pilbara Leaf-nosed Bat	Mammal	Vulnerable	Vulnerable	PMST	Roosts within rocky areas, including deep and complex cave systems. Foraging occurs in almost all productive and semi-productive habitats.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Aipysurus apraefrontalis	Short-nosed Sea Snake	Reptile	Critically Endangered	Critically Endangered	PMST	Reef flats and shallow waters along the outer reef edge.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Aipysurus foliosquama	Leaf-scaled Sea Snake	Reptile	Critically Endangered	Critically Endangered	PMST	Reefs of the Sahul Shelf.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Caretta caretta	Loggerhead Turtle	Reptile	Endangered Migratory	Endangered	PMST	Waters of coral and rocky reefs, seagrass beds and muddy bays.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely** No suitable habitat for this species is present. Habitat is degraded.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Chelonia mydas	Green Turtle	Reptile	Vulnerable Migratory	Vulnerable	PMST	Shallow benthic foraging habitat including tropical tidal and sub-tidal coral and rocky reef, or inshore seagrass beds.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Dermochelys coriacea	Leatherback Turtle	Reptile	Endangered Migratory	Vulnerable	PMST	Nesting occurs on sanding beaches, otherwise the species is largely pelagic.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Eretmochelys imbricata	Hawksbill Turtle	Reptile	Vulnerable Migratory	Vulnerable	PMST; DBCA	Tidal and sub-tidal coral and rocky reef habitats.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Liasis olivaceus barroni	Pilbara Olive Python	Reptile	Vulnerable	Vulnerable	PMST; DBCA	Prefers escarpments, gorges and water holes	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Natator depressus	Flatback Turtle	Reptile	Vulnerable Migratory	Vulnerable	PMST	Soft bottom habitat over the continental shelf, with nesting occurring on sandy beaches.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur.** No available habitat for this species is present.
Falco peregrinus	Peregrine falcon	Bird	-	Other Specially Protected	DBCA	Peregrine falcons prefer open habitats, such as grasslands, tundra, and meadows. They are most common in tundra and coastal areas and rare in sub-tropical and tropical habitats. They nest on cliff faces and crevices. They have recently begun to colonize urban areas because tall buildings are suitable for nesting in this species, and because of the abundance of pigeons as prey items.	**Potential**. Suitable habitat for this species may occur within the survey area.	**Unlikely**. Habitat within the survey area is not suitable for this species.
Mormopterus cobourgianus	North-western free-tailed bat	Mammal	-	Priority 1	DBCA	They are associated with mangrove habitat and roost in the hollows of those trees, and known to seek food there and in eucalypt or melaleuca woodland or other coastal habitat.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely**. Habitat within the survey area is not suitable for this species.
Hydromys chrysogaster	Water-rat, rakali	Mammal	-	Priority 4	DBCA	Lives in burrows on low banks of rivers, lakes, wetlands, estuaries and even along the coast. Intact riparian vegetation and associated bank stability is critical to their survival.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Unlikely**. Habitat within the survey area is not suitable for this species.

Species	Common Name	Class	Conservation Status		Source	Habitat	Likelihood of Occurrence	
			EPBC Act	BC Act/DBCA			Pre-survey	Post-survey
Pseudomys chapmani	Western pebble-mound mouse, ngadji	Mammal	-	Priority 4	DBCA	Typical Pebble-mound Mouse habitat occurs in spinifex grassland on gravelly spurs or lower ridge slopes. Mounds have also been found on ridge tops, and flatter lower areas.	**Unlikely**. Suitable habitat for this species is unlikely to occur within the survey area.	**Does not occur**. No available habitat for this species is present.

Appendix E Ecological communities likelihood of occurrence assessment

Community ID	Community name	Conservation status		Likelihood of occurrence	
		EP BC Act	BC Act / DBCA	Pre-survey	Post-survey
Burrup Peninsula rock pile communities	Burrup Peninsula rock pile communities	-	P1	**Unlikely**. Rock piles are unlikely to be present within the survey area.	**Does not occur**. Rock piles are not present within the survey area.
Burrup Peninsula rock pool communities	Burrup Peninsula rock pool communities	-	P1	**Unlikely**. Rock pools are unlikely to be present within the survey area.	**Does not occur**. Rock pools are not present within the survey area.

Appendix F Quadrat data

Site	Date	Site type	Observer
R01	26/03/2024	Quadrat 50 x 50	JM & GM
Condition	**Disturbance notes**	**Age since fire years)**	**Vegetation type**
Poor	Weeds, tracks, clearing	N/A	VT1
Soil description	**Bare ground**	**Leaf litter**	**Coarse woody debris**
Brown gravelley clay	98	0	0.1
Landform	**Outcropping**	**Easting**	**Northing**
Flat	2-10%	476020	7718726

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Tecticornia halocnemoides	6	G	Shrubs <1m
Tecticornia indica subsp. leiostachya	3	G	Shrubs <1m
Trianthema turgidifolium	0.5	G	Shrubs <1m
Eragrostis tenellula	0.3	G	Grasses
Tecticornia pergranulata	0.2	G	Shrubs <1m
Eriachne sp.	0.1	G	Grasses

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-Stratum
Neobassia astrocarpa	0.1	G	Shrubs <1m
**Cenchrus ciliaris*	0.1	G	Grasses
Cyperus bulbosus	0.01	G	Herbs
Arivela viscosa	0.01	G	Herbs

Appendix G Flora species list

Family	Species name
Chenopodiaceae	*Tecticornia halocnemoides*
Chenopodiaceae	*Tecticornia indica* subsp. *leiostachya*
Aizoaceae	*Trianthema turgidifolium*
Poaceae	*Eragrostis tenellula*
Chenopodiaceae	*Tecticornia pergranulata*
Poaceae	*Eriachne* sp.
Chenopodiaceae	*Neobassia astrocarpa*
Poaceae	**Cenchrus ciliaris*
Cyperaceae	*Cyperus bulbosus*
Cleomaceae	*Arivela viscosa*

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Appendix C: Perdaman Lateral Project Construction Environmental Management Plan

Perdaman Lateral Project

Construction Environmental Management Plan

Australian Gas Infrastructure Group

E-PLN-051
Revision: 2
Date: 30 August 2024

Document Revision History

Rev	Date	Reviewer	Approver	Revision Description
1	23/08/2024	M Kenny	T. Rakai	Initial draft
2	30/08/2024	M Kenny	T. Rakai	Final for submission

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EXECUTIVE SUMMARY

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<tr><th>Proposal Name</th><th colspan="2">Perdaman Lateral Project</th></tr>
<tr><td>Proponent Name</td><td colspan="2">DBNGP (WA) Nominees Pty Ltd</td></tr>
<tr><td>Purpose of this EMP</td><td colspan="2">The purpose of this Construction Environment Management Plan (CEMP) is to support the referral under section 38 of the <i>Environmental Protection Act 1986</i> (WA) (EP Act) to minimise the duration, intensity and/or extent of impacts on environmental values during the construction phase of the Proposal.
This CEMP outlines the management actions, management targets, contingency measures and reporting designed to meet the environmental outcomes and/or objectives for each relevant environmental factor.</td></tr>
<tr><td rowspan="5">Key environmental factors/issues and objectives</td><td>Flora and Vegetation</td><td>The Proponent shall manage the implementation of the Proposal to meet the following management objectives:
• Minimise the loss and fragmentation of native vegetation
• Minimise the potential for new weeds to be introduced from external sources and minimise the risk of spreading existing weeds within and adjacent to the Development Envelope
• Minimise the degradation of remnant flora and vegetation adjacent to the Development Envelope from dust emissions.</td></tr>
<tr><td>Terrestrial Fauna</td><td>The Proponent shall manage the implementation of the Proposal to meet the following management objectives:
• Minimise the loss and fragmentation of fauna habitat
• Minimise the trenching during periods of inundation (i.e. periods of extreme weather or tidal inundation) when conservation significant species have the potential to occur
• Minimise direct impacts to fauna including injury and mortality to fauna from collision with vehicles or machinery and entrapment in excavations or trenches
• Minimise changes to pest predator abundance within and adjacent to the Development Envelope
• Minimise native fauna disturbance as a result of dust, noise and/or vibration.</td></tr>
<tr><td>Inland Waters</td><td>The Proponent shall manage the implementation of the Proposal to meet the following management objectives:
• Minimise the risk to surface water contamination from the excavation/exposure of contaminated groundwater
• Minimise the risk to surface water and groundwater from contamination, including from spills or loss of hazardous materials hazardous materials
• Minimise the risk to surface water quality from increased erosion and sediment load.</td></tr>
<tr><td>Social Surroundings</td><td>The Proponent shall manage the implementation of the Proposal to meet the following outcomes:
• No disturbance to Aboriginal heritage sites as a result of construction activities.
The Proponent shall manage the implementation of the Proposal to meet the following management objectives:
• Minimise impacts of dust, noise and vibration on sensitive receptors
• Minimise impacts of air emissions produced during construction on the integrity of Aboriginal rock art.</td></tr>
<tr><td>Fire</td><td>The Proponent shall manage the implementation of the Proposal to meet the following management objectives:
• Minimise the risk of bushfires occurring as a result of construction activities, including hazardous material spills.</td></tr>
</table>

Proposal Name	Perdaman Lateral Project
Key components in this CEMP	The key components in the CEMP are outlined in Section 3. The CEMP outlines outcome and objective based actions which will be applied during the construction phase of the Proposal.

ABBREVIATIONS

Abbreviation	Definition
ACV	Authorisation to Clear Vegetation
ALARP	As Low As Reasonably Practicable
ASAP	As Soon as Possible
ASS	Acid Sulfate Soils
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016* (WA)
CEMP	Construction Environmental Management Plan
CoE	Clean on Entry
CMP	Crisis Management Plan
CMT	Crisis Management Team
CR	Critically Endangered
DBCA	Department of Biodiversity, Conservation and Attractions (WA)
DBNGP	Dampier Bunbury Natural Gas Pipeline
DBP	DBNGP (WA) Nominees Pty Ltd
DDG	DBP Development Group
DEMIRS	Department of Energy, Mines, Industry Regulation and Safety (WA)
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation (WA)
EGM Comm	Executive General Manager Commercial
EGM TAM	Executive General Manager Transmission Asset Management
ELA	Eco Logical Australia
EMS	Environmental Management System
EMT	Emergency Management Team
EN	Endangered
EPA	Environmental Protection Authority (WA)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Cth)
EP Act	*Environmental Protection Act 1986* (WA)
ERP	Emergency Response Plan
ESA	Environmental Site Assessment
GIS	Geographic Information System
ha	Hectare

Abbreviation	Definition
HSE	Health, Safety and Environment
IMT	Incident Management Team
JHA	Job Hazard Analysis
km	Kilometre
LMS	Land Management System
m	Metre
MAC	Murujuga Aboriginal Corporation
MI	Migratory
NES	National environmental significance
NGER	National Greenhouse and Energy Reporting
No.	Number
NPI	National Pollution Inventory
NVCP	Native Vegetation Clearing Permit
OSCP	Oil Spill Contingency Plan
PEC	Priority Ecological Community
PFAS	Per- and polyfluoroalkyl substances
PIC	Person In Charge
PP Act	*Petroleum Pipelines Act 1969* (WA)
PP(E)R	Petroleum Pipelines (Environment) Regulations 2012
Project Ceres	Perdaman Urea Plant Development
RiWI Act	*Rights in Water and Irrigation Act 1914*
ROW	Right of Way
RSD	Referral Supporting Document
SDS	Safety Data Sheet
SWMS	Safe Work Method Statements
TAM	Transmission Asset Agent
TAN	Technical Ammonium Nitrate
TBC	To be Confirmed
TEC	Threatened Ecological Communities
VT	Vegetation Type
VU	Vulnerable
WA	Western Australia
WoNS	Weeds of National Environmental Significance

1. CONTEXT AND SCOPE

1.1 Proposal

DBNGP (WA) Nominees Pty Ltd (DBP; the Proponent) is proposing to construct and operate the Perdaman Lateral Project (the Proposal), located within the Burrup Peninsula of the Pilbara region of Western Australia, approximately 20 km north of Karratha and 8 km north of Dampier (Figure **1-1**).

The Proposal will consist of a 550 m long pipeline, and supporting infrastructure, to transport natural gas from the existing Dampier to Bunbury Natural Gas Pipeline (DNBGP) to the Perdaman Urea Plant development (Project Ceres), which is currently being constructed on the Burrup Peninsula, directly adjacent to the north, east and south of the Proposal. The plant will convert natural gas into ammonia and subsequently into urea using a single synthesis reactor to produce fertiliser. The Proposal will provide the primary natural gas source from the DBNGP to Project Ceres. The supporting infrastructure includes:

- Perdaman Inlet Station
- Perdaman Meter Station
- Material storage/laydown areas
- Rock causeway.

All activities associated with the Proposal will be contained within a 2.05 ha Development Envelope (Figure 1-2).

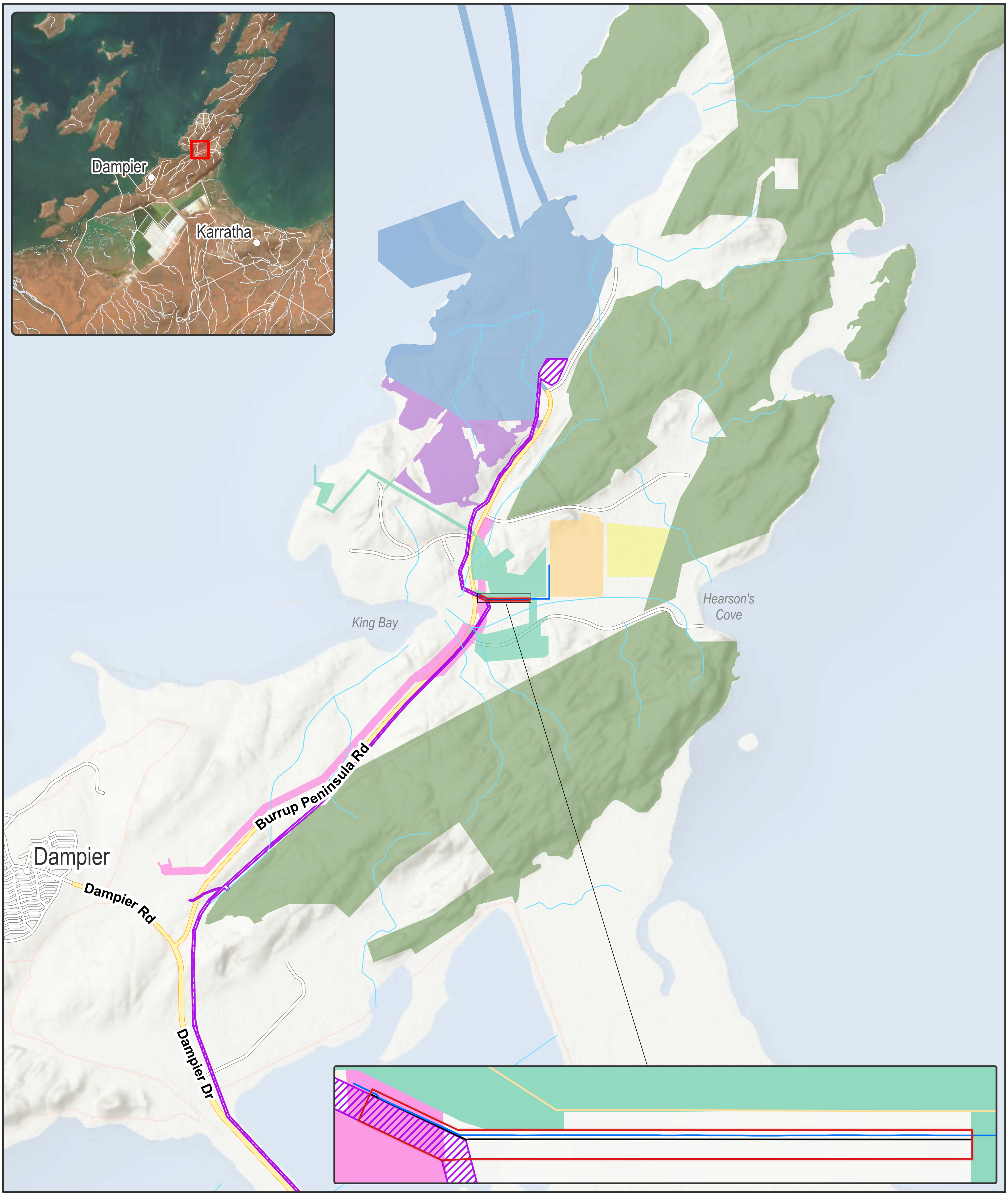

Figure 1-1: Regional Context of the Proposal

- 🟥 Development Envelope
- 🟩 Murujuga National Park
- — Watercourses
- — Distributor Road
- — Access Road
- — Burrup Fertilisers Lateral (PL62)
- — Existing Rock Causeway
- ▨ Dampier to Bunbury Natural Gas Pipeline (DBNGP)
- 🟩 Project Ceres
- 🟧 Yara Pilbara Fertilisers Plant
- 🟦 North West Shelf Project Extension
- 🟪 Burrup Common User Transmission Infrastructure
- 🟪 Pluto LNG Development
- 🟨 Technical Ammonium Nitrate Production Facility

0 0.5 1 2
Kilometres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER7890-JP Date: 9/07/2024

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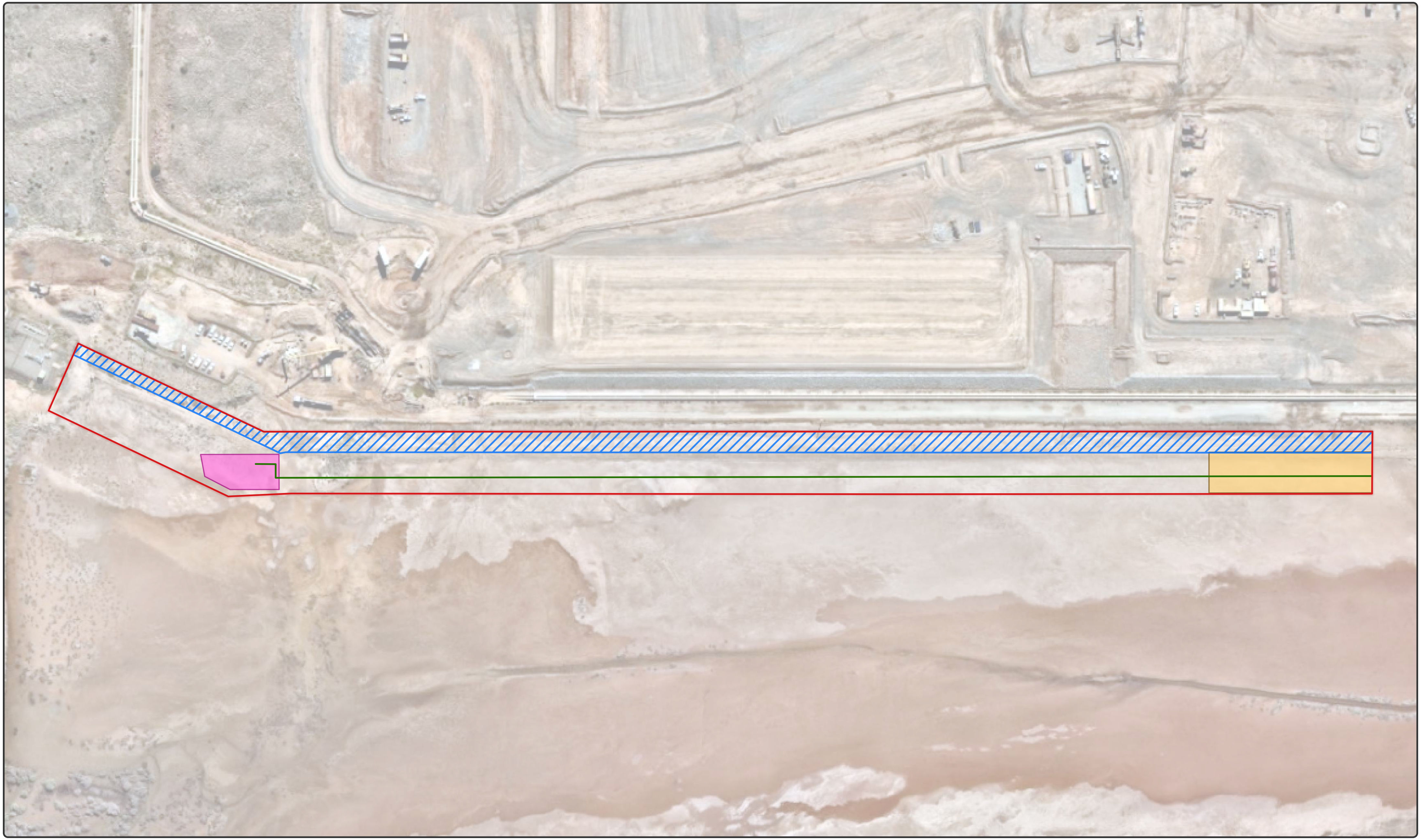

Figure 2-2: Development Envelope and Proposal Elements

- 🟥 Development Envelope
- ▨ Existing Rock Causeway and PL62 LoS
- — Perdaman Lateral Pipeline
- 🟪 Inlet Facility
- 🟧 Meter Station

Datum/Projection:
GDA 1994 MGA Zone 50

24PER7890-JP Date: 9/07/2024

1.2 Purpose and Objectives

The overarching objective of the Construction Environmental Management Plan (CEMP) is to demonstrate that the Proponent provides and maintains an effective environmental management system that is capable of systematically and continually identifying, assessing and managing environmental aspects arising from the construction of the Proposal. This CEMP outlines management measures to ensure that the potential direct and indirect impacts on environmental factors during the construction of the Proposal are not greater than predicted.

The CEMP aims to establish suitable controls to eliminate or minimise the risks to environment to a level that is low, negligible or reduced to as low as is reasonably practicable (ALARP). Moreover, the CEMP seeks to provide a framework for measuring environmental performance against legislative requirements and internal policies and standards.

The specific purpose of the CEMP is to:

- Document the rationale and approach to the management of environmental factors identified as relevant to the construction of the Proposal
- Identify environmental objectives for the management of the identified environmental factors
- Provide rational and practical measures to mitigate impacts, to ensure construction activities do not adversely affect environmental factors
- Detail the monitoring and reporting requirements as well as contingency actions if objectives and outcomes are not met
- Ensure that any potential environmental impacts from the Proposal are managed in accordance with legislative requirements.

This CEMP has been prepared in accordance with the '*Instructions on how to prepare Environmental Protection Act 1986 Part IV Environmental Management Plans*' (EPA 2024).

1.3 Legislative Context

1.3.1 Legislation

Key environmental legislation and other requirements that apply to the Proposal are presented in Table 1-1.

Table 1-1: Associated environmental legislation and other requirements

Act/Standards	Relevance to this CEMP
Commonwealth Legislation	
Aboriginal and Torres Strait Islander Heritage Protection Act 1984	An Act to ensure the protection of Cultural Heritage, which requires that any new development in previously undisturbed areas is reviewed to assess potential heritage impacts and ensure appropriate approvals are in place prior to commencing works. Any modifications or enhancements (projects) include a heritage impact assessment. Awareness of the requirements under this Act and the State Act ensure knowledge of assessment requirements and identification of heritage artifacts and Native Title aspects of the local area.
National Greenhouse and Energy Reporting Act 2007	This Act requires the monitoring and if required, reporting of greenhouse gas and energy production / consumption. This is completed annually and relates to fuel gas use, gas venting and diesel fuel use.
Native Title Act 1993	An Act to ensure Native Title holders' rights are protected throughout development within proclaimed areas. Any modifications or enhancements

Act/Standards	Relevance to this CEMP
	(projects) include a heritage impact assessment and respect for the local Native Title requirements.
Western Australian Legislation and Associated Regulations	
Aboriginal Heritage Act 1972 (AH Act)	All Aboriginal sites are protected and will require pre-clearance survey and permit if materials are to be disturbed. Declared heritage places are protected and will need to be avoided or consent obtained if site is to be disturbed. The Proposal included a heritage impact assessment as well as ensuring personnel are aware of their requirements to protect any heritage identified.
Biodiversity Conservation Act 2016 (BC Act)	Superseded the *Wildlife Conservation Act 1950* and requires management of impacts to threatened species, ecological communities and conservation reserves. Includes requirements under regulations for licensing to take or impact native flora and fauna as will be required during construction of the Proposal. Clearing and vegetation maintenance activities can impact on rare flora or fauna, but these have not been recorded in the Development Envelope.
Biodiversity Conservation Regulations 2018	Fauna licensing for any fauna handling along the pipeline route or in the compounds. Also applies to threatened flora and threatened ecological communities (TEC) licensing requirements for impacts to conservation significant species. The Proposal does not impact any TEC areas, but Fauna licenses will be required for fauna handlers on the Proposal.
Biosecurity and Agriculture Management Act 2007 (BAM Act)	Includes obligations for the management of declared weeds within WA and the need for the identification and management of weed species. Declared weeds may occur along the pipeline route or in the plant area and require management and landholder consultation for best management practices.
Bushfires Act 1954	Sets out requirements for fire protection matters including firebreaks around compounds and fire ban controls. Total Fire Ban exemptions and conditions for work have been built into hot works and other fire prevention controls. Recent updates to the regulations also include no hot works during catastrophic fire rating days and this is incorporated into Table 3-6.
Dampier to Bunbury Pipeline Act 1997	An Act that sets out the controls and responsibilities for access to the Dampier to Bunbury pipeline corridor (easement) including access authority and granting of access for third parties. The Proposal shall meet these requirements as part of connection to the DBNGP.
Dangerous Goods Safety Act 2004 (DGS Act)	An Act that outlines the requirements for the storage, handling and transport of dangerous goods and reference to the Australian Dangerous Goods Code.
Environmental Protection Act 1986 (EP Act)	An Act to ensure the protection of the environment. Includes requirements for referral of Proposals, licensing of scheduled activities and obligation to prevent pollution and minimise impacts to the environment. Section 1.3.2 sets out the current related approvals.
Environmental Protection Regulations 1987	Regulations (including sub regulations) in terms of the management of noise, clearing of native vegetation, controlled wastes, unauthorised discharges and litter is managed on site.
Environmental Protection Regulations (Clearing of Native Vegetation) 2004	Regulations specific to the clearing of native vegetation and includes potential exemptions under Petroleum related legislation and activities.
Environmental Protection Regulations (Noise) 1997	Controls in relation to noise levels at environmental receptors. Includes management of activities that could breach levels including timing of activity, duration, notification to stakeholders and noise monitoring.
Petroleum Pipelines Act 1969 (PP Act)	Manages the pipeline license area for construction and operations and includes pipeline safety and Safety Case obligations and the obligation to minimise environmental impacts.
Petroleum Pipelines (Environment) Regulations 2012 (PP(E)R)	Sets out specific requirements including the development and approval of the CEMP and the need to manage environmental impacts.

Act/Standards	Relevance to this CEMP
Standards	
AS2885 Pipelines – Gas and Liquid Petroleum	Pipeline design requirements as well as specific to line of sight clearing requirements (vegetation maintenance) and pigging requirements.
AS1940 2017 The storage and handling of flammable and combustible liquids	Ensure the bunding of hydrocarbons and odorant on site is managed according to this standard.
AS1697 2005 Installation and maintenance of steel pipe gas systems	Installation and maintenance of steel pipe systems including design criteria to ensure containment.
AS1692 2006 Tanks for flammable and combustible liquids	Pressure vessel requirements for waste oil, oil and the odorant tanks to ensure design and maintenance to ensure containment.
AS3780 2008 The storage and handling of corrosive substances	Any minor storage of corrosives on site will meet this standard.
AS2507 1998 The storage and handling of pesticides	Any minor / temporary storage of pesticides and herbicides will meet this standard.
Codes and Guidelines	
Instructions on how to prepare *Environmental Protection Act 1986* Part IV Environmental Management Plans (EPA 2024)	Provides general guidance for preparing environmental management plans for environmental impact assessments and approvals under Part IV of the EP Act.

1.3.2 Proposal Approvals

The Proposal is being assessed under Part IV of the EP Act which provides for the referral and assessment of proposals that may or will, have a significant impact on the environment.

The other environmental approval decision-making authorities (DMAs) and regulating legislation relevant to the Proposal are outlined in Table 1-2.

Table 1-2: Summary of environmental approvals

Decision Making Authority	Legislation or Agreement Regulating the Activity	Relevant Approval
Department of Energy, Mines, Industry, Regulation and Safety (DEMIRS)	*Petroleum Pipelines Act 1969* (PP Act) and Petroleum Pipelines (Environment) Regulation 2012 PP(E)R	Variation to DBNGP Licence #40 to construct and operate the Perdaman pipeline
	EP Act, Part V Environmental Protection (Clearing of Native Vegetation) Regulation 2004	Native Vegetation Clearing Permit (NVCP)
Department of Biodiversity, Conservation and Attractions (DBCA)	*Biodiversity Conservation Act 2016* (BC Act)	Licensing associated with fauna and flora surveys and research, including fauna handling licenses

1.4 Condition Requirements

This CEMP has been prepared to support the referral of the Proposal to the EPA under Part IV of the EP Act. As such, at the time of the CEMP preparation, there are no approval conditions for the Proposal.

If approval conditions are prescribed by the EPA under a Ministerial Statement, subsequent CEMP iterations will address these condition requirements, as relevant.

1.5 Environmental Factors

The EPA Environmental Factors relevant to this CEMP are:

- Flora and Vegetation
- Terrestrial Fauna
- Inland Waters
- Social Surroundings
- Marine Environmental Quality
- Benthic Communities and Habitats.

The Referral Supporting Document (RSD) also considered greenhouse gas emissions related to the construction of the Proposal. Construction emissions are estimated to be 1,362 t CO_2-e. Given this amount is considered insignificant under EPA guidelines (EPA 2023a) and the National Greenhouse and Energy Reporting (NGER) Regulations 2008, this environmental factor is not considered relevant to this CEMP and the Greenhouse Gas Emissions factor has not been included.

The Proposal's construction activities and significance applicable to each relevant environmental factor is summarised in Table 1-3.

Table 1-3: Environmental factor, significance and relationship with the Proposal

Proposal Activity	Significance
Environmental Factor – Flora and Vegetation	
EPA objective***: Protect flora and vegetation so that biological diversity and ecological integrity are maintained*** **(EPA 2016a)**	
• Clearing of native vegetation • Earthwork activities including excavation, soil disturbance, compactions, movement and stockpiling • Operation, movement and refuelling of plant, machinery, and vehicles • Other construction activities such as grinding and welding.	• Loss of up to 0.21 ha of native vegetation • Indirect impacts from: ○ Increased dust deposition ○ Increased fragmentation of native vegetation ○ Altered fire regimes as a result of construction activities ○ Introduction or spread of weeds from clearing and vehicle and machinery movements.
Environmental Factor – Terrestrial Fauna	
EPA objective: ***Protect terrestrial fauna so that biological diversity and ecological integrity are maintained*** **(EPA 2016b)**	
• Clearing of fauna habitat • Earthwork activities including trenching, excavation, soil disturbance, compaction, movement, and stockpiling • Construction of permanent and temporary infrastructure • Operation, movement and refuelling of plant, machinery, and vehicles	• Loss of up to 1.43 ha of fauna habitat • Injury, mortality, or displacement of terrestrial fauna • Indirect impacts from: ○ Increased fragmentation of fauna habitat ○ Disturbance to native fauna from mechanical noise and vibration generated by construction activities ○ Habitat degradation as a result of: ▪ Dust emissions produced during construction activities ▪ Increased competition or predation by feral fauna ▪ Altered fire regimes due to construction activities ▪ Introduction and/or spread of weed species.
Environmental Factor – Inland Waters	
EPA objective: ***Maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*** **(EPA 2018)**	
• Clearing of vegetation • Storage and handling of chemicals and hazardous materials • Earthwork activities including trenching, excavation, soil disturbance, compaction, movement, and stockpiling • Construction of permanent and temporary infrastructure	• Contamination of surface water from the exposure of contaminated groundwater and Acid Sulfate Soils (ASS) • Contamination of surface water and groundwater from the accidental loss or spill of chemicals and hazardous materials • Reduction of quality of surface water due to site construction works and earthworks exposing underlying soil followed by increased erosion and sediment load.
Environmental Factor – Social Surroundings	
EPA objective: ***To protect Social Surroundings from significant harm*** **(EPA 2023b)**	
• Clearing of vegetation • Earthwork activities including trenching, excavation, soil disturbance, compaction, movement and stockpiling • Construction of permanent and temporary infrastructure • Operation, movement and refuelling of plant, machinery and vehicles.	• Unidentified Aboriginal cultural heritage sites could be impacted • Reduced amenity to the surrounding landscape from dust, noise and vibration • Impacts to the integrity of Aboriginal rock art as a result of air emissions.
Environmental Factor – Marine Environmental Quality and Benthic Communities and Habitats	

Proposal Activity	Significance
EPA objective: ***To maintain the quality of water, sediment and biota so that environmental values are protected*** **(EPA 2016d)**	
• Storage and handling of chemicals and hazardous materials • Earthwork activities including trenching, excavation, soil disturbance, compaction, movement, and stockpiling	• Elevated turbidity from fugitive dust emissions resulting in reduced marine environmental quality and impacts to the King Bay mangrove community • Elevated turbidity resulting in reduced marine environmental quality and impacts to the King Bay mangrove community due to site construction works and earthworks exposing underlying soil followed by increased sediment load • Reduced marine environmental quality and associated impacts to the King Bay mangrove community from exposure of contaminated groundwater and ASS • Reduced marine environmental quality and associated impacts to the King Bay mangrove community from accidental spills of hazardous materials.

2. RATIONALE AND APPROACH

This CEMP documents the Proponent's commitments for each environmental factor relevant to the construction of the Proposal and outlines how the management provisions will be implemented to achieve these commitments. This CEMP has been developed utilising a combination of an outcome-based and objective-based approach for the relevant environmental factors to identify and prioritise management provisions.

Outcome-based provisions have been applied when suitable thresholds have been determined, whereas objective-based provisions have been applied when a level of uncertainty exists that prevents setting objective and measurable criteria. In this case, management targets are established to measure the success of management actions in achieving the environmental objective as there is insufficient site-specific information for setting outcome-based criteria and associated trigger and threshold values.

Section 2.2 to Section 2.4 provides a summary of the results of desktop and field surveys that have been conducted to understand baseline conditions of the environment associated with the Proposal, including a summary of associated assumptions and uncertainties.

Construction impacts on Marine Environmental Quality and Benthic Communities and Habitats include the potential for contamination, largely associated with accidental spills of chemicals, hydrocarbons, other hazardous materials and contaminated groundwater and ASS, as well as increased erosion and sedimentation. Objective-based management measures relating to the storage and response to spills of hazardous materials, exposure of contaminated groundwater and erosion controls are detailed within the management measures tables for Inland Waters, and as such Marine Environmental Quality and Benthic Communities and Habitats, have not been addressed in this document as standalone factors. A separate ASS Management Plan will be developed and implemented in accordance with the *Guideline: Treatment and Management of Soil and Water in ASS Landscapes* (DWER 2015) to manage impacts associated with ASS. As such, ASS management measures are not addressed in this CEMP.

The overall management approach applied under this CEMP and the rationale for the choice of indicators and management actions for the environmental factors are addressed in Section 2.7 and Table 2-2.

2.1 Surveys and Studies

Studies and surveys have been undertaken to understand baseline conditions of the environmental factors associated with the Proposal (Table 2-1). These baseline conditions are summarised in the following subsection and inform the management approaches designed to achieve the proposed environmental outcomes and objectives.

Table 2-1: Overview of studies undertaken in proximity to the Development Envelope

Reference	Survey Type and Location	Key Outcomes
Perdaman Pipeline Flora and Fauna Survey (ELA 2024)	**Survey Type** • Detailed and Targeted (conservation significant) flora and vegetation survey • Basic fauna survey **Timing** • The field survey was conducted on 26 March 2024.	• No vegetation types represented any known or potential TECs or Priority ecological communities (PECs) • No flora species recorded represented threatened or priority species within the Development Envelope • Two broad fauna habitat types delineated.
Perdaman Urea Proposal Pre and Post-wet Season Biological Survey (APM 2019)	**Survey Type** • Multi-Season Detailed Flora and Vegetation Survey • Level 1 fauna survey **Timing** • The field survey was conducted in late 2018 and early 2019.	• No mammals or reptiles of conservation significance were recorded • Nine conservation significant bird species were recorded during the survey • Four broad fauna habitats delineated.
Site Avoidance Survey of the Proposed Gas Pipeline Alignment for connection to the Perdaman Urea Plant, Burrup Peninsula, Western Australia (ACHC 2023)	**Survey type** • Ethnographic Cultural Heritage Assessment **Timing** • The field survey was conducted on 17 November 2023.	• No Aboriginal heritage sites with ethnographic values intersect the proposed corridor, that would prevent the Proponent from proceeding with the program of works as described.
Report of a Site Avoidance Level Archaeological Survey undertaken for Australian Gas Infrastructure Group by Murujuga Aboriginal Corporation representatives and Scarp Archaeology (Scarp Archaeology 2024)	**Survey type** • Site Avoidance Archaeological Heritage Survey **Timing** • The field survey was conducted on 17 November 2023	• No aboriginal heritage sites with archaeological values intersect the Development Envelope, that would prevent the Proponent from proceeding with the program of works as described.
Baseline Environmental Site Assessment – Perdaman Lateral Pipeline, Burrup Peninsula (Senversa 2024)	**Survey type** • Baseline Environmental Site Assessment **Timing** • Site visits were conducted in June and July of 2024.	• No anthropogenic contaminants, including hydrocarbons, PFAS and metals were present in the soils. • Low levels of PFAS and hydrocarbon were found in the groundwater but were below adopted guidelines. • Low concentrations of metals were present in groundwater, apart from Zinc which was considered to be representative of ambient groundwater conditions • Elevated nutrients were present in groundwater • Potential ASS present in soils within the excavation footprint.

2.2 Flora and Vegetation

2.2.1 Environmental Outcome or Management Objectives

The Proposal has been designed to avoid clearing as far as practicable by preferentially locating the Development Envelope adjacent to existing infrastructure. By minimising this clearing, the Proponent has significantly reduced the impacts to flora and vegetation. This approach has reduced the overall environmental impact of the Proposal such that the residual impacts to the Flora and Vegetation factor can be appropriately managed with the following outcomes and objectives, reducing the risk to ALARP:

- Minimise the loss and fragmentation of native vegetation
- Minimise the potential for new weeds to be introduced from external sources and minimise the risk of spreading existing weeds within and adjacent to the Development Envelope
- Minimise the degradation of remnant flora and vegetation within and adjacent to the Development Envelope from dust emissions.

The rationale for these chosen outcomes and objectives is provided in Table 2-2, and a description of the survey and study findings that form the basis of the management approach to the Flora and Vegetation factor are provided below.

2.2.2 Survey and Study Findings

A Detailed and Targeted (conservation significant) flora and vegetation survey was undertaken within the Development Envelope, which covered approximately 1.43 ha of the 2.05 ha Development Envelope (the Survey Area; ELA 2024). The survey excluded 0.62 ha of the Development Envelope which is associated with the existing rock causeway and the Burrup Fertilisers Lateral (Pipeline Licence 62 [PL62]), which is maintained and cleared to enable Line of Sight (LoS).

Vegetation condition within the Survey Area is considered Poor (0.21 ha), with areas identified as Mudflat (1.22 ha) not assigned a vegetation condition given it is naturally devoid of vegetation. Disturbances recorded within the survey area included previous clearing, infestation of weed species and deposition of dust.

A total of 10 flora species (nine native and one introduced) from eight genera and five families were recorded within the Survey Area (ELA 2024). Most recorded taxa were representative of the *Chenopodiaceae* (four taxa) and *Poaceae* (three taxa) families. *Tecticornia* was the best-represented genera throughout the Development Envelope with three taxa recorded.

2.2.2.1 Vegetation Communities

One broad vegetation type (VT01: *Tecticornia halocnemoides*, *Tecticornia indica* subsp. *leiostachya*, *Trianthema turgidifolium* low sparse chenopod shrubland) was identified within the Survey Area, covering approximately 0.21 ha. The rest of the Survey Area was identified as Mudflats (1.22 ha), which are naturally devoid of vegetation (ELA 2024).

2.2.2.2 Threatened and Priority Ecological Communities

No vegetation types within the Survey Area represent any known or potential conservation significant ecological communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), the BC Act or by DBCA (ELA 2024).

The desktop assessment identified two PECs that occur within 5 km of the Survey Area (ELA 2023). Both PECs are considered not to occur within the Survey Area due to the lack of suitable species and habitats as well as both PECs being restricted to rockpile formations.

2.2.2.3 Conservation Significant Flora

No Threatened flora species listed under the EPBC Act or BC Act or Priority species listed by DBCA occur within the Development Envelope (ELA 2024).

Three conservation-listed flora species were identified during a desktop assessment as possibly occurring within the Survey Area; however, a likelihood of occurrence assessment determined that all are considered unlikely to occur due to a lack of suitable habitat present.

2.2.2.4 Introduced Flora

One introduced flora species is known to occur within the Survey Area, namely *Cenchrus ciliaris* (Buffel grass) (ELA 2024). The species is listed under the BAM Act as Permitted (s-11), with no specific conditions for control required. A total of 0.1% of the vegetation within the Survey Area contained the species.

2.3 Terrestrial Fauna

2.3.1 Environmental Outcome or Management Objectives

The Proponent has a proven track record of minimal impacts to native fauna species. The impacts to Terrestrial Fauna have been reduced by restricting construction activities during periods of inundation such as the wet season or when there is tidal inundation predicted to occur within the next three weeks. Moreover, fauna controls are well established within the gas industry and controls over trenching and excavations can be effectively implemented to minimise risks associated with construction of the pipeline and other infrastructure. This approach has reduced the overall environmental impact of the Proposal such that the residual impacts to the Terrestrial Fauna factor can be appropriately managed with the following outcomes and objectives, reducing the risk to ALARP:

- Minimise the loss and fragmentation of fauna habitat
- Minimise the trenching during periods of inundation (i.e. periods of extreme weather or tidal inundation) when conservation significant species have the potential to occur
- Minimise direct impacts to fauna including injury and mortality to fauna from collision with vehicles or machinery and entrapment in excavations or trenches
- Minimise changes to pest predator abundance within and adjacent to the Development Envelope
- Minimise native fauna disturbance as a result of dust, noise and/or vibration.

The rationale for these chosen outcomes and objectives is provided in Table 2-2, and a description of the survey and study findings that form the basis of the management approach to the Terrestrial Fauna factor are provided below.

2.3.2 Survey and Study Findings

The Proponent commissioned ELA to undertake a Basic Fauna Survey over approximately 1.43 ha of the 2.05 ha Development Envelope (the Survey Area).

2.3.2.1 Fauna Habitats

Two fauna habitat types were mapped within the Survey Area, namely 'Mudflats' (1.22 ha) and 'Low Chenopod Shrubland' (0.21 ha) (ELA 2024).

These habitats are not considered locally or regionally restricted with samphire shrublands and mudflats recorded in nearby areas by Animal Plant Mineral Pty Ltd (2019). The vegetation within the Low Chenopod Shrubland habitat is in Poor condition.

2.3.2.2 Terrestrial and Conservation Significant Fauna

No fauna species were recorded during the field survey (ELA 2024).

No direct or indirect evidence of Threatened species listed under the EPBC Act or BC Act, Priority species listed by DBCA or introduced species were recorded within the Survey Area (ELA 2024).

A total of 19 conservation-listed terrestrial fauna species were identified during a pre-survey desktop assessment as possibly occurring within the Survey Area. A post-survey likelihood of occurrence assessment determined that only eight of the 19 significant fauna species were considered as having the potential to occur within the Survey Area, based on the availability of suitable habitat and proximity of previous records (ELA 2024).

These species include:

- *Calidris ferruginea* (Curlew Sandpiper; listed as Critically Endangered [CR] and Migratory [MI] under the EPBC Act and BC Act)
- *Tringa nebularia* (Common Greenshank; listed as Endangered [EN] under the EPBC Act and MI under the EPBC Act and BC Act)
- *Xenus cinereus* (Terek Sandpiper; listed as Vulnerable [VU] under the EPBC Act and MI under the EPBC Act and BC Act)
- *Gelochelidon nilotica* (Gull-billed Tern; listed as MI under the EPBC Act and BC Act)
- *Hydroprogne caspia* (Caspian Tern; listed as MI under the EPBC Act and BC Act)
- *Limosa lapponica* (Bar-tailed Godwit; listed as MI under the EPBC Act and BC Act)
- *Pluvialis fulva* (Pacific Golden Plover; listed as MI under the EPBC Act and BC Act)
- *Tringa stagnatilis* (Marsh Sandpiper; listed at MI under the EPBC Act and BC Act).

Each of these species have generally broad habitat requirements associated with coastal areas, inlets and saline areas such as mudflats. Given the mudflats present within the Survey Area are occasionally inundated (e.g. during heavy rainfall periods and extreme spring tides), these species cannot be ruled out as potentially occurring (ELA 2024).

2.4 Inland Waters

2.4.1 Environmental Outcome or Management Objectives

The Proponent has designed the Development Envelope to avoid surface water features and has utilised industry leading technology to avoid all dewatering and discharge as part of the Proposal. Furthermore, standard controls for surface and groundwater management will be implemented to reduce potential impacts to Inland Waters. Therefore, the risk to the Inland Waters factor is considered low and residual impacts can be appropriately managed through the following objectives:

- Minimise the risk to surface water contamination from the excavation/exposure of contaminated groundwater

- Minimise the risk to surface water and groundwater from contamination, including from spills or loss of hazardous materials
- Minimise the risk to surface water quality from increased erosion and sediment load.

2.4.2 Survey and Study Findings

2.4.2.1 Surface Water

The Development Envelope occurs within the Port Hedland Coast basin and is located within a saline coastal flat (DWER 2018a). The Development Envelope does not intersect any significant surface water bodies or wetlands, nor any Public Drinking Water Source Areas (DWER 2024).

A minor (non-perennial) watercourse lies directly south of the Development Envelope, draining into King Bay.

The Development Envelope occurs within a mudflat area which drains westward to King Bay (Cardno 2020). The mudflats are tidal and are subject to flooding during heavy rainfall periods and during extreme spring tides.

2.4.2.2 Groundwater

The Pilbara Fractured Rock Aquifer underlies the Development Envelope, and forms part of the Pilbara Proclaimed Groundwater Area (DWER 2018b). Groundwater investigations were undertaken for Project Ceres which found that the local groundwater levels range between 0.7–2.8 m below ground surface and had a total dissolved salt concentration that exceed that of the surrounding seawater (40,000–50,000 mS/cm) (SKM 2001). Groundwater levels within the Development Envelope range between 0.276-0.376 m below ground level (Senversa 2024).

2.4.2.3 Site Contamination

Three lots within the Development Envelope (Lots 540, 3013 and 704) have been classified by DWER as 'Possibly Contaminated – Investigation Required', with restrictions on groundwater abstraction requiring testing prior to its use.

This classification is due to contamination assessments at the adjacent Technical Ammonium Nitrate (TAN) Yara Fertilisers Plant, which found ammonia, nitrates and nitrites at elevated concentrations in soil and groundwater, approximately 1.1 km northeast of the Proposal. Following a significant rainfall event in May 2021, environmental monitoring data indicated unacceptably high nitrate concentrations in surface waters migrating from the TAN plant, with the potential to impact sensitive ecological receptors in the supratidal flats and King Bay.

Senversa was commissioned by the Proponent to undertake a Baseline Environmental Site Assessment (ESA) of the Development Envelope to assess the potential contamination within the Development Envelope to inform management (Senversa 2024).

Based on the results of the survey, the soils within the Development Envelope were not found to contain evidence of anthropogenic contaminants, including hydrocarbons, Per- and polyfluoroalkyl substances (PFAS) and metals.

The groundwater was found to have low levels of PFAS; however, the concentrations were below adopted guidelines for human health and the environment. All hydrocarbons in the groundwater were below LoR and subsequently below the adopted assessment criteria. The groundwater was found to have exceedances of Zinc; however, in the absence of a defined contaminant source, and in light of comparatively low concentration of other reported metals, the zinc concentrations were considered to be reflective of ambient groundwater conditions.

The groundwater did have elevated nutrients (ammonia, total nitrogen and phosphorus) which were considered consistent with the nutrient seepage from the TAN plant.

2.5 Social Surroundings

2.5.1 Environmental Outcome or Management Objectives

The Proponent has investigated the location of Aboriginal cultural heritage sites and other heritage sites in proximity to the Development Envelope using standard approvals, GIS information, the Registered Sites Database and consultation with Traditional Owners. The Proponent is therefore aware of the heritage values present within the broader area. The implementation of industry standard controls minimises the generation of dust and noise emissions and the remote location of the Development Envelope ensures that the impact of these emissions on sensitive receptors (e.g. landholders) is insignificant. The risk to Social Surroundings is hence considered low and any residual impacts can be appropriately managed through the following outcomes and objectives:

- No disturbance to Aboriginal heritage sites as a result of construction activities
- Minimise impacts of dust, noise and vibration on local sensitive receptors
- Minimise impacts of air emissions produced during construction on the integrity of Aboriginal rock art.

2.5.2 Survey and Study Findings

2.5.2.1 Aboriginal Cultural Heritage

The Development Envelope is located within Dampier Archipelago National Heritage Place (ID: 105727).

An archaeological and ethnographic heritage survey was conducted concurrently in November 2023, advised by Traditional Owners from Murujuga Aboriginal Corporation (MAC). The preliminary advice from the surveys indicated that, although the mapped boundaries of seven Aboriginal heritage sites from the DPLH Aboriginal Cultural Heritage Register intersect the Development Envelope, there is no significant heritage material or other aspects of significant Aboriginal heritage value specifically located within the Development Envelope. An endorsement of the findings of the survey reports was received from MAC on 28 March 2024 (MAC 2024).

2.5.2.2 European Heritage and State Heritage

No registered European heritage values were detected in the Development Envelope through a search of the WA Heritage Council Database – inherit (DPLH 2024).

2.5.2.3 Sensitive Receptors

The Proposal occurs in an industrial area; hence the surrounding landscape is already heavily disturbed. The nearest sensitive receptor is the Dampier townsite, approximately 15 kilometres from the Development Envelope.

2.6 Key Assumptions and Uncertainties

A number of factors that represent risk to the success of this CEMP are described below. The outcomes and objectives, and associated trigger/threshold criteria, management targets and actions have been designed to try to minimise these risks wherever possible. These are summarised in Section 3.

The Proponent is ultimately responsible for successful construction of the Proposal to meet the specific completion criteria outlined in this CEMP however, there are actions that will be implemented by third parties where relevant (e.g. the Construction Contractor will implement the majority of actions based on a standard pipeline reinstatement approach).

2.7 CEMP Management Approach

The Proponent has applied the mitigation hierarchy (avoid, minimise and rehabilitate) to reduce the potential impacts to environmental values associated with the construction activities of the Proposal.

An outcomes and objective-based management plan, as defined under EPA Guidance (EPA 2024), will be implemented to ensure that objectives of impacts on environmental factors are not greater than predicted. Table 2-2 lists the environmental values and threatening processes that are the main scope of this CEMP, as well as the rationale for their inclusion.

Table 2-2: Rationale for choice of indicators and management approach

Environmental Factor	Environmental Aspect	Management Approach	Rationale for Approach
Flora and Vegetation and Terrestrial Fauna	Land disturbance – ground disturbance and vegetation clearing	Objective-based	Clearing of vegetation beyond that which is approved may lead to unacceptable outcomes to flora, vegetation and fauna values. Effective management of clearing is a commitment by the Proponent and the responsibility of the Health, Safety and Environment (HSE) manager, site operators and contractors. Objective-based provisions are considered appropriate for minimising the risk of exceeding clearing or disturbance requirements due to the minimal amount of clearing required and the short time frame clearing activities are likely to occur within. These provisions will ensure that all personnel are inducted on land disturbance and clearing management, as well as to ensure an Authorisation to Clear Vegetation (ACV) is in place for all land clearing activities.
Flora and Vegetation	Weed and hygiene management	Objective-based	Objective-based management provisions have been adopted to ensure correct hygiene management measures are in place to minimise the introduction and spread of weeds. As part of this contractors will be required to observe if there are any increases in weed species or abundance through observations and record and report the opportunistic sightings. Additional management measures include, targeted weed management, implementation of a Clean on Entry (CoE) Procedures and installation of hygiene egress points.
Flora and Vegetation and Terrestrial Fauna	Fire prevention and response	Objective-based	Bushfires could cause widespread damage, loss or degradation of native vegetation, flora, and fauna habitat, as well as present a significant safety issue to construction personnel. Objective-based management provisions have been adopted as the risk of accidental fires can only be minimised and not completely avoided.
Terrestrial Fauna	Disturbance to conservation significant fauna habitat	Objective-based	Construction activities during the wet season (November to April), periods of tidal inundation and high rainfall may impact on conservation significant migratory birds, which utilise the Mudflats habitat type during periods of inundation. Construction activities will be limited during these periods, to avoid any impacts to conservation significant species. Objective-based provisions have been adopted to minimise the risk of trenching during periods of inundation to prevent the disturbance of conservation significant fauna habitat.
Terrestrial Fauna	Direct fauna mortality or injury	Objective-based	Objective-based provisions have been adopted for direct fauna mortality from clearing activities/vehicle strike/ trenching activities, as whilst the risk of fauna mortality from construction activities is low and can be minimised through robust management practices and opportunistic monitoring, it cannot be completely avoided.
Terrestrial Fauna	Feral fauna	Objective-based	Objective-based provisions have been adopted to minimise the potential for an increase in the abundance of feral fauna species, as whilst hygiene management measures can be in place to minimise the risk of introducing or increasing the abundance of feral species, it cannot entirely be avoided given the highly disturbed nature of the area.
Flora and Vegetation, Terrestrial Fauna and Social Surroundings	Dust, vibration and noise management	Objective-based	Objective-based provisions have been adopted to minimise the impact of dust, vibration and noise emissions as robust management actions will effectively mitigate impacts from dust, vibration and noise emissions given the short time frame associated with construction activities.
Inland Waters	Erosion Management	Objective-based	As soil erosion cannot be completely avoided, objective-based provisions are considered appropriate. Erosion and sediment controls/management actions will be implemented to minimise the risk from erosion including the Procedure for Management of Erosion Risk Areas (E-PRO-003).
Inland Waters	Surface and groundwater quality management	Objective-based	Objective based provisions have been adopted for water quality due to the small area of disturbance. Robust management practices will reduce the risk of exposure/excavation of ASS and the accidental loss or spill of hazardous materials, and the subsequent risks of contamination and changes to water quality.
Social Surroundings	Heritage management	Outcome-based and objective-based	Outcome-based conditions have been implemented to ensure all personnel are inducted on existing Aboriginal Heritage surrounding the Development Envelope. Discovery of any potential sub-surface Aboriginal cultural heritage will lead to ceasing work immediately until further arrangements for re-commencement of work is determined. An objective-based provision is also proposed to ensure the appropriate management of new Aboriginal Heritage sites/artefacts uncovered or identified in accordance with the requirements of the *Aboriginal Heritage Act 1972*.

3. ENVIRONMENTAL MANAGEMENT PLAN COMPONENTS

This section of the CEMP identifies the standards and management actions that the Proponent proposes to implement to reduce residual impacts on environmental factors associated with the Proposal's construction. Management actions will be implemented for the following environmental factors and issues:

- Flora and Vegetation
- Terrestrial Fauna
- Inland Waters
- Social Surroundings
- Fire.

Management and monitoring provisions have been split into outcome-based (Section 3.1), where specific measurable outcomes incorporating threshold and trigger criteria have been proposed, and objective-based (Section 3.2), relating to the achievement of desired management targets/objectives.

3.1 Outcome-based Management Measures

3.1.1 Social Surroundings

Table 3-1 outlines the rationale for the proposed outcome-based management indicators, actions and monitoring for Social Surroundings.

Table 3-1: Social Surroundings – outcome-based management

EPA Factor/s	Terrestrial Fauna
EPA Objective/s	*To protect social surroundings from significant harm*
Environmental Values	• Aboriginal cultural heritage.
Key Impacts	• Impacts to unrecorded Aboriginal sites.
Key Risks	• Clearing in unapproved areas • Vehicle and earthworks machinery movements.

Outcome	Indicators (Trigger Criteria / Threshold Criteria)	Response Actions	Timing/Frequency of Monitoring	Reporting
• No disturbance to Aboriginal heritage sites as a result of construction activities.	**Trigger criterion** • Discovery of any potential sub-surface Aboriginal cultural heritage. **Threshold criterion** • Disturbance of a previously unidentified Aboriginal site as a result of the Proposal.	**Trigger level actions** • On discovery of any potential sub-surface Aboriginal heritage, the Proponent will cease the work immediately until further arrangements for re-commencement of work is determined. The Project Manager will be notified. **Threshold contingency actions** • Immediately cease clearing activities • Advise relevant government agencies and traditional owners of disturbance if confirmed • Identify the cause of disturbance and undertake a critical review of ACV planning, assessment, and implementation.	• Audits and inspections as required throughout the construction period • Traditional Owner Monitoring as required where subsurface Aboriginal cultural heritage is discovered during construction.	• Project Weekly HSE Inspection Checklist.

3.2 Objective-based Management Measures

3.2.1 Flora and Vegetation

Table 3-2 outlines the rationale for the proposed objective-based management indicators, actions and monitoring for Flora and Vegetation.

Table 3-2: Flora and Vegetation – objective-based management

EPA Factor/s	**Flora and Vegetation**
EPA Objective/s	*To protect flora and vegetation so that biological diversity and ecological integrity are maintained*
Environmental Values	• 0.21 ha of native vegetation in poor condition • Adjacent flora and vegetation
Key Impacts	• Degradation of vegetation condition • Introduction of new weeds • Spreading of existing weeds or pathogens.
Key Risks	• Clearing activities • Vehicle and earthworks machinery movements • Increased presence of WONS.

Management Target	**Management Action**	**Monitoring/ Timing/Frequency of Monitoring**	**Reporting**	**Contingency Action if Target(s) not Met**
• Minimise the loss and fragmentation of native vegetation.	• Ensure all staff and contractors are inducted on land disturbance and clearing requirements prior to commencement of works • All clearing will be managed through an internal native vegetation clearance procedure which includes the following measures to minimise clearing: ○ Obtain and implement an ACV form prior to clearing ○ Demarcate the approved clearing boundary using a GPS. Physical demarcation such as flagging tape may also be implemented.	• Weekly Project HSE inspections during construction • Conduct HSE Audit to ensure all native vegetation clearing is conducted in compliance with internal authorisation to clear native vegetation process • Review GIS data for relevancy and to ensure it is up to date • Implement induction on ACV requirements for relevant personnel.	• Project Weekly HSE Inspection Checklist • ACV Register • HSE Audit Report • GIS database • Induction records.	• Advise relevant government agencies of any impact on conservation significant flora outside of the approved disturbance area to determine appropriate mitigations • Undertake rehabilitation of cleared areas outside of approved extent, in consultation with relevant government agencies, including setting of objectives, targets and measures.
• Minimise the potential for new weeds to be introduced from external sources and minimise the risk of spreading existing weeds within and adjacent to the Development Envelope.	• Ensure all staff and contractors undertake an environmental awareness induction prior to commencement of works • Ensure all vehicles remain on existing tracks where possible • Implement CoE Procedures including: ○ A requirement for all vehicles, machinery and equipment to be checked and cleaned prior to entry • Where possible, restrict third-party access through physical barriers or discouraged through signage.	• Weekly Project HSE inspections during construction • HSE System Audit during construction to confirm CoE procedure has been implemented	• Project Weekly HSE Inspection Checklist • HSE Audit Report	• Review CoE Procedure which could include: ○ Additional criteria for vehicle inspections and clean-down ○ Increase the frequency of monitoring for heavy earthmoving machinery

Management Target	Management Action	Monitoring/ Timing/Frequency of Monitoring	Reporting	Contingency Action if Target(s) not Met
• Minimise the degradation of remnant flora and vegetation adjacent to the Development Envelope from dust emissions.	• Implement the following dust management measures as required: ○ Reduce speed limits to 40km/hr on the Right of Way (ROW) ○ Minimise time between trenching and backfilling ○ Safe work method statements (SWMS) / Job Hazard Analysis (JHA) to identify dust risk at time of activity and apply controls (i.e. water cart / truck) ○ Use of a water cart to stabilise stockpiles, when required ○ Limit topsoil stockpile height to less than 2 m in height.	• Weekly Project HSE Inspections to ensure water carts are being used where required and loads are covered during transportation • HSE audit during construction to ensure stockpiles do not exceed 2m in height.	• Project Weekly HSE Inspection Checklist • HSE Audit Report.	• If opportunistic monitoring identifies degradation in health of native vegetation: ○ Identify the likely cause of degradation ○ If dust emissions are confirmed to be the cause of degradation, review and revise dust management measures.

3.2.2 Terrestrial Fauna

Table 3-3 outlines the rationale for the proposed objective-based management indicators, actions and monitoring for Terrestrial Fauna.

Table 3-3: Terrestrial Fauna– objective-based management

EPA Factor/s	**Terrestrial Fauna**
EPA Objective/s	*To protect terrestrial fauna so that biological diversity and ecological integrity are maintained*
Environmental Values	• Fauna habitat and the fauna it supports • Conservation significant fauna individuals.
Key Impacts	• Direct loss or fragmentation of fauna habitat • Direct injury or mortality of individuals as a result of entrapment or interaction with vehicles/machinery • Indirect impact from introduction or spread of feral predators • Indirect impact to fauna habitat from fire ignition • Indirect impact to fauna and their habitat from dust, noise and vibration.
Key Risks	• Unapproved disturbance to conservation significant species • Trench or excavation fauna entrapment • Vehicle and earthworks machinery movements • Attraction of fauna to temporary facilities.

Management Target	**Management Action**	**Monitoring/ Timing/Frequency of Monitoring**	**Reporting**	**Contingency Action if Target(s) not Met**
• Minimise the loss and fragmentation of fauna habitat.	• Ensure all staff and contractors are inducted on land disturbance and clearing requirements prior to commencement of works • All clearing will be managed through an internal native vegetation clearance procedure which includes the following measures to minimise clearing: o Obtain and implement an ACV form prior to clearing o Demarcate the approved clearing boundary using a GPS. Physical demarcation such as flagging tape may also be implemented.	• Weekly Project HSE inspections during construction • Conduct HSE Audit to ensure all native vegetation clearing is conducted in compliance with internal authorisation to clear native vegetation process • Review GIS data for relevancy and to ensure it is up to date • Implement induction on ACV requirements for relevant personnel.	• Project Weekly HSE Inspection Checklist • ACV Register • HSE Audit Report • GIS database • Induction records. •	• Identify the cause of management failure and undertake a critical review of ACV planning, assessment, and implementation • Undertake rehabilitation of cleared and disturbed areas outside of approved extent, in consultation with relevant government agencies, including setting of objectives, targets and measures.
• Minimise the trenching during periods of inundation (i.e. periods of extreme weather or tidal inundation) when conservation significant species have the potential to occur.	• Ensure trenching occurs for a maximum of three weeks • Ensure no trenching occurs during the wet season • The Bureau of Meteorology (BoM) forecasts will be reviewed to avoid construction activities if extreme weather events (such as cyclones) are likely to occur • Tide charts will be reviewed to avoid construction activities during periods of king tides.	• Review of BoM forecasts on a daily basis • Review of Tide charts on a weekly basis. • Weekly Project HSE inspections during construction.	• Project Environmental Inspection Checklist.	• If unpredicted inundation occurs cease construction activities
• Minimise direct impacts to native fauna including injury or mortality from entrapment or collision with vehicles and machinery.	• All staff and contractors shall be required to undertake an environmental awareness induction prior to commencement of works • Implement Fauna Interaction Procedure including: o Reducing speed limits (40 km/h on the rock causeway during construction and 60 km/h during operations) o Minimising travel in dawn and dusk periods o Ensuring no clearing outside of authorised clearing areas o Ensuring vehicles stick to existing tracks as much as possible o Implementation of fauna interaction controls (minimise handling, release ASAP to safe location, report all handling events) o Utilising trained personnel in fauna handling	• Annual fauna interaction review to confirm no non-compliances with the Fauna Interaction Procedure • All fauna interactions captured as an event and reported for later review • Weekly Project HSE inspections to verify completion of twice daily fauna trench clearance reports HSE field audit to ensure any evidence of fauna impacts are identified and actioned.	• INX Event Reports • Project Weekly HSE Inspection Checklist • HSE Audit Report • Fauna Management Report.	• If conservation significant species are observed, they will be given the opportunity to move from the work area. If the conservation significant species will not move away from the work area, clearing will either be delayed or they will be relocated by a trained fauna handler, in consultation with DBCA as required • If trench inspections note increased numbers of fauna injury or death, trench inspections frequency will be increased

Management Target	Management Action	Monitoring/ Timing/Frequency of Monitoring	Reporting	Contingency Action if Target(s) not Met
	• To minimise the risk of fauna entrapment in trenches, implement the following trench management controls: ○ Trenching will occur for a maximum of three weeks ○ Twice daily trench inspections within three hours of sunrise and the second inspection between the hours of 3:00 pm and 6:00 pm of that same day ○ Trenches will be battered at 1H:1V to enable fauna egress ○ Installation of fauna egress points and / or refuges at intervals not exceeding 100 m ○ Completion of a fauna inspection within 30 minutes prior to lowering in/backfilling operations commencing.			
• Minimise changes to pest predator abundance within and adjacent to the Development Envelope.	• All relevant personnel and contractors will be inducted on feral animals and waste management, including: ○ Incident reporting ○ Food hygiene ○ Waste management • The Waste Management Procedure will be implemented. This includes requirements for: ○ Segregation of waste streams as far as possible ○ Covering over skip bins (except scrap metal) to prevent fauna attraction ○ Minimisation of wastes where possible (reduce, reuse) ○ Ensuring the labelling of receptacles ○ Frequent waste contractor removal of wastes to prevent build up ○ Additional waste storage available in case of severe weather • All waste shall be captured and stored and disposed of by a license contractor to a licensed waste facility • Food hygiene measures will be implemented during construction so as not to attract pest predators • Where there is a measurable increase in observations of pest predators within the Development Envelope, pest predator control will be undertaken within and adjacent to the Development Envelope in co-operation with regional control programs, if applicable.	• Weekly Project HSE Inspections to ensure site hygiene measures are adhered to, including assurance that all waste is inaccessible to pest predators • Opportunistic observations of pest predators.	• Project HSE Checklist • Fauna interaction records/data • Contractor supplied waste records/receipts.	• If opportunistic feral fauna sighting records show an increase in fauna occurrence over an extended period during construction, investigate cause and establish further mitigation measures including: ○ Targeted control measures in consultation with DBCA; and / or ○ Staff training and reinduction if measures are not implemented or incident reporting indicates management processes are not being followed, i.e. access to no-go zones.
• Minimise native fauna disturbance as a result of dust, noise and/or vibration.	• All staff and contractors shall be required to undertake an environmental awareness induction prior to commencement of works • Implement noise and vibration management measures including: ○ Compliance with statutory requirements ○ Implement dust management measures as per flora and vegetation objective-based management Table 3-2.	• Weekly Project HSE inspections.	• Project Weekly HSE Inspection Checklist • Incident Reports • HSE Audit Report.	• Modify management actions to reduce noise and dust emission levels during construction.

3.2.3 Inland Waters

Table 3-4 outlines the rationale for the proposed objective-based management indicators, actions and monitoring for Inland Waters.

Table 3-4: Inland Waters – objective-based management

EPA Factor/s	**Inland Waters**
EPA Objective/s	*To maintain the hydrological regimes and quality of groundwater and surface water so that environmental values are protected*
Environmental Values	• Surface water and groundwater.
Key Impacts	• Surface water contamination from contaminated groundwater • Surface water or groundwater contamination from hazardous materials • Erosion and increased sediment load.
Key Risks	• Contaminated groundwater • Hazardous chemical use including hydrocarbons, and sewage • Hazardous waste storage • Transport of hazardous chemicals • Poor stockpiling of topsoil.

Management Target	**Management Action**	**Monitoring/Timing/Frequency of Monitoring**	**Reporting**	**Contingency Action if Target(s) not Met**
• Minimise the risk to surface and groundwater from contamination, including from spills or loss of hazardous materials.	• Any spills shall be contained as soon as possible and clean up actioned as soon as feasible • Avoid hazardous materials handling within 100 m of watercourses such as refueling of machinery and vehicles • Minimise amount of chemicals stored onsite • All chemicals used shall be transported, stored, handled and disposed of in accordance with the requirements of the relevant legislation and industry standards and Hazardous Materials Storage and Handling Procedure, which includes the following controls: ○ Safety Data Sheets (SDS) available onsite ○ Chemical Register available onsite ○ Spill kits in heavy vehicles and at all storage locations ○ Licensed DG transport personnel and contractors (includes waste contractor) ○ Use of drip trays during refuelling/vacuum removal from tanks ○ Self-bunded / contained storage vessels in line with AS1940 (including alarms where possible) ○ Bunding/self-containment of equipment (i.e. generators) ○ Signage ○ ChemAlert subscription including risk assessment, maximum storage volumes and approval process. • Personnel shall be aware of and abide by requirements of the Oil Spill Response procedure that sets out the: ○ Response to spills, the 3C approach – control, contain, cleanup ○ Escalation requirements for emergency level spills • Implement Waste Management Procedure which sets out the controls for waste onsite and the disposal process including the: ○ Licensing of waste contractor ○ Segregation of waste streams including hydrocarbon waste and batteries. ○ Bunding or containment of liquid wastes • Frequent removal of waste product to minimise waste hydrocarbon storage time onsite (vacuum truck)	• Weekly Project HSE Inspections • Opportunistic event reporting of spills • Waste Transfer Monitoring to confirm that all wastes have been removed by a licensed contractor	• Project HSE Inspection.	• Identify cause of surface and/or groundwater contamination and undertake critical review of management actions, including assessing the suitability of alternative actions and implement them • Site remediation plan will be prepared and implemented.

Management Target	Management Action	Monitoring/Timing/Frequency of Monitoring	Reporting	Contingency Action if Target(s) not Met
• Minimise risk of erosion and increased sediment load in surface water.	• Ensure all vehicles remain on existing tracks where possible • Implement erosion controls on stockpiles (where required) • Rock armouring will be placed strategically around the metering station and inlet facility to reduce the potential for erosion.	• Weekly Project HSE Inspections to identify evidence of subsidence and/or erosion.	• Project Weekly HSE Inspection Checklist.	• Identify cause of erosion and/or increased sediment load and undertake critical review of management actions, including assessing the suitability of alternative actions and implement them

3.2.4 Social Surroundings

Table 3-5 outlines the rationale for the proposed objective-based management indicators, actions and monitoring for Social Surroundings.

Table 3-5: Social Surroundings– objective-based management

EPA Factor/s	**Social Surroundings**
EPA Objective/s	*To protect social surroundings from significant harm*
Environmental Values	• Aboriginal cultural heritage • Amenity.
Key Impacts	• Impacts to unrecorded Aboriginal sites • Impacts to amenity of surrounding landscape from dust, noise, and vibration.
Key Risks	• Clearing in unapproved areas • Vehicle and earthworks machinery movements.

Management Target	**Management Action**	**Monitoring/Timing/Frequency of Monitoring**	**Reporting**	**Contingency Action if Target(s) not Met**
• Minimise impacts of dust, noise and vibration on sensitive receptors.	• All staff and contractors shall be required to undertake an environmental awareness induction prior to commencement of works • Implement dust, noise and vibration management measures including: ○ Compliance with statutory requirements ○ Implement dust management measures as per flora and vegetation objective-based management Table 3-2.	• Weekly Project HSE Inspections	• Project Weekly HSE inspection checklist • Incident Reports • HSE Audit Report.	• Modify management actions to reduce dust, noise, vibration emission levels.

3.2.5 Fire

Table 3-6 outlines the rationale for the proposed objective-based management indicators, actions and monitoring for Fire.

Table 3-6: Fire – objective-based management

EPA Factor/s	**Flora and Vegetation, Terrestrial Fauna**
EPA Objective/s	• To protect flora and vegetation so that biological diversity and ecological integrity are maintained • To protect terrestrial fauna so that biological diversity and ecological integrity are maintained.
Environmental Values	• Native vegetation • Fauna habitat.
Key Impacts	• Direct loss or fragmentation of native vegetation • Direct loss or fragmentation of fauna habitat.
Key Risks	• Ignition from vehicles, hot works (grinding, welding, etc.) or other activities (smoking etc.).

Management Target	**Management Action**	**Monitoring**	**Timing/Frequency of Monitoring**	**Reporting**	**Contingency Action if Target(s) not Met**
• Minimise the risk of bushfires occurring as a result of construction activities, including hazardous material spills.	• Abide by all Bushfire Regulations including total fire ban requirements (conduct daily checks on fire danger rating for daily prestart) • All activities shall be conducted in accordance with relevant fire restrictions (local, state), notifications and permitting procedures. This includes: ○ Designated smoking areas ○ All plant and equipment comply to fire safety standards ○ High gas risk areas are demarcated and signed ○ Inductions include fire risks (hot works and smoking) ○ Selected personnel are trained in responding to fires ○ Appropriate, maintained firefighting equipment is available at all times ○ All prohibited items are kept away from hazardous areas ○ Permit to Work and Hot Works Certificate including gas testing for hazardous areas as per the Hot Works Procedure • Minimise amount of chemicals stored onsite • Any spills shall be contained as soon as possible and clean up actioned as soon as feasible to reduce risk of bushfires • All chemicals used shall be transported, stored, handled and disposed of in accordance with the requirements of the relevant legislation and industry standards and Hazardous Materials Storage and Handling Procedure. In addition to the above, an OSCP have been prepared by the Proponent and will be implemented during construction. • Personnel shall be aware of and abide by requirements of the Hazardous Materials Storage and Handling Procedure and the OSCP that sets out: ○ Response to spills, the 3C approach – control, contain, cleanup ○ Escalation requirements for emergency level spills ○ Alarms on waste oil storage units (above ground) ○ The implementation of best practice provisions including, but not limited to: ▪ SDS available onsite	• One HSE System audit during construction to verify all conditions for firefighting equipment, notifications and total fire ban monitoring are implemented • Weekly Project HSE Inspections or Facility HSE Inspections to: ○ verify that firefighting equipment are in place and that 90% are tagged in date ○ ensure suitable spill response equipment is in place	• Weekly Project HSE Inspections during construction • HSE Audit once during construction	• Project HSE Inspection Checklist • HSE Audit Report	• Advise relevant government agencies of any fires caused by project activities, if confirmed • Review management actions, including assessing the suitability of alternative actions and implement them • ERP, OSCP and Hot Work permit procedures will be reviewed.

Management Target	Management Action	Monitoring	Timing/Frequency of Monitoring	Reporting	Contingency Action if Target(s) not Met
	▪ Chemical register available onsite ▪ Spill kits in heavy vehicles and at all storage locations ▪ Use of drip trays during refuelling / vacuum removal from tanks ▪ Bunding/self-containment of fixed plant and equipment (i.e. generators) ▪ All liquid chemical waste disposal includes bunding during storage. ▪ Ensuring secondary containment is in place ▪ Labelling all containers ▪ ChemAlert subscription including risk assessment, max storage volumes and approval process ▪ Frequent removal of waste product to minimise waste hydrocarbon storage time onsite (vacuum truck) ▪ Bund valves locked in closed position (default position).				

4. ENVIRONMENTAL MANAGEMENT SYSTEM

This section describes the documented systems and processes of the Environmental Management System (EMS) used for the safe construction of the Proposal. The Proponent will implement the EMS to conform with the overarching DBNGP construction. The EMS ensures that hazards are identified and assessed to eliminate or minimise the risk to the environment to a level that is ALARP throughout construction of the Proposal.

4.1 Induction and Training

All staff and contractors shall be required to undertake an environmental awareness induction prior to commencement of works on the Proposal. The environmental awareness induction is targeted to educate staff and contractors regarding the Proponent's environmental objectives and their individual responsibilities for environmental management.

The induction additionally ensures that all personnel are capable of implementing the JHA process to identify and manage risks.

All visitors or short term workers to a location receive a site-specific induction appropriate in length and content for the type of work being undertaken.

Employees will be trained and provided with appropriate resources to ensure compliance with environmental laws, codes and standards and company policies. These additional specific training needs are addressed on an as needs basis. The Proponent will maintain a record of training for all personnel.

4.2 Job Hazard Analysis and Take 5

The Proponent enables site-based risk assessment via the use of either one of two tools: Take 5 (a mini risk assessment) or JHA (a detailed risk assessment). The appropriate tool to use will vary dependent upon the number of job steps and hazards requiring assessment and control.

Both the Take 5 and JHA tools require Personnel to:

- Communicate as a work party
- Discuss the task to ensure a common understanding
- Identify hazards with potential for an adverse impact
- Establish and implement controls to mitigate risk of harm
- Evaluate residual risk and agree as a work party that it is acceptable
- Consider the risk assessment regularly throughout the delivery of the task, especially after breaks
- Revise the risk assessment whenever a new job step or hazard is identified.

The JHA and Take 5 Procedure sets out the protocol for the completion of a JHA or Take 5. All personnel conducting work at any Perdaman Lateral Project site must be inducted regarding these key risk management tools.

On completion of the job, the JHA is to be sent to the DBNGP Planning department for filing within a work order tracking system, so it can be referred to in the future when the job, or a similar type of job, occurs again.

4.3 Incident Management

It is a mandatory requirement for any and all personnel working for or on behalf of the Proponent to respond to all hazards and events that have affected or have the potential to adversely affect the environment.

Examples of such events include: odour emissions, fuel spillage, excessive noise incidents, chemical spills or a complaint from a neighbour.

The first line of response is to take immediate actions to minimise risks to persons, plant, equipment and the environment. These actions may include:

- Stop work
- Assess site and make the area safe
- Notify other parties that may be affected by the Hazard / Event.

Following this, incidents must then be classified and reported on in accordance with the Risk Classification Matrix contained within the HSE Event Reporting and Investigation. The level of analysis required will vary dependent upon the level of risk associated with the event.

At a minimum reporting will require documentation of all details, notification of key stakeholders in accordance with the event classification and determination of corrective actions with due dates and accountabilities.

Event reporting is conducted and recorded via InControl a tailored software system purchased from INX Cube Consulting. InControl facilitates the communication of events, tracking of corrective actions and the analysis of trends. All significant events may be subject to an ICAM investigation, led by a suitably qualified Lead Investigator, as mandated by the HSE Event Reporting and Investigation Procedure (S-PRO-014).

Actions arising from incident reports and ICAM investigations shall be monitored (via InControl) to ensure their adequate and timely implementation.

The findings of all incident investigations shall be communicated to the business where appropriate to increase awareness and prevent recurrence.

4.4 Reporting

4.4.1 External reporting

The requirements for external reporting are summarised in Table 4-1. The Proponent shall ensure that all relevant parties are informed of any significant incident verbally within 2 hrs (or as early as possible) and then in writing within 3 days.

A Significant Environmental Incident is an event which:

- May but does not necessarily result in any permanent damage to the environment but requires the use of additional personnel or contractors external to the site and additional remediation equipment; or
- The regulatory authority deems as notifiable; or
- Is likely to result in wide spread public complaints and anger.

External notifications of significant incidents shall be carried out by the designated responsible person in accordance with the Event Reporting and Investigation Procedure.

DEMIRS may be contacted via the petroleum environment email address petroleum.environment@demirs.wa.gov.au.

Additionally, where an incident impacts on a reserve set aside for conservation purposes or a national park or may have significant or material environmental impact the appropriate regional office of DWER is to be informed.

If an incident occurs contrary to conditions set out in any of the Ministerial Statements DWER shall also be notified.

Contact details for all agencies, including regional offices, that may need to be contacted in the event of an emergency, are specified within the DBNGP Emergency Response Plan.

Table 4-1: DBNGP external incident reporting / notification requirements

Requirement	Reference	Agency	Timeframe
Where an incident causes or threatens to cause serious[1] or material[2] environmental harm.	*EP Act*	DWER	As soon as practicable
Recordable Incidents: Any incident arising from the activity that breaches a performance objective or standard identified in the DBNGP EP (and is not a reportable incident) shall be reported monthly, on or prior to the 15th day of each month.	*PP Act* PP(E)R	DEMIRS	Monthly, on or prior to the 15th day of each month. A Nil report shall be provided where no events occur.
Reportable Incidents: *Consequence based:* Where an unplanned event is identified to have caused (or have potential to cause) an adverse environmental impact	*PP Act* PP(E)R	DEMIRS	As soon as practicable but not later than 2 hours after the operator becomes aware of the reportable incident. A written report shall be submitted within 3 days after the first occurrence of the reportable incident
Reportable Incidents: *Additional Reporting Requirements:* • Spills of hydrocarbons or hazardous materials in excess of 80 L to the sea or inland waters; Spills of hydrocarbons or hazardous materials in excess of 500 L in other areas • Spills of hydrocarbons or hazardous materials that affect a ground surface area greater than 100 m^2 • An unplanned gaseous release to atmosphere 500 m^3 or more • Death or injury to individual(s) from a Listed Species during an activity • Unplanned impact caused to a matter of national environmental significance (NES) during an activity (as per the EPBC Act).	*PP Act* PP(E)R	DEMIRS	As soon as practicable but not later than 2 hours after the operator becomes aware of the reportable incident. A written report shall be submitted within 3 days after the first occurrence of the reportable incident
Known contaminated sites	*Contaminated Sites Act 2003*	DWER	Within 21 days of first knowing the site is contaminated
Suspected contaminated sites	*Contaminated Sites Act 2003*	DWER	As soon as is reasonably practicable

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[1] *Serious Environmental Harm: environmental harm that:*
(a) is irreversible, of a high impact or on a wide scale
(b)is significant or in an area of high conservation value or special significance
(c) results in actual or potential loss, property damage or damage costs of an amount, or amounts in aggregate, exceeding 5 times the threshold amount (i.e. $100,000).
[Environmental Protection Act 1986, s 3A(1)]

[2] *Material Environmental Harm: environmental harm that:*
(a) is neither trivial nor negligible; or
(b) results in actual or potential loss, property damage or damage costs of an amount, or amounts in aggregate, exceeding the threshold amount ($20,000);
[Environmental Protection Act 1986, s 3A(1)]

Recordable incidents shall be reported on a monthly basis and the following details shall be provided:

- Type of incident
- All material facts
- Actions taken to avoid and mitigate impacts of the incident
- Corrective action applied.

Reportable incidents shall be addressed through documentation of and submission of the following:

- Facility name
- Pipeline title
- Location of incident
- Name of operator
- Names and contact details of witnesses
- Name and contact details of report submitter
- Description of the incident
- Work activity undertaken at time of incident
- Quantity and composition of spilled/vented material
- Duration of spill/vent
- Extent of impact
- Immediate actions taken
- Arrangements for internal investigation
- Corrective actions applied.

4.4.2 Compliance Reporting

Annual Compliance Reporting will be undertaken for the Proposal in line with regulatory requirements and relevant guidance documentation. The annual reports will document compliance with applicable approval conditions imposed on the Proposal as well as requirements stipulated in this CEMP.

4.5 Emergency Preparedness and Response

The Proposal shall feed into the Proponent's Emergency Response Process. The Proponent has three tiers of emergency and crisis response: Incident, Emergency and Crisis Response (Figure 4-1).

The ERP provides for an Emergency Management Team (EMT) and an Incident Management Team (IMT) who are responsible for managing emergencies and minor incidents.

The contractor's local area emergency response plan specifies the assignment of particular responsibility and provisions for Proposal related emergency response requirements and interfaces with the Proponents ERP.

The Crisis Management Plan (CMP) establishes the Crisis Management Team (CMT) which is responsible for managing Crisis events, being those that are likely to be associated with personnel, public safety, supply, pipeline license or Proponent reputation issues.

In the event that an emergency deteriorates and can no longer be managed effectively by the EMT the CMT would be activated.

4.5.1 Emergency Response Plan

The emergency response processes (including storage of emergency response equipment) have been designed to effectively respond to all foreseeable emergency events as identified in various risk assessments (e.g. JHA's) and from DBNGP experience.

The ERP is in place to manage events and emergencies so as to limit the consequences of such events so as to:

- Minimise or eliminate danger or risk to individuals
- Minimise or eliminate any risk to the business
- Ensure that the Proposal is retuned efficiently to a safe condition with minimum impact to suppl of gas and the environment.

The Perdaman Lateral Project ERP consists of:

- All Hazards Plan (framework) which specifies the arrangements for:
  - Incident escalation
  - Incident and emergency management structures
  - Roles and responsibilities of IMT and EMT and their interface
  - IMT and EMT interface with Crisis Management Team
  - Display of emergency information including incident/emergency management logs
  - Changeover of responsibilities
  - Emergency operations centre locations
  - Emergency Procedures, Contingency Plans and Work Instructions
  - Emergency Equipment Management Plan
  - Contacts Directory
  - Notification and reporting requirements.

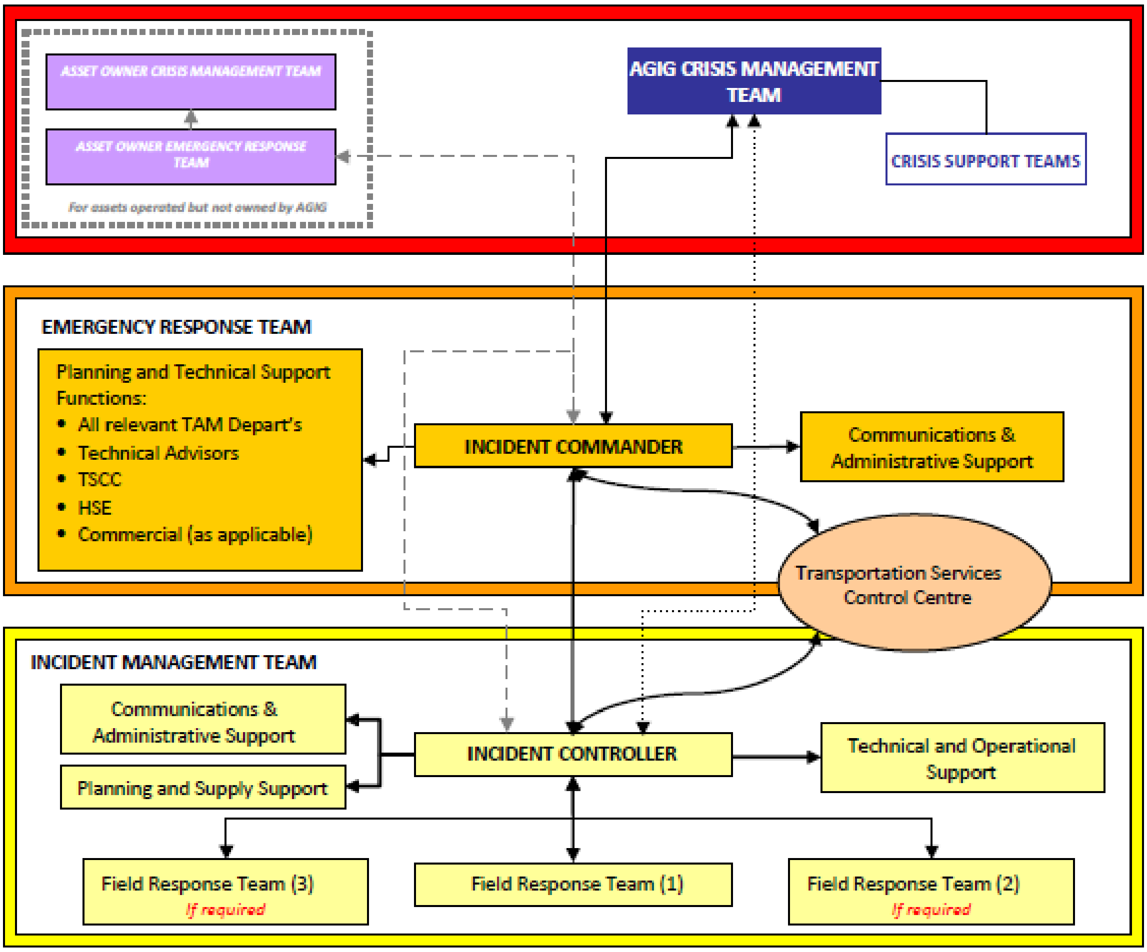

Figure 4-1: Emergency & Crisis Teams – Structures

The Proponent's ERP operates on a risk-based incident escalation and notification structures as shown in Table 4-2. These structures describe the escalation of an event to an emergency, which triggers the activation of the Proponent's ERP (see Table 4-2). Depending on the severity of an emergency, the Crisis Management Plan may also be activated.

Table 4-2: Levels of emergencies and categories

Incident	Emergency	Crisis
Injury		
• Minor injury only.	• Severe injury.	• Fatality or fatalities • Multiple injuries.
Operational Impacts		
• No interruption or curtailment of supply • Minor damage to equipment.	• Short term interruption or curtailment within contractual limits • Moderate damage to equipment, may require repair or replacement.	• Extensive interruptions or curtailment • Declaration of Force Majeure • Declaration of Gas Supply System Emergency • Major damage to equipment.
Environmental Impacts		
• Short term impact without lasting effects.	• Serious impact with medium to long term effects.	• Major offsite impact; long term severe or permanent effects; rectification required.
Community / Government / Reputation / Social / Cultural / Heritage		
• Public concern restricted to local complaints • Minor infringement of cultural heritage – repairable.	• Attention from Media • Ongoing social issues or concerns from local community • Permanent damage to items of cultural or heritage value.	• Serious social issues with State political ramifications • Significant damage or infringement of cultural heritage with widespread public outcry.

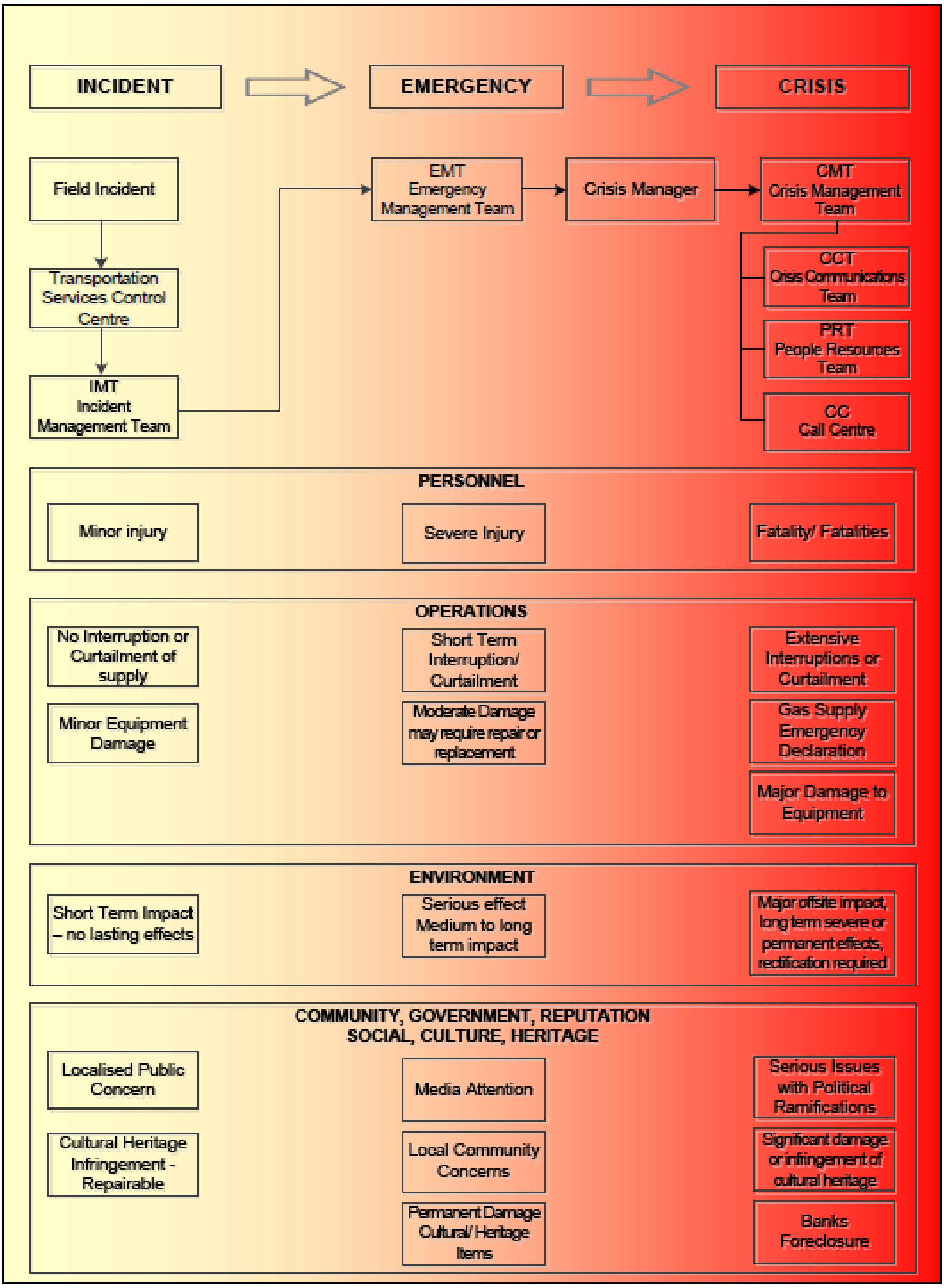

Figure 4-2 Emergency & Crisis Management Teams – Flowchart

4.5.2 Emergency Training

All field personnel are trained and competent in Senior First Aid/Remote Area First Aid, Fire Fighting and 4WD Driving. The performance of the tasks associated with Emergency Procedures for the pipeline and associated facilities are an extension of normal work practices and as such the personnel are trained on a regular basis to perform those tasks. Selected personnel also conduct competency-based training in the completion of emergency response through regular emergency exercises.

Emergency exercises are conducted annually to assess the emergency response capabilities of the various teams by providing exercises at levels up to and including crisis. The level of escalation may vary from one exercise to another. All exercises include at least activation of the IMT and EMT.

The key roles in the response and recovery processes are the Incident Commander (GM Transmission Asset Management or delegate) and Incident Controller (GM Transmission Operations or delegate).

4.5.3 Emergency Preparedness and Management

The Proposal's Construction Team assesses each Proposal activity and potential external factors or influences that may give rise to identifiable emergency conditions. Systems will then be established and assigned priority to prevent, manage or mitigate emergency events, i.e. awareness of general fire restrictions, permit to work systems requirements, adverse weather monitoring etc.

The preparation for emergency response also includes an assessment of the probability of the type of emergency events identified through the hazard identification process.

The Proposal's emergency planning and procedures will reference:

- Communications/alarm systems
- Emergency equipment
- Emergency reporting and support contact information
- Frequency of emergency response drills/exercises
- Muster points
- Provisions to account for personnel on site
- Response to specific emergency situations
- Specific responsibilities.

4.5.4 Crisis Management Plan

The Proponent's details the roles and responsibilities of the CMT. Events that will trigger the activation of the CMT are likely to be associated with personnel, public safety, supply, licence or reputation issues.

The function of the CMT is to manage a crisis at a strategic level. Once activated, the CMT will receive input from all groups involved in the crisis. The operational crisis or the event is monitored and assessed for the impact on the Proponent's statutory and legal obligations, shipper contracts and its corporate reputation.

4.6 Roles and Responsibilities

All staff are responsible for the environmental performance of their activities and for reporting any environmental hazards and incidents. Environmental responsibilities for staff and contractors are contained within position descriptions, relevant procedures and work instructions. Overarching roles and responsibilities are described in Table 4-3 below.

Table 4-3: Key environmental responsibilities

Position Title	Environmental Responsibilities
Executive Leadership Team	• Hold overall responsibility for environmental management of the Proposal • Review, understand, approve and support implementation of this plan • Ensure adequate resources are provided for the implementation of this plan.
Executive General Manager Transmission Asset Management (EGM TAM)	• Ensure that environmental obligations are embedded into design of the Proposal and the Proponent's systems and processes for satisfying compliance and due diligence requirements • Ensure that proposed Proposal additions and alterations obtain all necessary environmental approvals • Manage and coordinate emergency response in accordance with the Proposal's ERP.
Executive General Manager Commercial (EGM Comm)	• Ensure environmental obligations are embedded into the operation and dispatching of the plant. • Control Room operators are adequately trained to carry out the dispatching of the plan efficiently • Manage and coordinate the emergency responses from the control room in support of the ERP and CMT • Drive fuel efficiency operation of the plant • Conduct construction in line with commitments in the GHG Management Plan.
Relevant Managers	• Ensure construction personnel training plans reflect the environmental duties and the training is carried out • Ensure this plan is embedded in an Asset Management tool • Ensure incident reporting protocols are followed and that all personnel report Events/Hazards and near misses • Respond to environmental incidents as required.
Environment Manager - Transmission	• Monitor implementation of and compliance with the CEMP and environmental risk assessment recommendations • Facilitate and monitor EP Reviews • Coordinate, undertake and conduct reviews of audit reports and monitor completion of required corrective actions • Report significant environmental non-conformances with the CEMP and legislation internally to the Proponent's Executive Management Team and externally to regulatory authorities, as required • Ensure all environmental obligations are added to the DBNGP Master Obligations Register and are kept current in that register • Monitor compliance against environmental obligations • Manage the ACV permit process • Assess changes to legislation and regulatory requirements and update the CEMP as required to ensure ongoing compliance • Identify changes to construction and update the CEMP to address and manage any new environmental risks • Review and maintain the CEMP to incorporate any internal changes including organisational and process changes • Provide assistance and/or advice regarding implementation of the CEMP and any other environmental management concern • Liaise with government agencies regarding environmental issues

Position Title	Environmental Responsibilities
	• Assess environmental incidents to determine regulatory reporting requirements.
Head of Transmission Engineering	• Ensure that any engineering works are undertaken in compliance of the requirements of the CEMP • Ensure the Proposal Management Office conducts works in compliance to the CEMP • Ensure the Proposal handover process has the CEMP obligations embedded into the handover.
Head of Land Management	• Liaise with landholders, traditional owners, community representatives, contractors, councils, planning and local government authorities as well as utilities and infrastructure owners on land management and environmental matters as required • Report on, and address as required, existing and emerging Native Title and Cultural Heritage issues.
Person In Charge (PIC)	• PIC is the onsite role to manage and conduct onsite works including inspections, permitting, daily rounds and planned and corrective maintenance tasks • Ensure all personnel working onsite aware of Stop Work Authority • Ensure risk assessment processes are implemented prior and during work activities • Onsite leadership and management for personnel, contractors and visitors • Conduct or delegate site specific induction requirements • Conduct or delegate site testing / sampling requirements in line with approved plans and procedures • Provide incident management and reporting advise to personnel.
Training Manager	• Facilitate the maintenance, implementation and ongoing improvement of training and induction programs.
All Personnel	• Read, understand and implement the control measures detailed within Section 3 of this plan • Report all observed non-conformances to a supervisor • Report all observed incidents, hazards and near misses • Understand requirements for response to an environmental incident or hazard • Participate in environmental training and emergency response exercises. • Continually seek to identify areas for improvement of environmental management and report these to the HSE Manager.

5. ADAPTIVE MANAGEMENT AND REVIEW

5.1 Inspections and Audits

5.1.1 Weekly HSE Inspections

HSE Inspections shall occur weekly during construction and assist assessing compliance to the CEMP and regulatory approvals. Planning, controlling and monitoring construction activities are considered essential in ensuring those activities are effectively and efficiently performed. Proposal HSE Inspections are performed at least weekly and include the following environmental aspects:

- Evidence of any spills or leaks
- Evidence of mobilisation of contaminated soils
- Security, lighting and signage of the facility
- Appropriateness of chemical storage (volume, storage type, availability of SDS)
- Evidence of subsidence or erosion
- Impacts to flora and fauna are as per Proposal approvals
- Waste management
- Weed and vegetation control.

All issues identified must be recorded, investigated and action implemented to prevent the issue recurring.

5.1.2 HSE Audits and Field Evaluations

The HSE Audit and Evaluation Procedure sets out the process for conducting internal HSE audits. Ultimately, the objective of this process is to provide a framework that ensures the implementation and effectiveness of the Proponent’s HSE management system.

There are two levels of assessment used to verify the implementation and effectiveness of the Proponent’s HSE management system, these are:

- System Audit: An in depth and targeted assessment against specific criteria, established to assess compliance against a strategic audit objective
- Field Audit: A high level and systematic assessment against generic criteria, tailored to evaluate ongoing compliance against key system indicators.

The HSE Manager must monitor the frequency and scope of field audits completed and where there is concern that insufficient coverage is achieved, take steps to schedule targeted field audits to address this.

5.2 Non-conformances and Corrective Actions

Non-conformances from audits, inspections, regular monitoring or response testing will be communicated to the relevant internal and external stakeholders. Findings will be recorded, managed, and closed-out via InControl procedure using the InControl User Guide (S-GUI-023-3).

Corrective action requests are raised to facilitate the investigation and implementation of corrective actions where non-conformances or deviations from specified requirements have been identified.

Opportunities for improvement are raised where management systems are implemented in accordance with specific requirements, but opportunities to improve the system have been identified.

5.3 Document Control

The HSE Manager is responsible for the maintenance of all HSE documentation to ensure that they:

- Have an identifiable owner responsible for ensuring document updates as required
- Be clearly identifiable via a standard naming protocol and unique identifier
- Be subject to periodic review via a consultative process
- Be readily available to all Personnel (as required) with obsolete versions removed and retained on.

The HSE Document Control Procedure sets out the process for this. At the time of writing all HSE documents are managed, communicated to Staff and stored using InControl. The TAM Document Controller, jointly with relevant document authors/owners, is responsible for implementing the Document Control and Records Management Procedure (TEB-003-0016-01) which describes the method for controlling documents and management of data relating to asset management and Proposal management, and all Safety Cases.

The policy is applicable to all documents produced by TAM including policies, procedures, work instructions, and drawings, whether in hardcopy or electronic format, associated with management of the Proponents Assets (including DBP Development Group (DDG) assets).

Other relevant records, while not extensively referenced in this document, may be managed by the dedicated document control process which exists for the Maintenance and Commercial divisions as follows:

- Maintenance – Maintenance related work instructions are managed through DBNGP Work
- Instruction Administration Procedure (DBP-PR-ADM-004) by the Technical Writer
- Commercial – Pipeline Operations related documented are created and managed through the Document Control Procedure (TSD-PR-GEN-OPS-UNI-002) by DBP Transportation Services Control Centre. However, document numbers are issued by the TAM Controller.

6. STAKEHOLDER CONSULTATION

The proponent is committed to ongoing stakeholder engagement and communication throughout the Proposal's approval process, construction, operation and closure stages.

The purpose of stakeholder consultation is to:

- Obtain appropriate input into the ongoing improvement of this CEMP
- Keep key stakeholders up to date with the Proponent's activities
- Ensure timely response to landholder issues
- Maintain dialogue with regulatory authorities.

Recent consultation with key regulators is described below:

- Consultation with DWER (EPA) regarding the appropriate approval pathway, key environmental factors and referral documentation requirements
- Discussions with DPLH regarding site access rights
- DWER licensing and permitting requirements under the *Rights in Water and Irrigation Act 1914* (RiWI Act)
- Consultation with DEMIRS regarding updates to the DBNGP EP to include the Proposal.

Consultation and communication with relevant landholders, regulatory authorities, Aboriginal and other interest groups and the general public will be undertaken as part of the operation activities. The schedule and key messages to be included in the consultation program is governed by the Land Management Plan. All contact with stakeholders will be recorded in the LMS. The Land Management department are responsible for the development and distribution of corporate awareness publications to communicate the details of our environmental commitments to key stakeholders. All other relevant details about land use, foreign crossings, landholder concerns and issues are to be recorded on the LMS for future reference and reporting.

Formal contact with all landholders will be determined relevant to the perceived risk, with ongoing liaison throughout the year. All contacts involve the dissemination of information about the Proponent, discussion of any concerns and education of pipeline safety to increase awareness. This ongoing process is designed to decrease the risk of third party incidents and to encourage ownership of the activities around the pipeline.

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Appendix D: Perdaman Lateral Pipeline Acid Sulfate Soils Management Plan

senversa

Perdaman Lateral Pipeline, Burrup Peninsula

28 August 2024

Acid Sulfate Soil Management Plan

Document Information

Acid Sulfate Soil Management Plan

Perdaman Lateral Pipeline, Burrup Peninsula

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Revision	Date	Author	Reviewed	Approved	Detail
0	22 August 2024	Rebecca Duong	Jeremy Hogben	Jeremy Hogben	Draft for client review
1	28 August 2024	Rebecca Duong	Jeremy Hogben	Jeremy Hogben	Final

Project Manager:	Ashton Betti
Project Director:	Jeremy Hogben

Disclaimer and Limitations:

This document is confidential and has been prepared by Senversa for use only by its client and for the specific purpose described in our proposal which is subject to limitations. No party other than Senversa's client may rely on this document without the prior written consent of Senversa, and no responsibility is accepted for any damages suffered by any third party arising from decisions or actions based on this document. Matters of possible interest to third parties may not have been specifically addressed for the purposes of preparing this document and the use of professional judgement for the purposes of Senversa's work means that matters may have existed that would have been assessed differently on behalf of third parties.

Senversa prepared this document in a manner consistent with the level of care and skill ordinarily exercised by members of Senversa's profession practising in the same locality under similar circumstances at the time the services were performed.

Permission should be sought before any reference (written or otherwise) is made public that identifies any people, person, address or location named within or involved in the preparation of this report. Senversa requires that this document be considered only in its entirety and reserves the right to amend this report if further information becomes available. This document is issued subject to the technical principles, limitations and assumptions provided herein in **Section 8**.

Senversa acknowledges the traditional custodians of the land on which this work was created and pay our respect to Elders past and present.

Contents

Tables in Text

Appendices

List of Acronyms

Acronym	Definition
AASS	Actual acid sulfate soils
AGIG	Australian Gas infrastructure Group
AHD	Australian Height Datum
ASS	Acid sulfate soils
ASSMP	Acid Sulfate Soil Management Plan
CEP	Construction Execution Plan
CoPC	Contaminant of potential concern
DBNGP	Dampier to Bunbury Natural Gas Pipeline
DER	Department of Environment Regulation (former)
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
ESA	Environmental Site Assessment
m bgl	Metres below ground level
MW	Monitoring well
NATA	National Association of Testing Authorities
NEPC	National Environment Protection Council
PASS	Potential acid sulfate soils

1.0 Introduction

Senversa Pty Ltd was engaged by Dampier Bunbury Pipeline (WA) Nominees Pty Ltd, on behalf of DBP, to undertake a baseline assessment at the proposed location of the Perdaman Lateral Pipeline in the Burrup Peninsula, Western Australia (the site). The ESA was completed in August 2024, and titled *Baseline Environmental Site Assessment – Perdaman Lateral Pipeline, Burrup Peninsula* (ESA) (Senversa 2024). The ESA assessed the site for potential contamination in soil and groundwater, and the nature and extent of acid sulfate soils (ASS). The ESA identified the presence of potential ASS (PASS) that may become acidic if disturbed. This Acid Sulfate Soil Management Plan (ASSMP) provides management measures required to mitigate potential impacts to the environment during proposed works within the site.

1.1 Background and Objective

DBP propose to construct an approximate 550 m lateral natural gas pipeline from the Dampier to Bunbury Natural Gas Pipeline (DBNGP) to a proposed urea plant at the Perdaman site on the Burrup Peninsula. The plant, to be constructed and operated by Perdaman Chemicals and Fertilisers as part of the Perdaman Ceres Destiny Project, will be constructed for manufacturing fertiliser via the process of converting natural gas to ammonia, then to urea. Natural gas, delivered via the proposed pipeline, will be the primary constituent of the fertiliser production. The proposed pipeline location is shown on **Figure 1**. The project will require referral to the Western Australian Environmental Protection Authority (EPA).

Three lots (Lots 540, 3013 and 704) that the proposed lateral pipeline covers have been classified by the Department of Water and Environmental Regulation (DWER) as "*possibly contaminated – investigation required*" with restrictions on groundwater abstraction requiring testing prior to its intended use. The classification is due to the presence of ammonia, nitrate and nitrite in surface water and sediments which originates from a nearby ammonium nitrate production facility. As such, dewatering is not proposed for the construction of the pipeline.

The objective of the ASSMP is to develop a management framework to be implemented as part of the pipeline construction methodology in order to reduce risks to the environment that may otherwise result from acidification of disturbed soils at the site.

1.2 Scope of Work

To meet the project objectives, the following scope of work was undertaken and incorporated into this ASSMP:

- Review relevant soil and groundwater results obtained during the ESA.
- Develop management measures to minimise PASS impacts.
- Develop environmental compliance monitoring and reporting requirements, including the provision for an ASS closure report.
- Provide contingency measures.

1.3 Relevant Legislation / Guidelines

The scope of work was completed in general accordance with the following guidelines:

- *Identification and investigation of acid sulfate soils and acidic landscapes* (Department of Environment Regulation [DER] 2015a).
- *Treatment and management of soil and water in acid sulfate soil landscapes* (DER 2015b).
- *Contaminated Sites Act 2003* and *Contaminated Sites Regulations 2006*.

2.0 Construction Summary

The proposed construction methodology for the works is detailed in the document *CEP-T24001-01 Construction Execution Plan: AGIG – Perdaman Pipeline Lateral* (CEP) (Pipecraft 2024). This document has been included as **Appendix A**.

DBP has advised that the pipeline will extend approximately 550 m in length. The CEP includes the following specifications for the proposed pipeline:

- DN400 pipe, indicating 16 inch or approximately 400 mm external diameter.
- Pipe wall thickness of 9.53 mm.
- Constructed of concrete weight coating (CWC).

The pipeline is proposed to be constructed via open trench excavation. The proposed construction methodology, as it relates to disturbance of PASS, is as follows:

- Clearing and grading of the work area.
- Excavation of soils within the pipeline trench.
- Stockpiling of spoil.
- Preparation of the trench bed.
- Installation of pipe.
- Padding of the pipeline with spoil.
- Trench backfill with spoil.

Where excavations extend below the groundwater table, pipe installation is proposed to be undertaken in freestanding groundwater. No dewatering or abstraction of pooled groundwater is proposed. Should the construction methodology change to include dewatering, this ASSMP should be updated to address groundwater management requirements. The general construction layout is shown in **Plate 1** below.

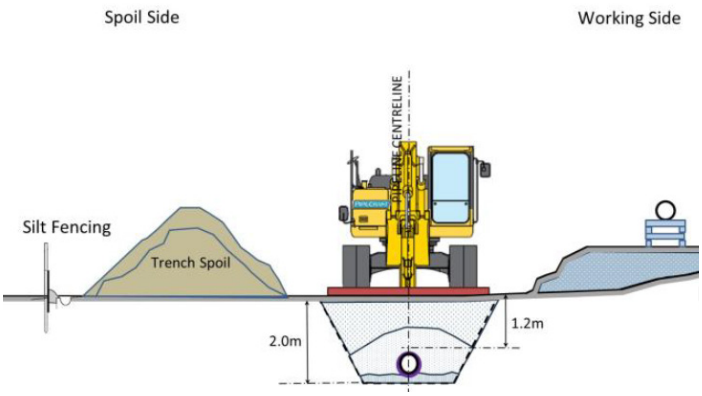

Plate 1: Proposed construction layout (Pipecraft 2024)

The open trench is expected to be battered at a profile of 1:1 on the assumption that the soil encountered will be reasonably cohesive (predominantly estuarine muds), with the occasional presence of cobbles and boulders. Should the encountered soil be less cohesive, the battering will be a reduced incline, at a profile up to 2:1.

An indicative cross-section of the excavation trench is provided as **Plate 2**, with the hatched area indicative of excavated soil. At an assumed battering of 1:1, an assumed base trench width of 1 m, and a total trench length of 550, the total possible volume of excavated soil is calculated to be 2,200 m^3.

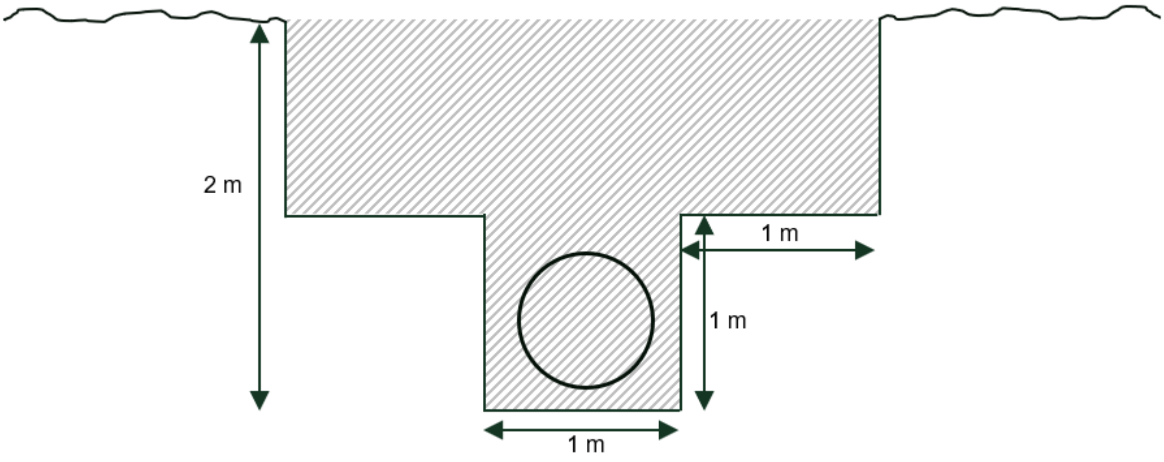

Plate 2: Indicative excavation trench cross-section.

3.0 Site Identification

Site identification details are provided in **Table 3-1**. The site location and boundary are shown on **Figure 1**. Certificates of title are provided in the ESA (Senversa 2024).

Table 3-1: Site Identification Details

Item	Details
Site Address	Burrup Road, Burrup Peninsula,
Certificate of Title (CoT)	Lot 540 on Deposited Plan 221364 (LR3122 / 50) Lot 3013 on Deposited Plan 42282 (LR3139 / 36) Lot 704 on Deposited Plan 411759 (LR3174 / 529)
Site Boundary Coordinates	Site boundary coordinates are provided on **Figure 1**.
Site Area	10,816 m^2
Local Government Authority	City of Karratha
Site Owner	Crown Land, Responsible Agency: Department of Planning, Lands and Heritage Lot 540 – Status: Unallocated Crown Land, Primary Interest Holder: State of Western Australia Lot 3013 – Status: Reserve without Management Order, Primary Interest Holder: State of Western Australia Lot 704 – Status: Reserve without Management Order, Primary Interest Holder: Western Australian Land Authority
Current Zoning	Strategic Industry (City of Karratha Local Planning Scheme No. 8)
Current Site Use	Vacant
Proposed Site Use	Lateral natural gas pipeline
Surrounding Site Use	North: Construction associated with the Perdaman gas plant South: Tidal flats East: Vacant tidal flats West: Burrup Road, followed by tidal flats

4.0 Site Characterisation

The environmental setting attributes of the site and surrounding areas were summarised in the ESA (Senversa 2024). The key attributes relevant to this ASSMP are included in **Table 3-1**.

4.1 General observations

Site access is off Burrup Road, via an unsealed track along the Water Corporation easement. The site is open and unfenced. No infrastructure or development is currently present at the site, nor was there any evidence of historical activities.

The site is aligned parallel to the existing Water Corporation, Telstra and Burrup fertiliser easements, which are located north of the site. An underground optical fibre line runs parallel to and 10 m north of the northern site boundary.

4.2 Topography, Geology, Hydrogeology and Hydrology

Topography

Regional topographic data (Landgate 2024) indicates that the site is predominately flat with an elevation of less than 10 metres in relation to the Australian Height Datum (AHD).

The site was observed to be generally flat during the investigation undertaken in July 2024. No significant undulations were observed. The site slopes gently downwards from east to west, with surface drainage likely flowing into King Bay.

Geology

Regional geological mapping from the 1*:50,000 Western Australia Geological Survey mapping* (Hickman, 1997; Sheet 2256, Dampier) indicates that the superficial geology is mapped to comprise silt and mud in supratidal to intertidal flats and lagoons (Qhmu).

Soils encountered during the investigation undertaken in July 2024 (Senversa 2024) were silty sands, with a higher clay fraction at depths >0.4 metres below ground level (m bgl). The silty sands were typically pale brown, poorly graded, fine to coarse grained, with occasional shell fragments. The deeper silty, clayey sand profile was mottled grey and brown poorly graded, fine to coarse grained, with trace gravel or cobbles.

Hydrogeology

The site is located within the Pilbara – Fractured Rock aquifer, being a non-target aquifer (DoW 2013a). Groundwater recharge is episodic and affected by direct rainfall infiltration in areas where the rocks are fractured. The fractures fill during rainfall and then drain during periods of abstraction or negligible rainfall. Recharge of the fractured rock aquifer also occurs by leakage from surface water flows.

Groundwater is generally in hydraulic continuity with the underlying weathered fractured rock aquifers. Consequently, the most important areas for groundwater resources are where the major surface watercourses traverse the coastal plain. Groundwater salinity is also lowest in these zones.

Groundwater depth measured by Senversa in July 2024 was very shallow, between 0.276 m bgl and 0.376 m bgl. Groundwater flow direction is expected to be in a westerly direction towards King Bay. Groundwater field monitoring indicated that groundwater at the site is near-neutral, hyper-saline, typically presenting aerobic and oxidising conditions.

Hydrology

The site is located within a local topographic low and is expected to receive surface runoff during watershed events. The primary drainage feature in the site locality is the ephemeral drainage feature approximately 50 m south of the site. The drainage feature discharges into King Bay approximately 400 m west of the site. Flow across this feature would be expected under wet season conditions or a falling king tide event.

During the site visit by Senversa in June 2024, the site surface was saturated with up to 50 mm of standing water.

4.3 Heritage

The following information was provided by DBP in relation to Aboriginal heritage:

> *The Traditional Owners were represented by Murujuga Aboriginal Corporation with whom AGIG* [Australian Gas infrastructure Group] *is developing a Cultural Heritage Agreement for this and subsequent projects.*
>
> *Archaeological and Ethnographic Heritage Survey was conducted 17 November 2024. The Traditional Owners preliminary advice indicated there were no sites of importance or significance along the chosen pipeline route although two midden sites were identified in the adjacent pipeline easement. A full report with a clearance was received on 28 March 2024.*

No areas of other heritage signficaince (including European heritage) were identified wthin 500 m of the site.

4.4 Acid Sulfate Soils

Regional ASS risk mapping for the Pilbara Coastline (Landgate 2024) identified that the site is located within an area designated as Level 1 ASS Risk, which is described as *"High to moderate risk of ASS occurring within 3 m of natural soil surface"* as shown in **Plate 3** below.

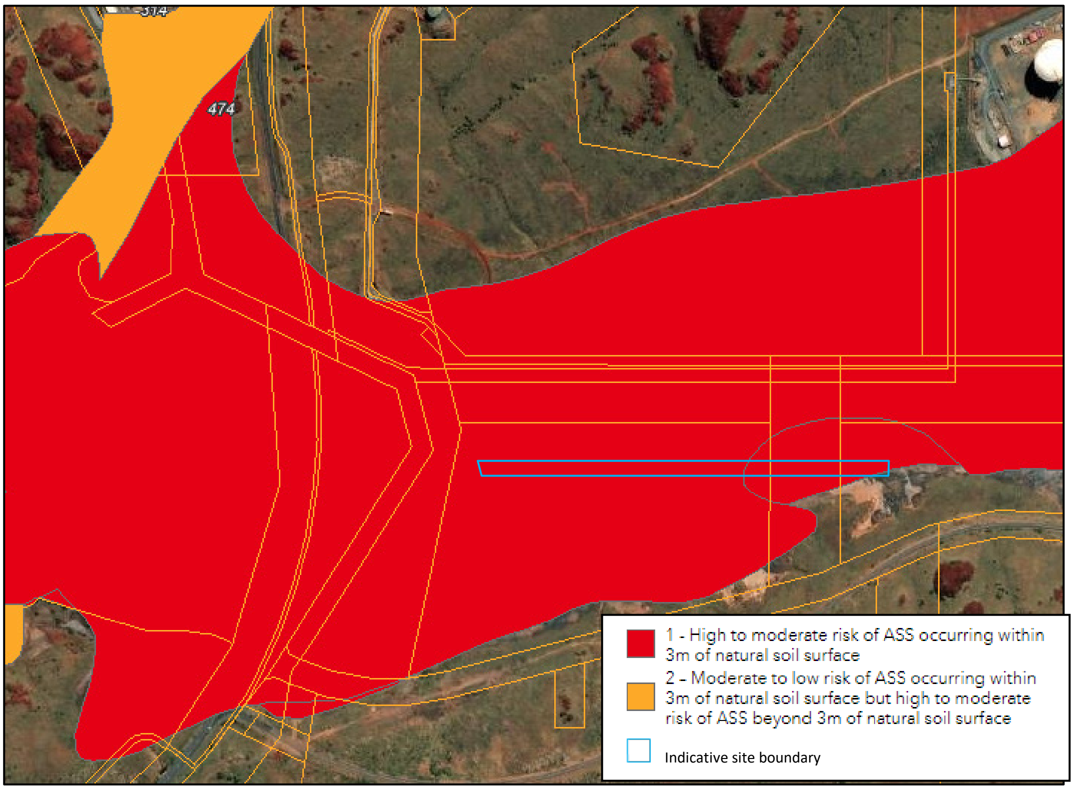

Plate 3: Acid Sulfate Soil Risk Map, Pilbara Coastline (DWER-053) (Landgate 2024).

The presence of PASS in soils in the vicinity of the site is consistent with other investigations undertaken by EnvEng (2020) and Tetra Tech Coffey (2022) who reported net acidity for shallow soil samples that were indicative of PASS.

4.4.1 ASS Investigation Outcomes

The ASS investigation undertaken on 4 July 2024 involved the augering of 12 soil bores to a maximum depth of 1.5 m bgl (metres below ground level). The shallow soil profile (to 1.5 m bgl) was found to be generally consistent across the site, and described as: silty sand, with a higher clay content at depth >0.4 m bgl. Refusal on rock was encountered shallower than 1.5m bgl at some locations. No visual evidence of anthropogenic materials or contamination was identified during the investigation, which was confirmed by the absence of key contaminants of potential concern (CoPCs) in the laboratory analytical results.

Soil lithologies were grouped on their physical characteristics and visual differentiation. Two distinct soil profiles were noted, being pale brown silty sand (SS), present as the uppermost horizon, underlain by mottled grey and brown silty, clayey sand (SS(C)). The soil profile descriptions are provided in **Table 4-1** and will be hereafter used as soil management categories in relation to ASS management.

Table 4-1: Soil Management Categories

Depth (m bgl)	Soil Profile Code	Lithological Description
0.0 – 0.4 m	SS	**Silty sand** • Pale brown, poorly graded, fine to coarse grained. • May include shell fragments. • Typically dry to moist.
0.4 – 1.5 m	SS(C)	**Silty, clayey sand** • Mottled grey and brown poorly graded, fine to coarse grained. • May include trace gravel or cobbles. • Typically moist to wet.

Consistent with DER (2015a), ASS field screening indicators were assessed for field pH (pH_F) and oxidised field pH (pH_{FOX}) results for all 24 samples. Indicators of PASS or AASS were not present in any sample with all pH_F results between pH 8.2 and pH 8.8 and all pH_{FOX} results between pH 6.8 and pH 8.1.

All samples were submitted for Suspension Peroxide Oxidation Combined Acidity and Sulphur (SPOCAS) analysis. The SPOCAS results were used to determine the net acidity of each sample, which is determined from the existing and potential acidity of the soil. DER (2015a) provides a calculation to determine net acidity of a soil:

Net acidity = potential acidity + existing acidity – acid neutralising capacity (ANC), where:

- Potential acidity is calculated from the sulfur trail of the SPOCAS analysis, which gives a measure of the maximum oxidisable sulfur. Potential acidity is reported as peroxide oxidisable sulfur (S_{POS}).
- Existing acidity is calculated from the Titratable Actual Acidity (TAA) of a soil, which measures the soluble and readily exchangeable acidity of a particular soil.
- ANC is a measure of a soil’s ability to buffer against decreases in soil pH (i.e. increased acidity). DER (2015a) states that without confirmatory kinetic testing or modified laboratory methods, ANC cannot be used to reduce ASS management where potential and/ or existing acidity exist.

Therefore:

Net acidity = S_{POS} + *TAA*

The calculated net acidity results for each soil profile are provided in **Table 4-2** below. The DER Action Criteria of 0.03%S was adopted for assessment based on the soil type (medium textured sandy loams to light clays with a clay content of 5% – 40%), and an estimate disturbance of >1000 tonnes of material.

Table 4-2: SPOCAS Results

Soil Management Category		**SPOCAS**		
		TAA	**SPOS**	**Net Acidity (excl. ANCE)**
SS	Min	<0.005	0.007	<0.02
	Max	<0.005	0.150	0.15
SS(C)	Min	<0.005	0.039	0.04
	Max	<0.005	0.255	0.26
Action Criteria (DER 2015)		-	-	0.03
Units	-	*%S*	*%S*	*%S*

The net acidity results indicate that both soil management categories exceeded the DER Action Criteria, which trigger the requirement for ASS management.

The outcomes of the ASS investigation indicated that soil at the site is slightly alkaline with no field indicators of PASS or ASS. However, the majority of soils have a net acidity above the DER Action Criteria of 0.03%S, which indicates that there is the potential for acidification of soils if oxidised.

5.0 ASS Treatment and Management

The outcomes of the ASS investigation indicated that all soils excavated as part of the proposed pipeline construction require treatment for the mitigation of PASS (where disturbed), in accordance with the *Treatment and management of soil and water in acid sulfate soil landscapes* (DER 2015b):

The following management measures should be implemented during intrusive works which result in the disturbance/ excavation of soils within the investigation area.

- Soil treatment should be undertaken on a treatment pad.
  - The treatment pad should consist of a minimum 300 mm thickness compacted limestone base (or other neutralising material).
  - The treatment pad should have bunded edges to prevent leachate runoff.
- Soils should be segregated into SS and SS(C) soil types. Where soils are not separated, the soil should be treated at the higher treatment rate (i.e. applicable to the SS(C) soil type).
- Soils should be appropriately treated with a neutralising agent (see **Section 10.1.1** for dosing rate calculations).
  - An alkaline material, such as calcium carbonate ($CaCO_3$), in the form of finely crushed limestone or aglime, is commonly used as a neutralising agent. Sodium based compounds are not recommended for ASS treatment.
  - Treatment should be undertaken via mechanical mixing of the neutralising agent with the excavated soil so that the material is uniform.
  - Untreated soils should not be left exposed for long periods of time. Loamy sands should be treated within 2.5 days of stockpiling.
- Treated soils should be validated prior to backfilling. Where possible, validated soils should be placed above the water table.
- Following decommissioning of the treatment pad, validation of the soil beneath the treatment pad should be undertaken to ensure that leaching has not occurred.

Note: Where soils are encountered that do not correspond with either of the soil profiles described above, further investigations should be undertaken to determine whether soils present ASS risks, and is so, the treatment rate that should be applied.

5.1 Liming Rates

The neutralising agent is to be mixed through the excavated soil, at a rate that is calculated from the highest net acidity of each soil type. The calculation to determine the volume of lime to be applied is as follows:

Lime (kg $CaCO_3$/ tonne soil) = bulk density x (net acidity x 30.59) x 1.02 x safety factor x 100/ENV, where:

- Bulk density value is applied in tonne/ m^3. The DWER default value for loamy sands (most applicable to the site) is a factor of 1.5.
- Net acidity value is applied %S units. The highest net acidity for each soil type should be used.
- A safety factor of 1.5 should be applied at a minimum to account for non-homogeneous mixing.
- The effective neutralising value (ENV) should be used for the specific ENV from the neutralising agent used. This information can be obtained from the supplier.

The site-specific inputs for the liming rate calculation are presented in **Table 7-2**.

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The ENV of a specific neutralising agent should be calculated for each particle size, based on the following calculation:

ENV = % Proportion/100 x Utilisation Factor x NV

A Specification Sheet for Limesand sourced from Dongara (Aglime of Australia Pit) has been provided as a potential source of neutralising agent to be used at the site. The specific ENV for the product has been calculated based on the percentage proportion and neutralising value (NV) for the product. The ENV, calculated from the sum of individual ENVs for each equivalent particle size, is shown as the value in the green shaded cell in **Table 7-1** below. The Aglime Specification Sheet is provided in **Appendix B**.

Table 7-1: Calculated ENV Values

Particle size	Equivalent particle size	Proportion (%)	Utilisation factor	NV	ENV
1.00–2.00mm	0.1	0.1	0.01	69.5%	0.0007%
0.85–1.00mm	0.3	0.3	0.10	76.7%	0.023%
0.300–0.850mm	20.4	20.4	0.60	91.0%	11.14%
<0.300mm	74.4	74.4	1.00	93.2%	69.34%
	4.8	4.8	1.00	92.0%	4.42%
Total		**100**	**-**	**-**	**84.92%**

<u>Note: Where a different neutralising agent is used, other than the product specified above, the ENV should be re-calculated for that specific product.</u>

The liming rates for each soil management category are shown in **Table 7-2** below.

Table 7-2: Liming Rates

Soil Management Category	Bulk Density (loamy sands)	Maximum Net Acidity	Safety Factor	ENV	Liming rate
SS	1.5	0.15	1.5	84.92	12
SS(C)	1.5	0.26	1.5	84.92	21
Units	*tonne/m^3*	*%S*	-	*%*	*kg/ tonne*

Based on the above inputs, the calculation for the SS soil type is:

Lime (kg $CaCO_3$/ tonne soil) = *1.5 x (0.15 x 30.59) x 1.02 x 1.5 x 100/84.92*

= *12 kg of neutralising agent per tonne of soil*

Based on the above inputs, the calculation for the SS(C) soil type is:

Lime (kg $CaCO_3$/ tonne soil) = *1.5 x (0.26 x 30.59) x 1.02 x 1.5 x 100/84.92*

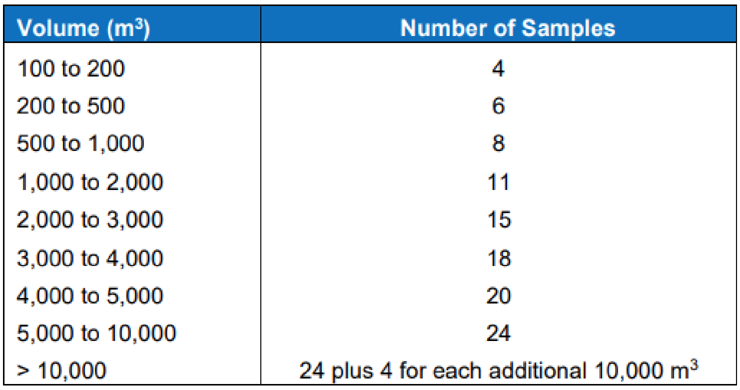
= *21 kg of neutralising agent per tonne of soil*

The total volume of soil to be excavated to facilitate installation of the pipe, as per the construction specifications included in **Section 2.0**, is estimated to be approximately 2,200 m^3. Of this volume, based on a maximum profile depth of the SS soil management category:

- Approximately 660 m^3 (or 1,000 tonnes[1]) of excavated soil is likely to be SS.
- Approximately 1,540 m^3 (or 2,300 tonnes[1]) of excavated soil is likely to be SS(C).

5.2 Validation Sampling

Prior to the on-site reuse or backfilling of excavated material, validation sampling should be undertaken and the results verified to ensure effective neutralisation has been achieved. As per DER (2015b), sampling frequency should be undertaken in accordance with DWER's current *Landfill waste classification and waste definitions* (DWER 2019). The required sampling frequency is presented in **Plate 4**.



Volume (m^3)	Number of Samples
100 to 200	4
200 to 500	6
500 to 1,000	8
1,000 to 2,000	11
2,000 to 3,000	15
3,000 to 4,000	18
4,000 to 5,000	20
5,000 to 10,000	24
> 10,000	24 plus 4 for each additional 10,000 m^3

Plate 4: Validation sampling frequency (DWER 2019)

Noting that the field ASS results did not indicate PASS or AASS, all validation samples should be analysed for SPOCAS. Analysis should be undertaken on an unground sample. The following validation criteria should be met:

- Evidence that the neutralising material has been thoroughly mixed with the soil.
- pH_F >6.0 pH units.
- Net acidity <0.03%S.

Note: Where validation samples do not meet the validation criteria of <0.03%S, further neutralisation should be undertaken, and subsequent validation sampling, until the validation criteria is met.

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[1] Based on a bulk density of 1.5.

6.0 Groundwater Management

It is understood that no groundwater dewatering is proposed as part of this project and therefore no management of groundwater is proposed for the site.

Should dewatering be proposed, specific management measures will need to be implemented to ensure that groundwater acidification does not occur. The management measures will need to be documented in a separate management plan.

7.0 Reporting

All works associated with ASS management during the proposed works should be recorded and documented in an ASS Closure Report, to be completed at the conclusion of the works and subsequently submitted to DWER.

The ASS Closure Report should include records of:

- General construction information, including construction dates, confirmed construction methodology, trench dimensions, battering and final pipe alignment.
- Descriptions of soils encountered during the works, including any soils not consistent with the SS and SS(C) descriptions.
- Total volume of soil excavated for each soil type.
- Total volume of soil neutralised.
- Neutralising agent used, including records of the Specification Sheet.
- Total volume of neutralising agent used.
- Stockpile tracking (location, stockpile numbers and volumes).
- Stockpile validation sample information, including date of collection, depth, location and sample IDs.
- Validation sample results and assessment against the validation criteria.
- Confirmation of absence of dewatering (or otherwise information relating to groundwater and dewatering effluent monitoring and management).
- Photographs, field notes, laboratory documentation and other evidence of the above items.

8.0 Principles and Limitations

The following principles are an integral part of site contamination assessment practices and are intended to be referred to when resolving any ambiguity or exercising such discretion as is accorded the user or site assessor.

Area	Principle and Limitation
Elimination of Uncertainty	Some uncertainty is inherent in all site investigations. Furthermore, any sample, either surface or subsurface, taken for chemical testing may or may not be representative of a larger population or area. Professional judgment and interpretation are inherent in the process, and even when exercised in accordance with objective scientific principles, uncertainty is inevitable. Additional assessment beyond that which was reasonably undertaken may reduce the uncertainty.
Limitations of Information	The effectiveness of any site investigation may be compromised by limitations or defects in the information used to define the objectives and scope of the investigation, including inability to obtain information concerning historic site uses or prior site assessment activities despite the efforts of the user and assessor to obtain such information.
Level of Assessment	The investigation herein should not be considered to be an exhaustive assessment of environmental conditions on a property. There is a point at which the effort required to obtain information is outweighed by the time required to obtain that information, and, in the context of private transactions and contractual responsibilities, may become a material detriment to the orderly conduct of business. If the presence of target analytes is confirmed on a property, the extent of further assessment is a function of the degree of confidence required and the degree of uncertainty acceptable in relation to the objectives of the assessment.
Comparison with Subsequent Inquiry	The justification and adequacy of the findings of this investigation in light of the findings of a subsequent inquiry should be evaluated based on the reasonableness of judgments made at the time and under the circumstances in which they were made.
Data Useability	Investigation data generally only represent the site conditions at the time the data were generated. Therefore, the usability of data collected as part of this investigation may have a finite lifetime depending on the application and use being made of the data. In all respects, a future reader of this report should evaluate whether previously generated data are appropriate for any subsequent use beyond the original purpose for which they were collected, or are otherwise subject to lifetime limits imposed by other laws, regulations or regulatory policies.
Nature of Advice	The investigation works herein are intended to develop and present sound, scientifically valid data concerning actual site conditions. Senversa does not seek or purport to provide legal or business advice.

9.0 References

Department of Environment Regulation (2015a) *Identification and investigation of acid sulfate soils and acidic landscapes*. June 2015.

Department of Environment Regulation (2015b) *Treatment and management of soil and water in acid sulfate soil landscapes.* June 2015.

Enveng Group (2020) *Perdaman Environmental Testing and Acid Sulfate Soils (ASS) Preliminary Assessment - Summary of Findings and Recommendations*, Enveng Group Project No. PR25, 10 September 2020.

Hickman, AH (1997) *Dampier, W.A. Sheet 2256: Western Australia Geological Survey, 1:100 000 Geological Series.*

Landgate (2024) *SLIP Locate V5*, viewed 15/08/2024, <https://maps.slip.wa.gov.au/landgate/locate/>.

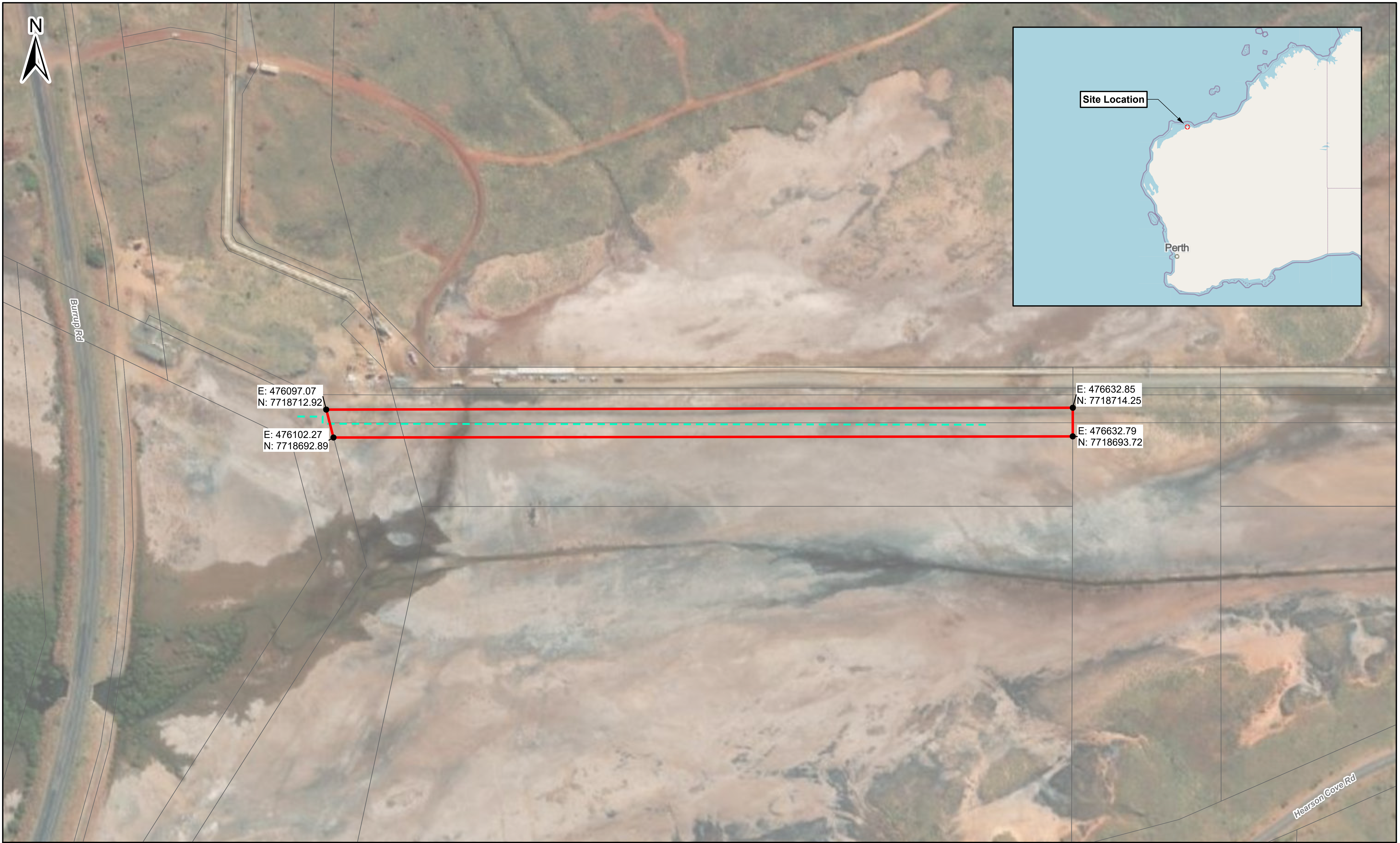
Pipecraft (2024) *CEP-T24001-01 Construction Execution Plan: AGIG – Perdaman Pipeline Lateral,* Revision D, Issued for Information, 13 August 2024.

Senversa (2024) *Baseline Environmental Site Assessment – Perdaman Lateral Pipeline, Burrup Peninsula*, Senversa Pty Ltd, Document number P21705_002_RPT_Rev1, Revision 1 (Final), 9 August 2024.

Tetra Tech Coffey (2022) *Perdaman Urea Project - Project Destiny. Detailed Site Assessment for Acid Sulfate Soil*, Document Reference: 754-PEREN297100, 19 April 2022.

Figures

Figure 1: Site Location Plan



senversa

Legend

🟥 Boundary

- - Proposed Pipeline

☐ Cadastre (LGATE-001)

Aerial Imagery © ESRI World Imagery

Created:	A. Murray	Date:	6/08/2024
Reviewed:	E. Churchill-Gray	Revision:	0
Approved:	A. Betti	Scale:	1:2,500 (A3)
File:	P21705_002_F001 Site Location		

0 12.5 25 50 75 100 125 Metres

Coordinate System: GDA2020 MGA Zone 50

Figure No: **1**

Title: **Site Location**

Project: Baseline Environmental Site Assessment

Location: Perdaman Lateral Pipeline, Burrup Peninsula

Client: Australian Gas Infrastructure Group

Path: S:\01_Jobs\6.WA_Jobs\P21705_AGIG_BURRUP PIPELINE_BASELINE ASSESSMENT\APRX\P21705_002.aprx

Appendix A: Construction Execution Plan (Pipecraft 2024)

CEP-T24001-01
CONSTRUCTION EXECUTION PLAN

AGIG – PERDAMAN PIPELINE LATERAL

VERSION HISTORY					
REV	**DATE**	**DESCRIPTION**	**PREPARED**	**CHECKED**	**APPROVED**
D	13-Aug-2024	Issued for Information	FR	DB	

DOCUMENT ATTRIBUTES

This Plan, complies with the requirements of Document Management Standards and Guidelines.

Approver: Pre-Contracts Manager

Reviewer: Project Manager

Custodian: Project Manager

Document Controller: Department Coordinator

Audience: Business Unit

Document Type: Plan

ENGINEERING STANDARD REQUIREMENTS

Business Management System (BMS) documents are published on the PIPECRAFT intranet and printed copies shall be checked for currency.

Standard Documents are controlled documents and as such are not to be used, changed or modified without being subjected to the thorough review and approval process.

If you identify that this Standard Document requires revision contact the Custodian.

TABLE OF CONTENTS

1 INTRODUCTION

1.1 Project Execution

This Construction Execution Plan (CEP) describes the work methodology for completing the **AGIG Perdaman Pipeline Lateral** in Dampier, Western Australia (the “Project”).

Figure 1: Pipeline Scopes of Work

Project	Length	Specification
Pipeline Lateral	0.502 km	DN400 x 9.53 mm WT API 5L PSL2 X65 3LPE CWC (30mm)

1.2 Purpose

The CEP incorporates all procedures, data and documents required by the project execution team to carry out the works in accordance with PIPECRAFT and CLIENT documents, relevant codes, standards and work procedures.

The CEP includes the following execution activities and information:

- Project background and siting;
- Project organisation including key personnel and roles & responsibilities;
- Business management systems to be implemented and to guide the execution of the works; and
- Definition of the construction execution through project-specific procedures and documentation, including mobilisation, site establishment, construction works, remediation, hand-over, demobilisation and project close-out.

The CEP is a single point of reference during execution of the project to define the construction methodology and is a live controlled document.

The CEP shall be read in conjunction with the Project Execution Plan (PEP) which provides a detailed explanation of the business management systems to be implemented on the works.

1.3 Objectives

The objective of this CEP is to communicate how the Project will be constructed in a controlled and measured way, specifically to:

- Meet the contractual requirements of the CLIENT including all technical requirements and specifications;
- Describe how the Project will be managed in completing the construction activities;
- Define the construction methodology; and
- Outline the Project responsibilities.

1.4 Project Background

The Perdaman Ceres Project Destiny is to construct a urea plant on the Burrup Peninsula using natural gas provided by Woodside as the primary feedstock to the production facility. Natural gas is to be delivered to the plant via an AGIG constructed DN400 pipeline lateral off the Dampier Bunbury Natural Gas Pipeline (DBNGP PL40).

Located on the Burrup Peninsula, approximately 20 kilometres north of Karratha on the Western Australia coast, the plant will be the largest in Australia and one of the largest in the world. The plant is to have a production capacity of 2 million metric tons of urea per year.

The plant will produce fertiliser from urea by transforming natural gas into ammonia and then into urea using a single synthesis reactor.

The pipeline lateral to supply the plant will be DN400 in diameter and 500m in length traversing the periphery of Kings Bay on the Burrup Peninsula.

1.5 Distribution

This plan is to be read by all management and supervision to communicate the construction work method statement. This document is to be made available to any PIPECRAFT employee or subcontractor operating under this document.

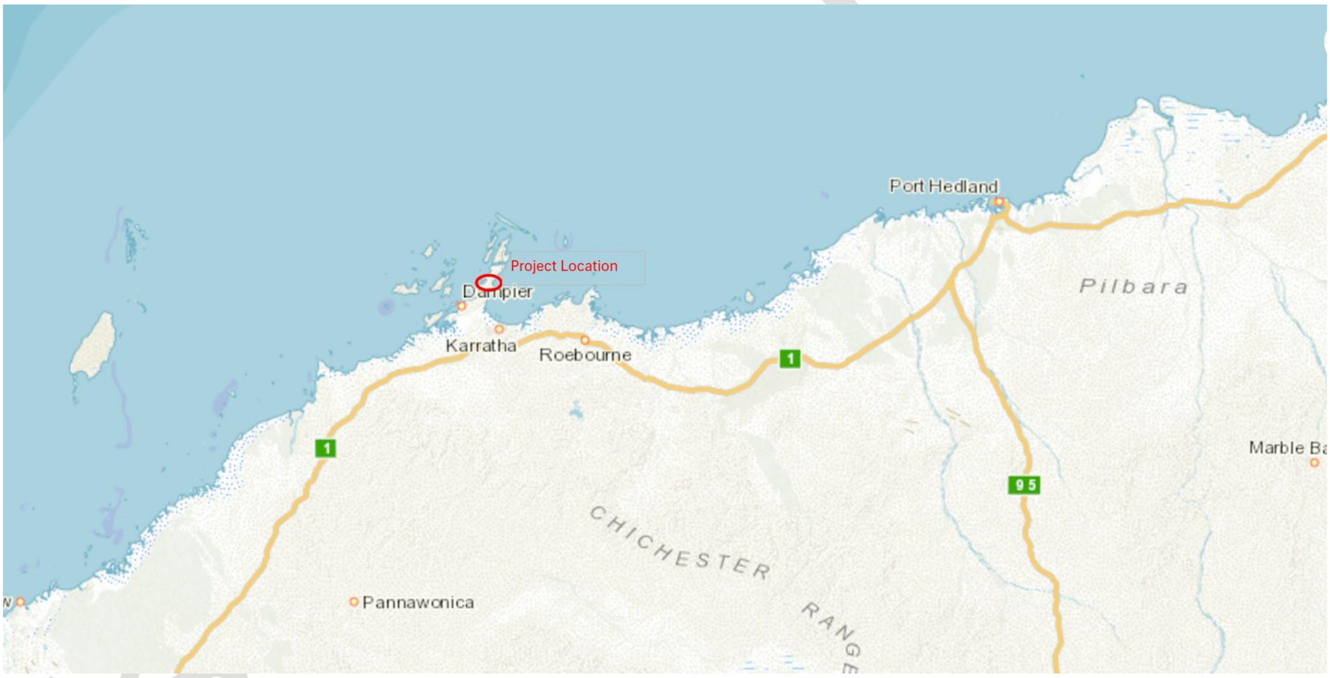
A secondary function of this document is to also demonstrate compliance with any Project or CLIENT requirements.

1.6 Project Location

The project is located on the Burrup Peninsula in the northwest of Western Australia, approximately 20km north of the town of Karratha. The Project Site is situated along the northern shoreline of King Bay and southwest of the existing Yara fertiliser facility. King Bay is a tidal area on the Burrup connecting Hearson's Cove to the King Bay waterway and Phillip Point.

The Site is accessed via the NW Coastal Highway to the Dampier Highway and up the Burrup Road to the site access road.

Figure 2: Project Location



1.6.1 Project Site

The project work site is shown in the following Figure.

Figure 3: Project Area

1.6.2 Laydown and Office Area

Two construction laydown areas will be created for the Project due to workspace limitations at the Project Site, as all site works are to be confined within existing easement boundaries. The two laydown locations will be located at:

- Project Management offices and staging areas at the AGIG Nickol Bay Yard, off the Dampier Hwy immediately north of the causeway crossing to the Peninsula; and
- Construction laydown and staging areas on the Project Site, immediately north of the Burrup Fertilizers Meter Station, adjacent to the new Perdaman access road.

The Nickol Bay laydown will be the location of offices, cribs and ablutions with receiving and storage facilities, including:

- Set-up of all temporary Project offices, cribs, workshops and ablutions;
- Container storage facilities;
- Receipt of all materials and consumables;
- Parking and housing of all plant and equipment when not in use along the CROW.

Line pipe load-out will also be completed at the DBNGP Nichol Bay Pipe Yard.

The Site based laydown will be used for staging of construction activities and immediate site support, including:

- Set-up of a temporary Project crib hut and toilet facilities;
- Container storage facilities;
- Stockpile and storge of select engineering aggregate (fill sand and D200 rock).

Indicative locations of the laydowns are shown in the following Figures. Actual locations are to be finalised.

Figure 4: Project Laydown Locations

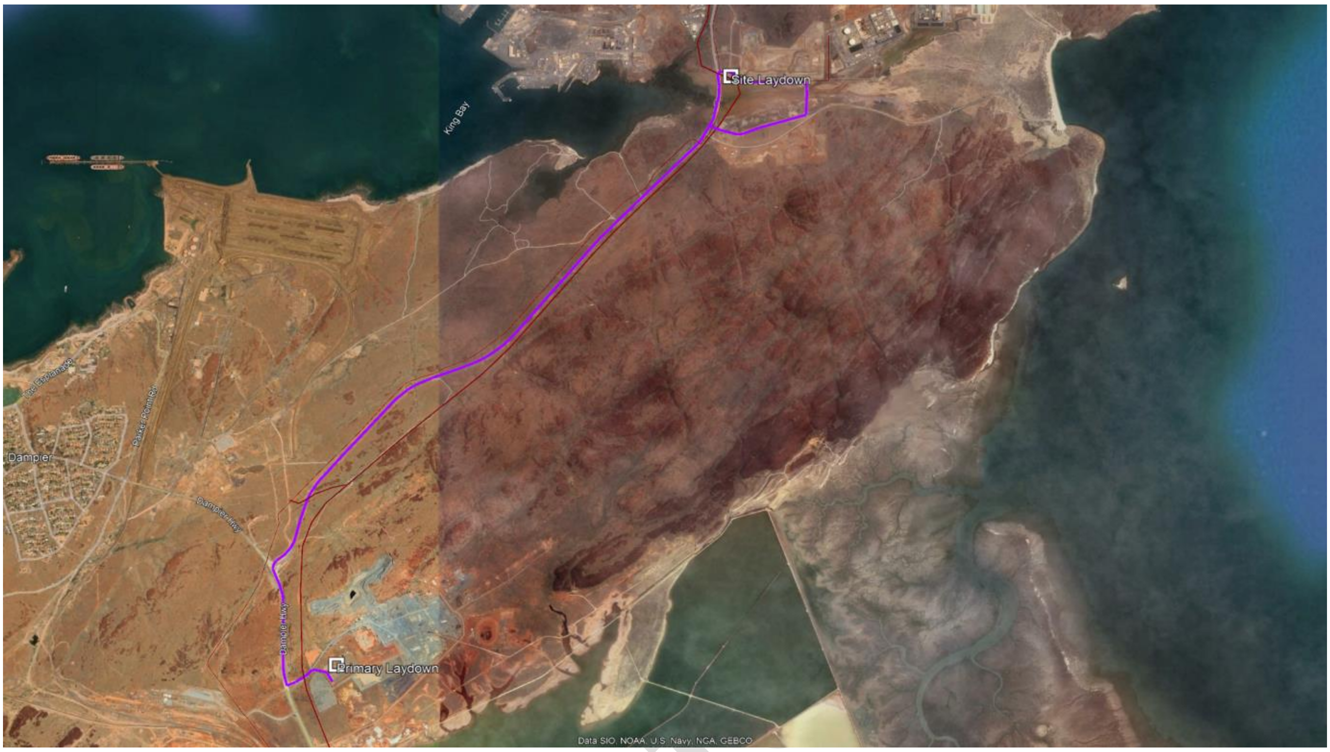


Figure 5: Primary Project Laydown - Typical Layout

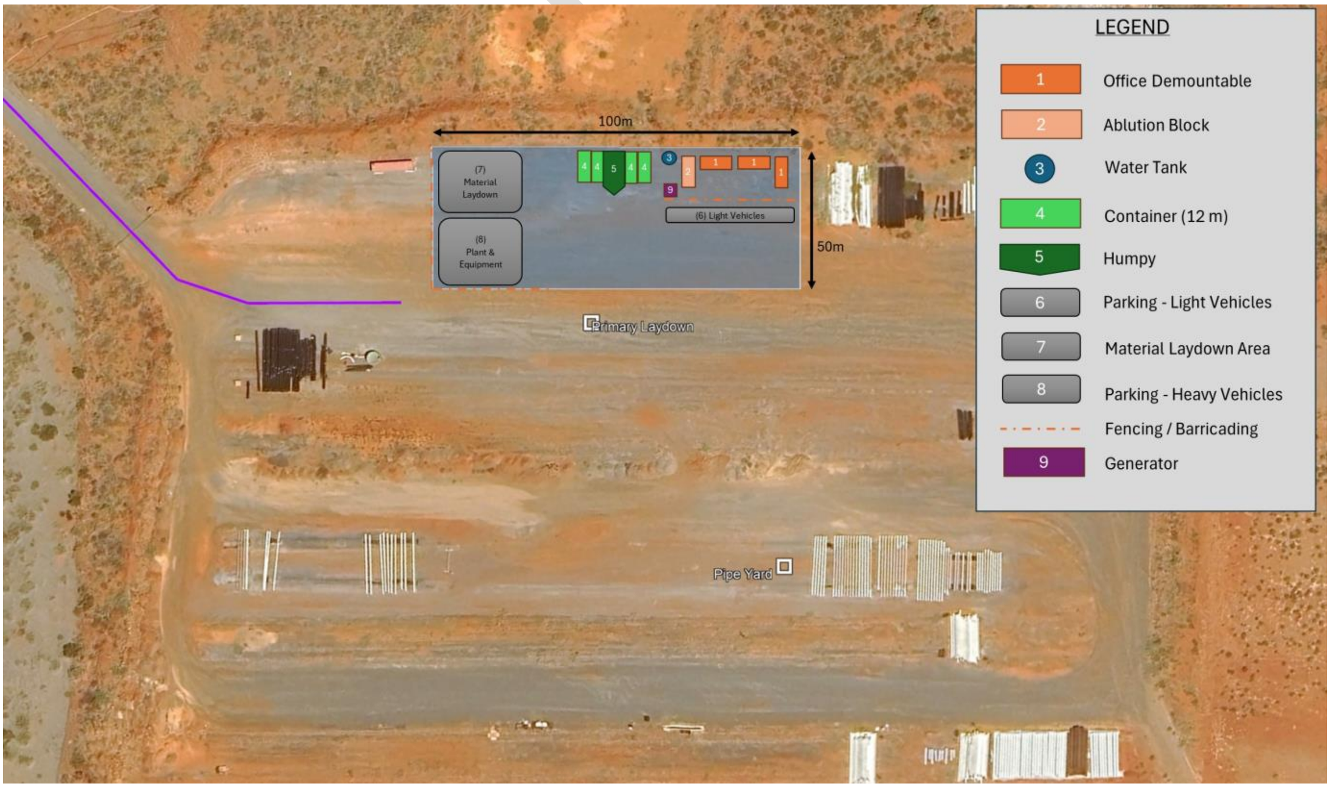
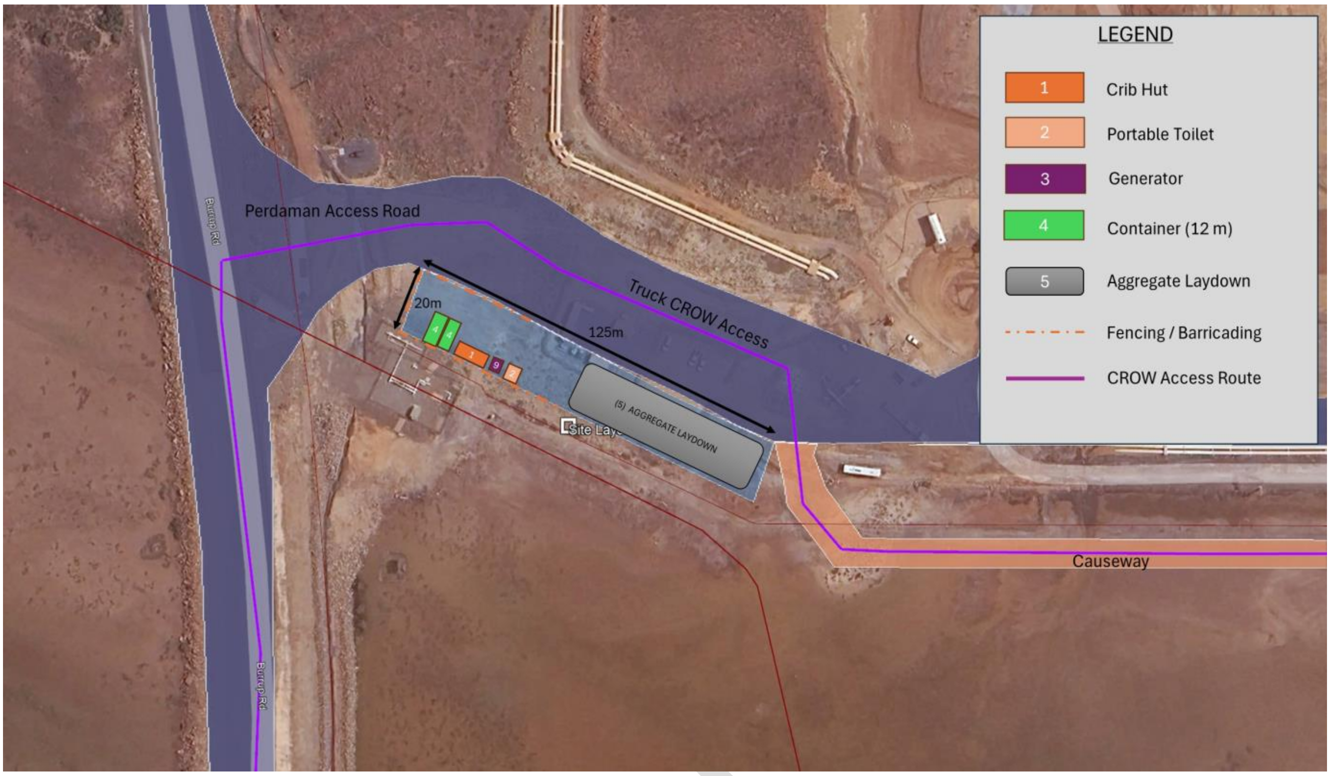


Figure 6: Site Project Laydown - Typical Layout



1.6.3 Site Access

PIPECRAFT work crews and equipment will be mobilised from Perth, WA. The Work Site is accessible from Perth via the NW Coastal Highway. The location permits drive-in / drive-out operations for mobilisation / demobilisation of plant and equipment with fly-in / fly-out of the work crew to Karratha based on the roster schedule.

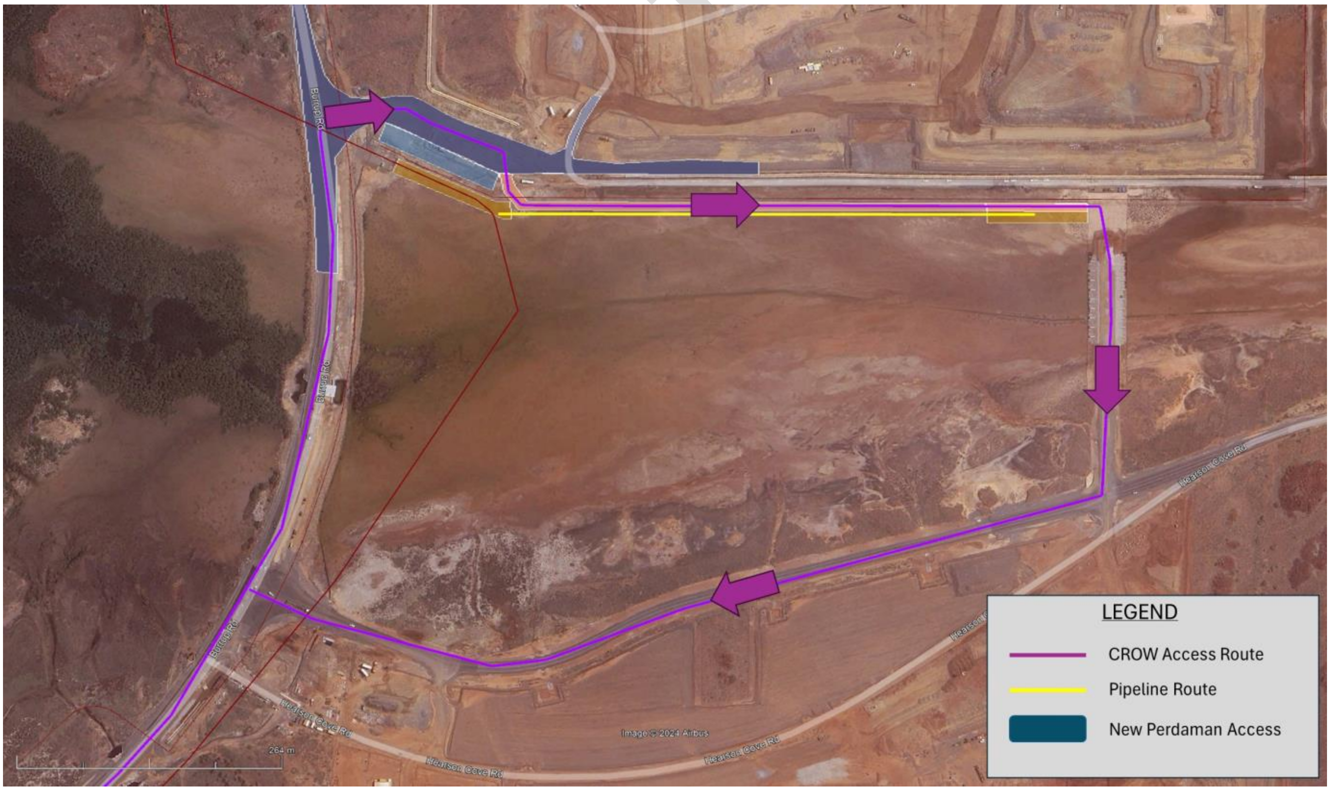
Crews will be housed locally within commercial camp accommodations.

Site access is:

- The general access to the CROW is based on:
    - North on NW Coastal Highway from Perth to Karratha (1535km)
    - North on Madigan Road to Dampier Highway to the Burrup Road
    - Turn into the site off Burrup Road.
- The Project laydown area is to be located off the Perdaman access road and is to be accessible via truck and trailer standard arrangements.
- Accommodation is to be located in Karratha.
- Other support services are to be accessed in Karratha.

Figure 7: Site Access

Figure 8: Site Access Tracks



1.6.4 Daily Commute from Camp

The construction work crew will commute daily from commercial accommodations in Karratha to the Project Site. Depending on the accommodation location, daily commute will be:

- A 25km daily commute taking approximately 30 minutes each way.

Daily travel time is accounted for in the planned roster hours of work.

1.6.5 Track Improvements

The Site is currently accessed via the main Perdaman Project access which is considered a high-grade gravel access track capable of truck and trailer access.

The existing CROW rock causeway will be improved to permit access along the length of the CROW including ensuring the causeway is accessible from the Perdaman Project access roadway.

No other access improvement or maintenance has been planned.

It is assumed prime movers and trailers can freely access the site based on the assumption that:

- Existing access tracks are well-graded and permit double lane traffic with a minimum working width of 3.5 metres for each lane;
- Existing access tracks horizontal turns are at a 23-metre radius of curvature for the outside tyre; and
- Existing access tracks vertical sags and crests are currently graded out to prevent bottoming out of trailers. Depending on the length of the vertical change, this typically limits the grades to 3-9%.

1.6.6 Spooling Fabrication

Fabrication of permanent above-ground pipe spooling is excluded from the scope of work.

The scope of work is limited to “riser to riser” for the pipeline installation.

The following temporary spooling will be fabricated during pre-construction works to support the pipeline pre-commissioning program:

- DN400 Low Pressure cleaning headers;
- DN400 High Pressure test headers.

All test headers will be fabricated from project line pipe in accordance with AS2885.

1.7 Shared Working Areas

PIPECRAFT will potentially be sharing work areas with other project contractors:

- SIMOPS requirements at CLIENT facilities include:
  - DBNGP Off-take facility;
  - DBNGP lateral delivery facility;
  - Perdaman access road traffic;
  - Watercorp access track traffic.
- Construction water is to be sourced based on:
  - Free-issued from the Perdaman Project site Watercorp spigot / standpipe.

It is assumed that PIPECRAFT will have free access to the pipeline CROW and will not be impeded by SIMOPS.

1.8 Traffic Management

A large volume of truck movements will be required at discrete points during construction: for mobilisation / demobilisation, and for line pipe delivery.

No long-term road closures have been identified as required to complete the works.

PIPECRAFT shall provide general traffic management, as required, and the details and the extent of traffic management shall be agreed between the CLIENT and PIPECRAFT.

For general movements to Site and along the main site access tracks, the following provisions will be made:

- Development of a PIPECRAFT Traffic Management Plan to manage all PIPECRAFT traffic movement interfaces on the Project Site; and
- Signposting of all tracks to clearly identify Project tracks and access areas.

A PIPECRAFT Traffic Management Plan will be developed in conjunction with the CLIENT to govern all project traffic movements on the access road and within the Site.

For general movements along the main access road, the following applies:

- Coordination of traffic movements with the CLIENT management team i.e. notice of truck movements, partial road closures;
- Signposting of all laydowns and work areas to clearly identify Pipeline Project work areas; and
- Compliance with existing speed limit posted signage along the access road.

The project does not require a local shire or MainRoads approved Traffic Management Plan as controlled roadways are not impacted by the construction works.

Document Number	Document Name
TMP-T24001-001	Traffic Management Plan

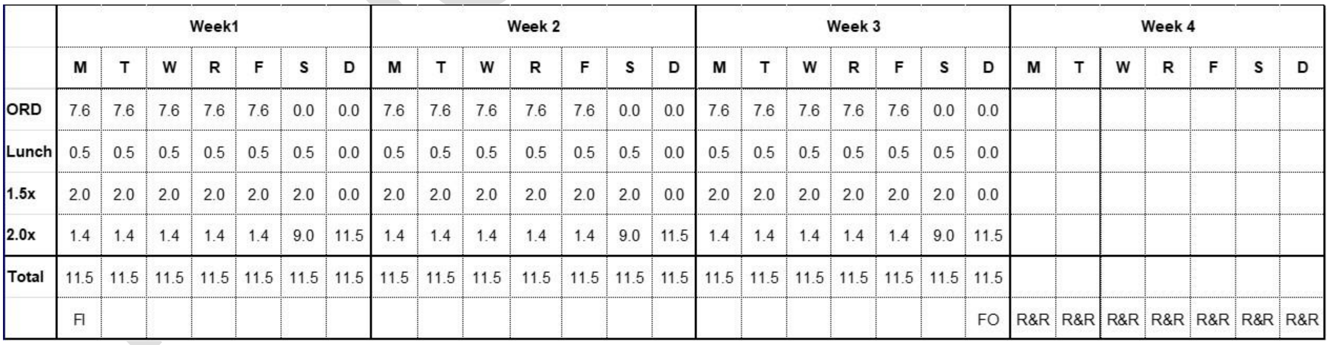
1.9 Construction Roster

Base working calendar is a 21:7 roster over a 28-day cycle.

The construction crews will be accommodated in local commercial accommodations and drive-in / drive-out daily to the CROW.

Work hours generally fall within 5:30 - 17:30 per day on Site with a base 11.5-hour workday including travel, subject to daylight hours.

Figure 9: Construction Roster



	Week1							Week 2							Week 3							Week 4						
	M	T	W	R	F	S	D	M	T	W	R	F	S	D	M	T	W	R	F	S	D	M	T	W	R	F	S	D
ORD	7.6	7.6	7.6	7.6	7.6	0.0	0.0	7.6	7.6	7.6	7.6	7.6	0.0	0.0	7.6	7.6	7.6	7.6	7.6	0.0	0.0							
Lunch	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.0	0.5	0.5	0.5	0.5	0.5	0.5	0.0							
1.5x	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0	2.0	2.0	2.0	2.0	2.0	2.0	0.0							
2.0x	1.4	1.4	1.4	1.4	1.4	9.0	11.5	1.4	1.4	1.4	1.4	1.4	9.0	11.5	1.4	1.4	1.4	1.4	1.4	9.0	11.5							
Total	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5	11.5							
	FI																				FO	R&R	R&R	R&R	R&R	R&R	R&R	R&R

1.9.1 Nightworks

The Program of Works excludes nightworks as part of the roster.

As a contingency only, nightworks may be required based on operational requirements. If works are required to be accelerated, a risk assessment will be completed and nightworks implemented with adequate and approved controls in place to undertake the works.

Hydrostatic Pressure testing is completed over 24-hours to facilitate the pipeline leak test. These works are minor in nature (2-to-3-man crew at a fixed location) and these works are completed under a risk assessment.

1.10 Health, Safety, Environment and Quality

The following PIPECRAFT documents will be developed for the works and are to be read in conjunction with this CEP.

- Health and Safety Management Plan (HSMP) HSMP-T24001-001
- Construction Environment Management Plan (CEMP) CEMP- T24001-001
- Quality Management Plan (QMP) QMP- T24001-001

CLIENT documents have also been developed for the project and are referenced in the Appendices.

2 SCOPE

PIPECRAFT is to supply of all labour, supervision, construction materials, infrastructure, equipment, tools and services required for installation of the pipeline lateral in accordance with AS 2885 – Gas and Liquid Petroleum Pipelines.

The construction scope of work includes the following:

- Development of construction management plans and procedures to control the execution of the works;
- Procurement of all temporary construction materials, consumables and engagement of all specialist subcontractors;
- Recruitment and on-boarding of the construction crew, adopting all personnel into the project management systems;
- Qualification of all quality focused procedures such as welding, NDT, field joint coating and cold bending, under AS2885;
- Preparation and mobilisation of all plant & equipment, ensuring they meet site entry requirements;
- Mobilisation to the Project Site and establishment of support facilities;
    - Establishment of laydown areas (for offices/workshop etc)
    - Setting up site office and workshop areas.
- Completion of construction enabling works including:
    - Survey set-out;
    - Test pitting;
    - Extension of the existing road causeway along the length of the route (500m in length). Working width of the causeway is to be increased by five metres.
- Installation of the new pipeline lateral (PL-xxx) in accordance with the project Specification and Drawings including the following activities;
    - Surveying and pegging the CROW (Construction Right of Way)
    - Clearing boundary identification and pegging;
    - Clear and Grade;
    - Ditching of the pipeline trench;
    - Stockpiling of ditch spoil including neutralisation of any PASS contamination;
    - Line pipe haul and stringing;
    - Line pipe cold bending (if required);
    - Mainline welding of a single pipe string (including fabrication of riser sections);
    - NDT;
    - Field Joint Coating;
    - Ditch preparation and Lower-in;
    - Padding the pipeline with ditch spoil and backfill;
    - Installation and tie-in risers at KP0 and EOL of the pipeline;
    - Re-instatement of the CROW (leaving the rock causeway in place);
- Installation of marker posts and warning signs in accordance with the Drawings;
- Pre-commissioning of the pipeline through verification testing of the pipeline integrity via hydrostatic pressure testing including drying of the tested pipeline to -20ºC;
- DCVG survey;
- Demobilisation and Project Site Clean-up; and
- Project close-out and MDR submission.

2.1 Battery Limits

The physical project battery limits for the pipeline are limited to the below ground gas pipeline and pipeline risers at the start and finish of the pipeline i.e. the battery limits. The battery limits are the tie-in points (that will be a welded tie-in joint or flanged joint) between the facilities piping and the gas pipeline.

2.2 Subcontractor Strategy

It is planned that PIPECRAFT will execute the Scope of Work with specialist subcontractors to be contracted in the following manner. Final subcontractor selection is subject to change including subcontractor availability and HSEQ prequalification.

Figure 10: Subcontract of Works Strategy

Scope	Planned Entity
Head Contractor	PIPECRAFT
Survey / Ground Sweep / Locating	Veris Ltd / Other
Non-Destructive Examination	PXL / Other
Hydrostatic Pressure Testing	Process Chemicals / Others
Spooling Fabrication	P&A Welding / Other

2.3 Tender Schedule

Actual project milestones shall be established post FID, based on the design/survey information and site; the construction program forms the basis of the FEED study:

- Pre-construction works are 3 months in duration;
- Early Works (civil enabling works) are 0.5 month in duration;
- Pipeline construction is 2.5 months in duration on-site with MDR approval after pre-commissioning to facilitate pipeline commissioning;
- Project close-out after demobilisation is 1 month in duration.

Figure 11: Indicative Schedule Overview

Activity	Year 1												Year 2		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Contract Award		🟪													
Planning		🟪	🟪	🟪											
Early Works			🟩												
Mobilisation					🟩										
Construction					🟩	🟩	🟩								
Practical Completion							🟩								
Final Completion								🟪							

3 ACRONYMS AND DEFINTIONS

Figure 12: Acronyms and Definitions

Acronym	Definition
AFC	Approved for Construction
ALARP	As Low As Reasonably Practicable
BMS	Business Management System
CEP	Construction Execution Plan
CLIENT	Company or party contracting with PIPECRAFT, Australia Gas Infrastructure Group (AGIG)
External Interface	An interface that lies entirely outside PIPECRAFTs control and command and is the responsibility of the CLIENT to manage
HAZID	Hazard Identification
HSE(Q)	Health, Safety and Environment (and Quality)
Internal Interface	An interface that lies entirely within PIPECRAFTs control and command
ITP	Inspection and Test Plan
ITR	Inspection Test Record
JHA	Job Hazard Analysis
MDR	Manufacturer’s Data Report
MSDS	Material Safety Data Sheet
NDE	Non-Destructive Examination
PASS	Potential Acid Sulphate Soils
PEP	Project Execution Plan
PIPECRAFT	Pipecraft Pty Ltd, ABN 60 609 026 075
Project	Contract works being undertaken
Project Site	Contract work areas
QA / QC	Quality Assurance / Quality Control
Subcontractor	Supplier/s of Goods, Services or Personnel to PIPECRAFT
Third Party	Any party external to the works that has been identified as requiring involvement in the works

4 WORK METHODOLGY

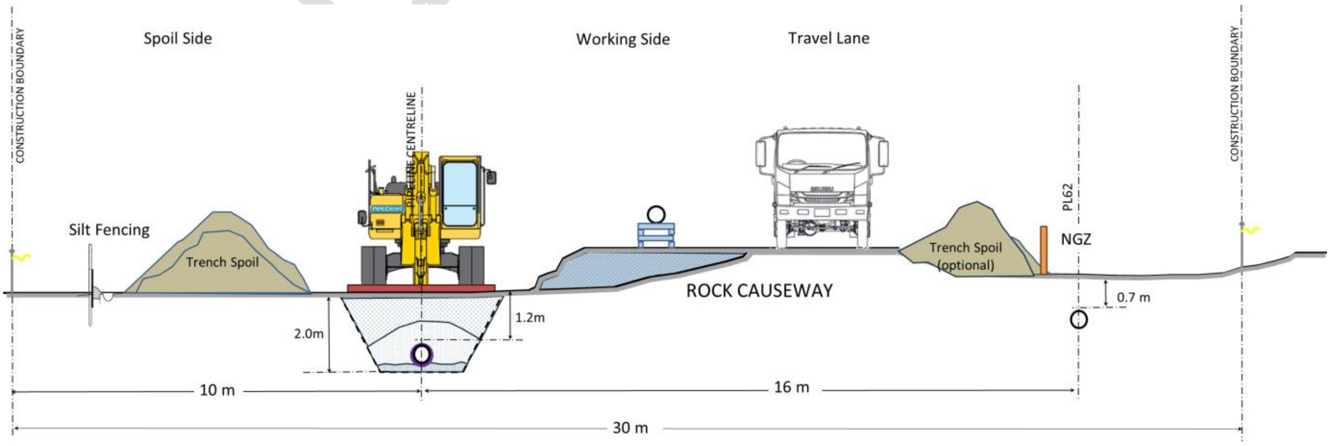
The planned construction sequence will be to complete the pipeline lateral from West to East, installing the pipeline in one continuous pipe string with tie-in of the pipeline risers after lowering-in.

The AFC alignment sheets are to show the CROW set out and limits of the CLIENT approved work area. The additional workspaces for truck turnarounds, truck turn-ins, vegetation, topsoil, subsoil placement and materials storage/laydown will also be shown on the alignment sheets.

The planned stages for construction will be:

1. Early Works
    a. Complete Survey Set-out;
    b. Complete Test Pitting;
    c. Construct extension of existing rock causeway by 5m along the length of the CROW (502m).
2. Pipeline Construction
    a. Mobilisation of site establishment personnel and equipment;
    b. Establishment of the laydown areas (office, crib, ablutions and workshop);
    c. Install silt fencing along the length of the CROW (on the downhill side of the easement);
    d. Complete ditching of the pipeline trench and neutralisation of PASS;
    e. Fabricate the pipeline string: haul and string line pipe, complete welding, NDT and Field Joint Coating;
    f. Lower-in of the pipe string into a potentially water filled ditch;
    g. Using in-situ spoil, bed, pad and backfill the pipeline;
    h. Complete installation of the pipeline risers at the start and finish of the pipeline installation and ready the pipeline for final tie-ins;
    i. Reinstate the pipeline easement including installation of pipeline markers and signs;
    j. Complete pre-commissioning of the pipeline via hydrostatic testing of the line;
    k. Complete a DCVG survey of the buried pipeline;
    l. Hand-over the pipeline to the operator / owner;
    m. Demobilisation from the Site.

Figure 13: Typical Conventional Pipeline Right-of-Way



4.1 Off Site Support

Throughout the duration of the works, the Pipeline Construction Project Team is supported by an off-site project management team and business management (overhead) personnel.

The off-site support consists of:

- Project management and coordination;
- Contracts administration;
- Project controls, scheduling and procurement support;
- HSEQ support;
- Human resources and payroll support; and
- Logistical and workshop support.

4.2 Mobilisation

Mobilisation refers to the staging and transportation of all personnel, plant, equipment and material to the Project Site. Activities include:

- Inspect all equipment, plant and materials in preparation for transportation to site for: mechanical reliability and HSE compliance, and weed hygiene clearance including lodgement on the Plant and Equipment Register;
- Determine the source, destination, delivery dates, quantity, description, dimensions, weight and unloading method for all equipment;
- Determine all permitting requirements for the trucking transport along public and private roadways in Australia. Permits may include: Transportation of Dangerous Goods Certificate, Road Authority load registration, Road Authority Heavy Haulage permits, Shire / Municipal notice, etc. as required;
- Follow Chain of Responsibility requirements;
- Complete staged transport of all equipment and personnel to site based on construction requirements;
- Complete receipt goods on site in laydown areas.

PIPECRAFT owned plant and equipment, storage containers and consumables will be mobilised from Perth WA. Hired equipment will typically be sourced from the local Karratha area and transported to site, subject to availability.

Experienced and trade qualified personnel will be sourced from the Perth and local areas including local indigenous group engagement, depending on services offered and availability.

4.3 Site Establishment

The following site infrastructure is to be provided and activities are to be completed to support PIPECRAFT in execution of the works:

- Submit and receive the CLIENT Authorisation to Clear Vegetation Permit;
- Submit and receive CLIENT ground disturbance or excavation permits;
- Mobilisation of initial equipment and personnel;
- Set up access point signage and call up points;
- Set up Muster Points;
- Establishment of principle material laydown areas, offices and temporary workshops;
- Survey and lay-out of all workspace and laydowns, as applicable;
- Formal notification of works to third-party asset owners; and

- Ground sweep and pot-holing of all underground utilities where ground disturbance activities are to occur, as applicable (by hand digging or vacuum excavation). Extra measures may be employed in brownfield areas (such as ground sweep).

PIPECRAFT's principal laydown and office facilities consist of:

- PIPECRAFT's Site office block (x2) plus one office for CLIENT use (x1);
- Crib huts (x1);
- Ablution block with water tanks and black water holding tanks (x1);
- Generator facilities with distribution board and cabling (requiring CLIENT Notification of Energisation (NoE) prior to commissioning of electric generation equipment);
- Communication systems;
- Material and small tools storage containers including loading and unloading capabilities; and
- General Laydown areas.

4.4 On Site Construction Support

PIPECRAFT onsite Construction support consists of the following:

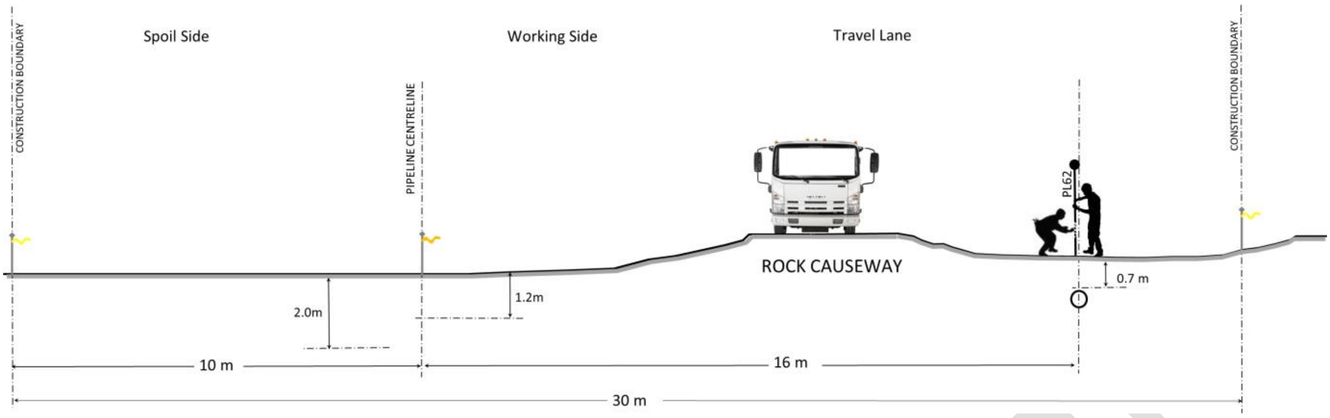
- Field Engineering for construction changes and quality assurance;
- Construction inspection and supervision for the construction crew monitoring safety, production, permit compliance, and construction specification compliance;
- Quality control inspection and data collection;
- Management and support to implement all safety systems, environmental controls including spills response, and quality inspection;
- Management and support to efficiently schedule work crews, achieve productivity levels, including the provision of tool cribs, and maintenance and warehouse activities;
- Provision of a construction support crew, typically consisting of mechanic/serviceman, truck drivers and storeman, to be based at the laydown yard and to support the construction work crews as required.

4.5 Survey Set-Out

Survey activities include:

- Complete verification of design data sets and base maps. Up to date plans and digital data are checked for any discrepancies;
- Set-up Site control survey at local SSM's to confirm acceptability;
- Survey control shall be surveyed using RTK GPS equipment to the Map Grid of Australia projections and geocentric datums;
- The laydown area boundaries will be surveyed with survey pegs being placed on the corners and at interval;
- All known underground utilities will be marked out;
- Any exclusion zone sites will be marked with survey stakes and flagging;
- Pipeline centreline shall be identified, and typically a 2.0m to 2.3m offset staked, at changes in direction and typically at 50m spacings;
- CROW boundary, extra workspaces, turnaround bays will be identified with survey stakes on the boundary at typically 50m spacings and on bends. Based on risk assessment, additional marking measures may be employed such as PVC conduit to increase visual marking of the CROW;
- After site clearing and grading is completed, the crew will peg the trench centreline at 25 metre intervals;
- The construction work area is typically 30m wide, with 10 m on the spoil side and 20 m on the working side respectively from the pipeline centreline. In this case, the working side is limited as the easement overlaps with PL62, which is a dedicated No-Go-Zone (NGZ); and
- After lowering-in, the crew will record an as-built survey of the installed pipe segments.

Figure 14: Typical Survey Set-out



4.6 Exclusion ‘No Go’ Zones

Prior to the commencement of any construction activities, delineation of exclusion zones shall be set-up to mark no-go zones. Project NO GO Zones (NGZ) include:

- Operating Pipelines (e.g. PL62);
- Cultural heritage sites (nil identified);
- Priority ecological sites (nil identified); and / or
- Environmentally sensitive areas (nil identified).

Any existing operating pipelines adjacent to the project area are also considered a NO GO Zone but are delineated by potholing and are not fenced.

It is not known if any heritage sites have been identified along the length of the pipeline CROW. Typically the CROW boundaries are flagged adjacent to these sites to ensure any accidental trespass does not occur if the heritage site falls within a prescribed distance of the CROW.

The CROW boundary is to be clearly delineated to allow for clearing and ground disturbance activities. The survey crew will have placed survey pegs along the CROW boundary, at approximately 50m spacings, on bends, at extra workspace areas and along boundaries of laydown areas.

The existing DBNGP mainline is currently delineated with pothole conduits and represents a ‘no-go’ zone. This zone will be demarked with signage at interval and offset markers. Steel pickets are not to be used within the NGZ.

NO GROUND DISTURBANCE ACTIVITIES MAY BE CONDUCTED WITHOUT A CLIENT PERMIT TO WORK.

4.6.1 Fencing and Gates

Based on a desktop review of the current site, no fences or gates are impacted by the pipeline construction works.

4.6.2 Ground Sweep and Potholing of Buried Services

The CROW will be subject to a ground sweep to identify and daylight any buried services. Buried service records will be reviewed and based on risk assessment, any high-risk areas may be subject to ground sweep by additional potholing with the further possibility of ground sweep by GPR (ground penetrating radar) if it is determined that unknown services may be present.

The existing DBNGP and PL62 will be potholed and marked with conduit to confirm its running alignment and offset from the new pipeline; adequacy of the existing potholes will be checked.

Locating of underground services consists of submission of pipeline route information to the national Dial Before You Dig (DBYD) organisation followed by a ground sweep and potholing of buried services and utilities prior to the commencement of pipeline construction ground disturbance activities.

All known services crossed and within a 6 m proximity should be potholed to locate and identify the service ahead of any construction activities requiring ground disturbance. No mechanical excavation is permitted within one meter of a CLIENT owned operating buried asset.

It is assumed a nominal amount of locates are required by a dedicated crew at mobilisation. All buried services are to be located prior to ground disturbance.

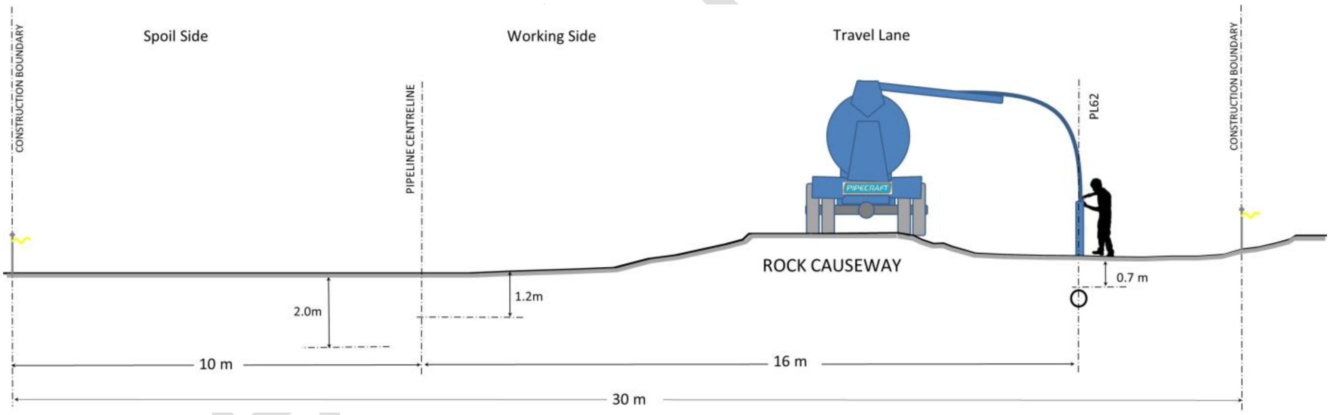
Activities will include locating the service by:

- DBYD;
- Electronic Service Location;
- Potholing foreign services by vacuum excavation; or
- Potholing foreign services by hand.

Daylighting of services consists of:

- Electronically locate the underground service. Confirm on plans and mapping;
- Using the vacuum excavator, and or hand excavate / pothole to locate underground service;
- No mechanical excavation is to occur within 1000mm of the service;
- Find service, physically mark and Install PVC conduit at the location if backfill is to occur; and
- Backfill or erect barricading if the excavation is to be left open.

Figure 15: Typical Ground Sweep of the Right-of-Way



4.7 Clear & Grade

Clearing refers to the removal and stockpile of vegetation and topsoil from the CROW. Grading refers to altering the ground topography by cutting of the subsoil or filling in order to create a stable working platform.

As the works are to be completed in King Bay, no clearing or topsoil stripping of the CROW is required. Some minor grading may be completed to create a level platform or to facilitate access.

Top layers of estuarine mud will be stripped during trenching so they are not mixed with subsoils.

4.8 Rock Causeway Construction

In order to facilitate construction access along the pipeline easement, the existing rock causeway is to be expanded. The existing causeway runs parallel to PL62 for the length of the pipeline within King Bay. This causeway will be expanded by 5m and raised to provided 400mm clearance from the natural level of the bay estuarine muds. The length of the causeway is approximately 500m.

Construction of the causeway will be completed as follows:

- 'Combigrid' 40/40 Geotextile is to be laid out for the width and length of the causeway installation in order to maintain the integrity of the rock fill on the mud soils;
- Well-graded rock fill (200mm minus material) is to be imported to the site and stockpiled at the principal laydown area;
- Rock fill is to be run out along the length of the existing causeway using a dozer;
- Rock fill is to be levelled and compacted to create a running track, creating a 5m extension of the existing causeway. A watercart is to provide dust suppression and water to assist in consolidation and compaction;
- Compaction is to be achieved using the dozer by track rolling;
- Rock fill is to be imported and run out along the length of the existing causeway, in order to raise the existing level of the causeway so that a 400mm fill height is achieved above the native surface level of King Bay.

Once the causeway has been completed, pipeline construction works may proceed.

At the end of the works, the rock causeway is to remain in place as the operational track for the pipeline.

Figure 16: Causeway Extension Limits

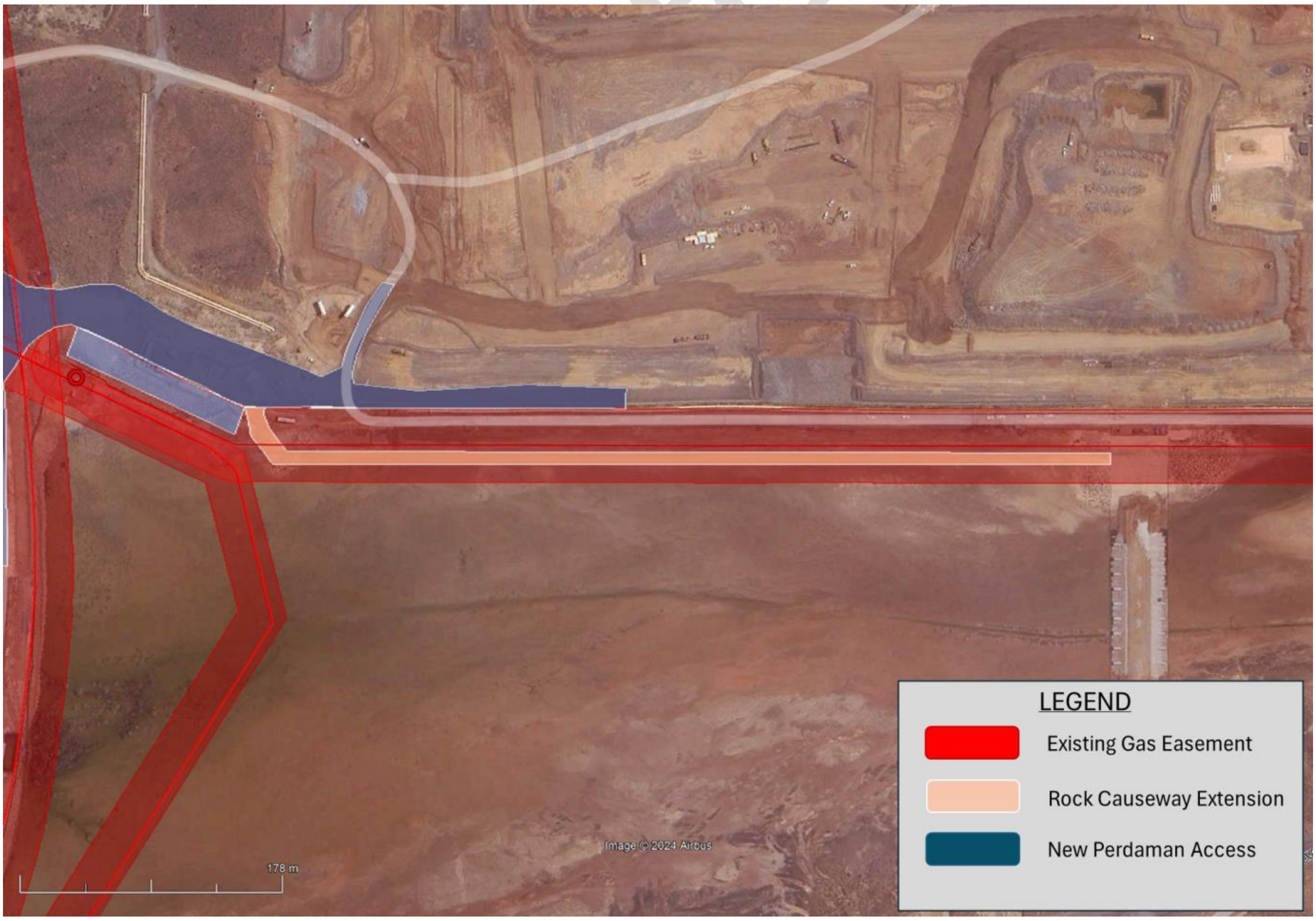
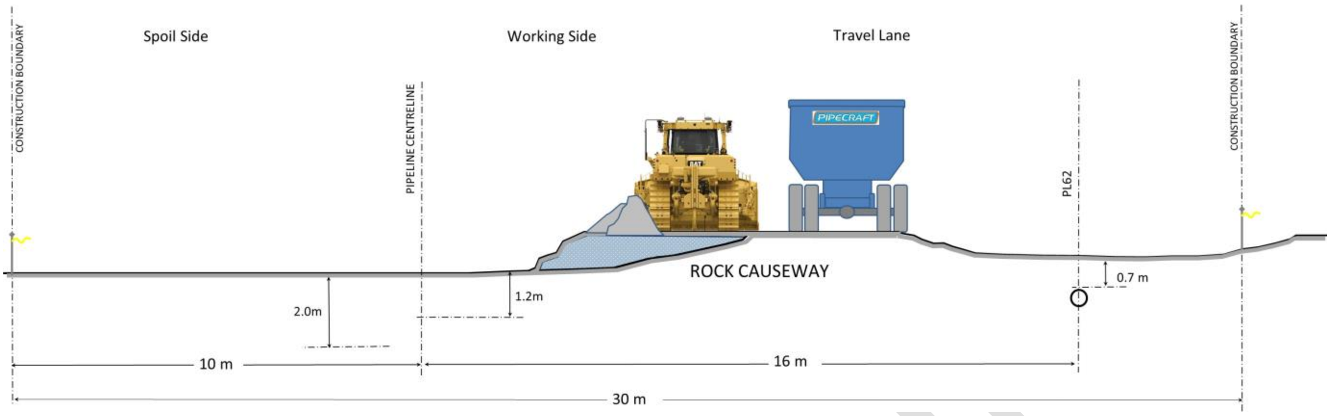


Figure 17: Causeway Extension with Rock Infill



4.9 Surface Runoff Control

Surface water runoff from the work site is to be controlled. Silt fencing is to be installed the length of the pipeline route, along the downhill easement boundary to control and filter any water runoff that is directed towards Kings Bay. Silt fencing should follow the topographic grades lines of the site so that it is located at the base of any local slopes. Any installed silt fencing will be inspected periodically to ensure it remains intact and functioning as intended. The purpose of silt fencing is to:

- Provide erosion control from water run-off; and
- Reduce / eliminate sediment transport from the work site from spilling into Kings Bay.

Figure 18: Silt Fencing Installation Extent

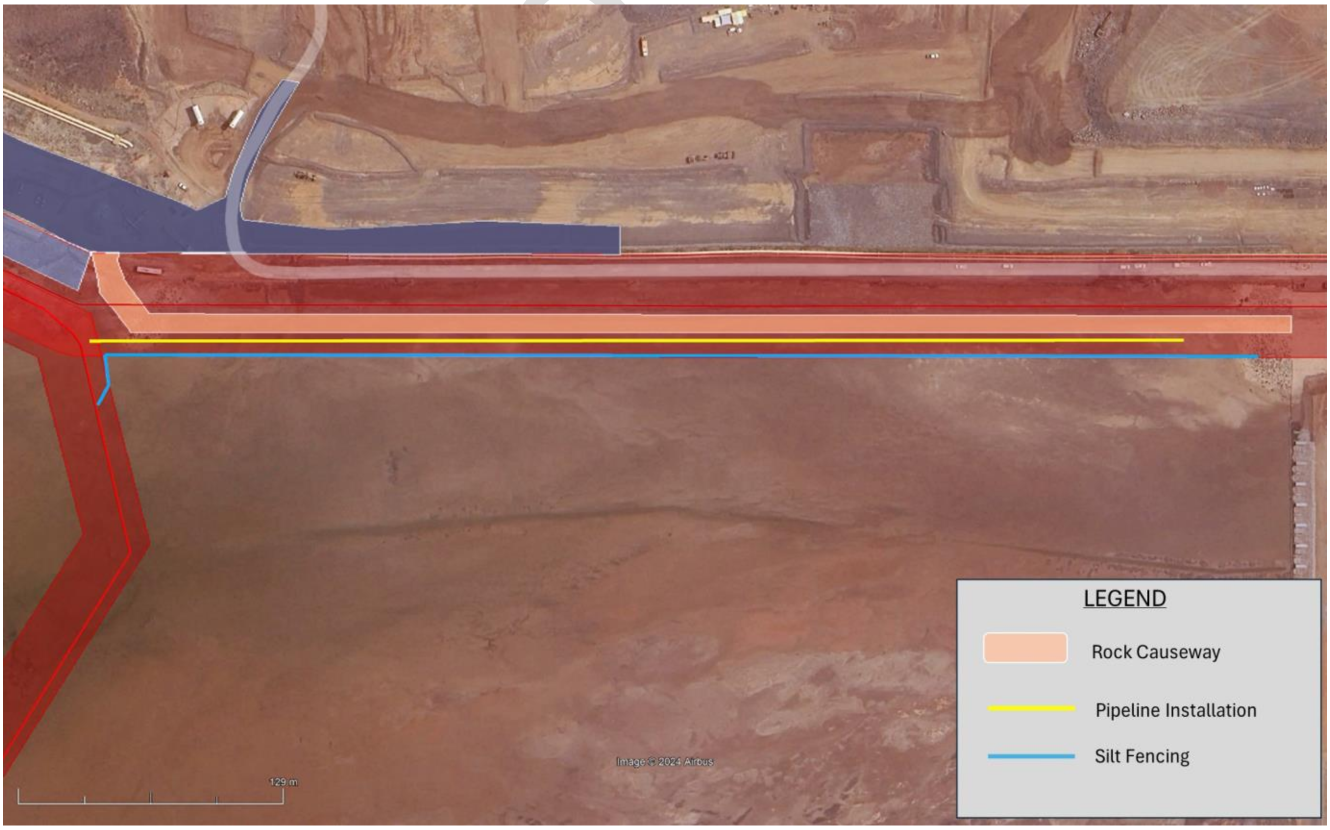
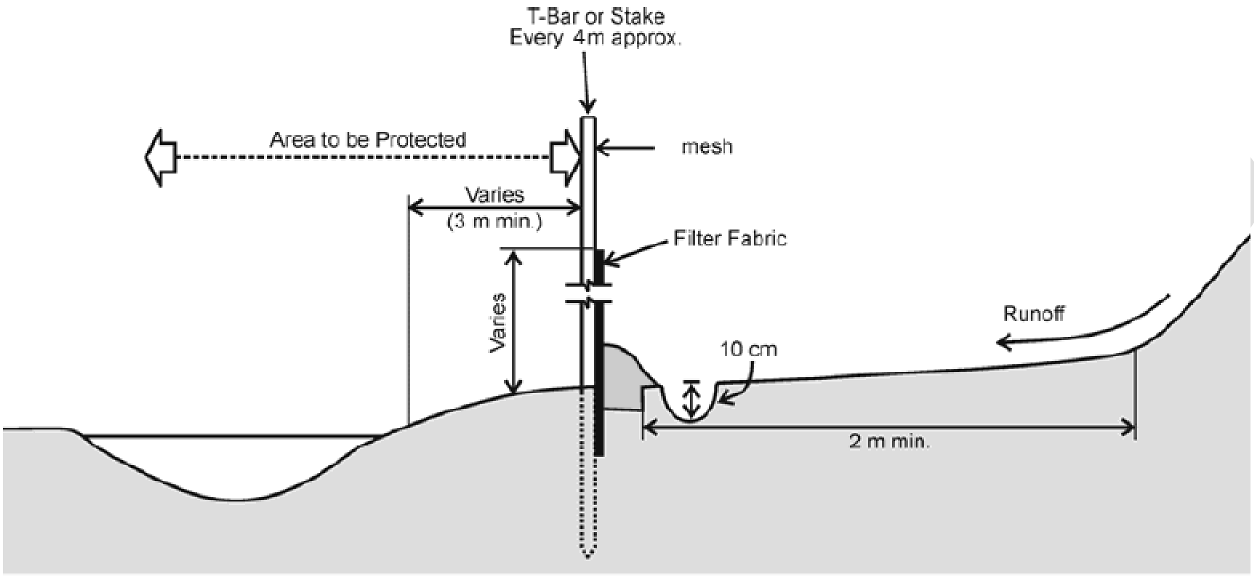
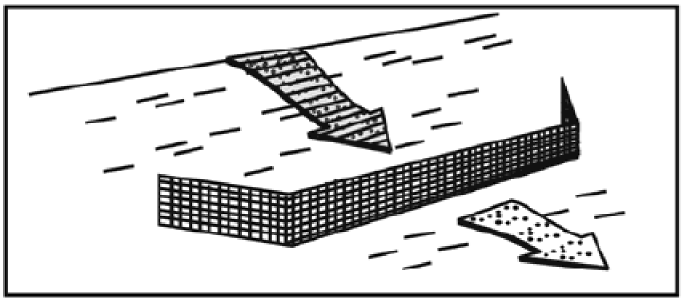


Figure 19: Typical Silt Fencing Installation



Side View of Silt Fence
(Not to Scale)



It is noted that ground water is not permitted to be discharged from any open excavations.

4.10 Trenching

The pipeline is to be installed conventionally and will be trenched. It is assumed that the ditch will be dug at a 1H:1V batter and will be fairly cohesive (Type 2 Soil).

- Ground disturbance protocols will be used to identify all underground infrastructure prior to trenching operations;
- Due to the layout of the CROW, trenching will be completed prior to fabrication of the pipe string;
- Normal depth of cover is 1200mm to top of pipe for the entire length of the route as it falls within King Bay and is considered a watercourse crossing;
- Trench spoil will be stored on the southern side of the CROW (on the King Bay side) and re-used for backfilling.

- As a contingency, due to possible environmental conditions, the spoil may be stored on the north side of the causeway within the PL62 easement (as an alternative stockpile location) but not within the PL62 NGZ.
- Trenching will be carried out by excavators where trench can be opened conventionally. Breakers shall be used to open rock trench (if it is discovered under the King Bay mud).
- Based on present knowledge of the subsurface conditions, cobbles and boulders are expected to be buried within the mud and some rock breaking may be required along some limited sections of the route;
- Bell holes will be located at the start and end of the line within the facility hardstands (to be constructed by Others). Bell-holes will be used to tie-in the pipeline risers to the main pipe string after lowering-in. As the facility hardstand grade elevation will be >1m above the King Bay natural prevailing elevation, the pipeline will rope up towards the riser with the final tie-in welds occurring within the facility fill (rather than the King Bay muds).

Figure 20: Typical Trench Profiles

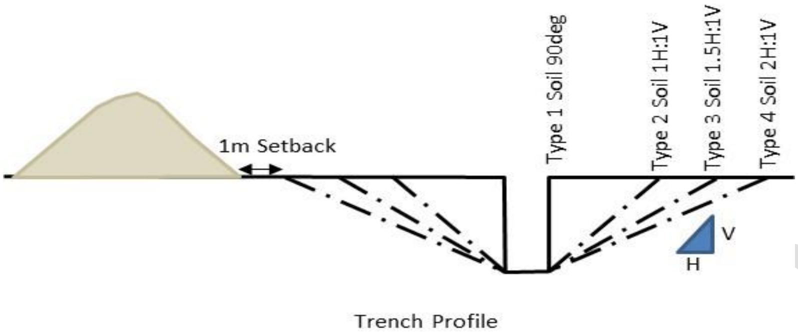


Figure 21: Typical Open cut Trenching of the Pipeline

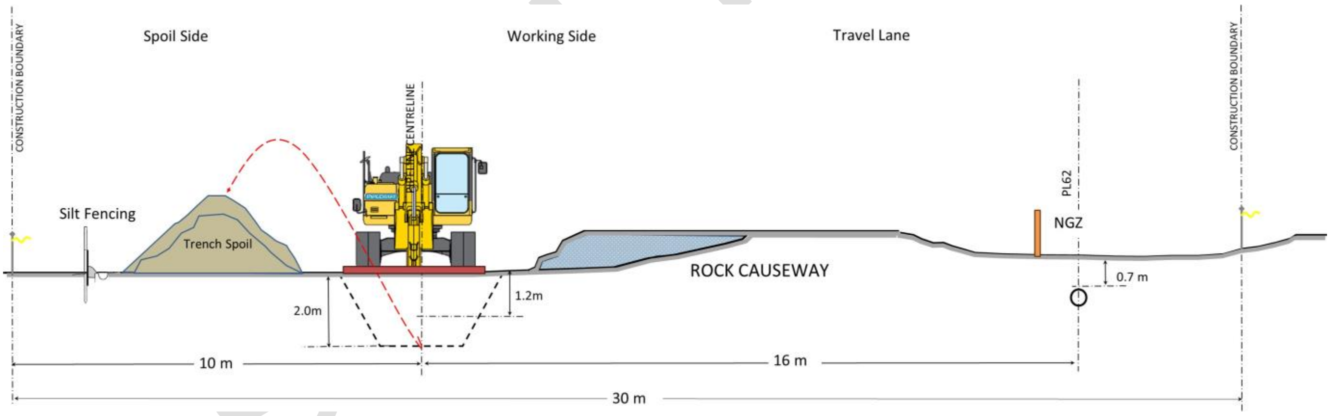


Figure 22: Alternative - Spoil Double Handling

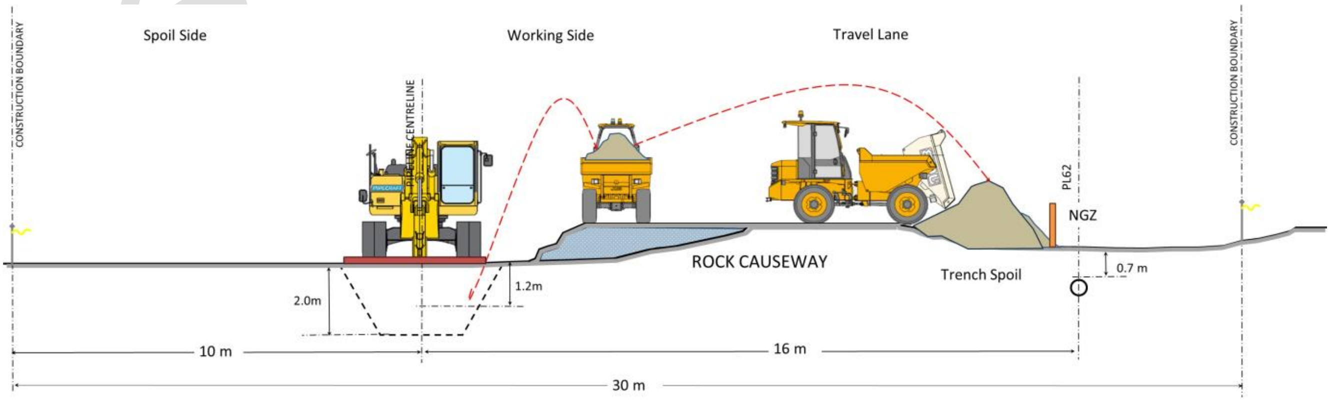


Figure 23: Surficial Geological Mapping

Figure 24: Trenching Geological Units from Regional Mapping

KP Start	KP End	Length	Soil Unit	Description	Trench Method
0.000	0.502	0.502	Qe	Estuarine, tidal delta deposits	Excavator

The pipeline primarily traverses through estuarine muds (Qe) and based on photos from other excavations in the area, some rock may underlie the mud (cobbles, bounders) given the route is along the high tide mark of King Bay.

It is assumed that Drill & Blast is not required, and all rock can be efficiently treated using excavators with rock breakers, if encountered.

4.10.1 Fauna Refuges

All open excavations shall make provision for the following fauna controls:

- Fauna refuges, consisting of hessian bags shall be placed at 50m intervals along the bottom of any dry open trenches. If trenches are water filled, fauna refuges are not required;
- Fauna ladders, consisting of mesh and fabric, shall be placed at 100m intervals, to facilitate trapped fauna to escape the trench;
- Any open excavations shall be visually inspected for trapped fauna at the start and end of each work shift (within 1 hour after sunrise and within 1 hour before sunset).

4.10.2 Ground Water Management

Subsurface water levels are unknown but generally may be several meters below ground level (mbgl) during the dry season and at ground level during the wet season. The works are to be timed to occur during the dry season at which point it is assumed the water table will be > 1-2 mbgl. This assumption will be confirmed during the test pitting program to be conducted.

It is understood that the ground water in the area and soils in King Bay are contaminated with PFAS (per- and polyfluoroalkyl substances) and therefore dewatering of trenches is prohibited.

The dewatering prohibition will impact the works as follows:

- Any open trenches will be allowed to fill up with water due to ground water seepage and infiltration. Water is not permitted to be pumped from trenches;

- As the pipeline is concrete coated, the pipe string will be lowered into a water filled ditch if the trench fills with water;
- The pipeline will be backfilled with in-situ spoil, whether the trench is dry or filled with water;
- If water must be pumped from the trench, it is to be contained and managed in accordance with CLIENT requirements. Temporary Ditch plugs should be considered to minimise the volume of water to be managed.

4.10.3 Acid Sulphate Soils Management

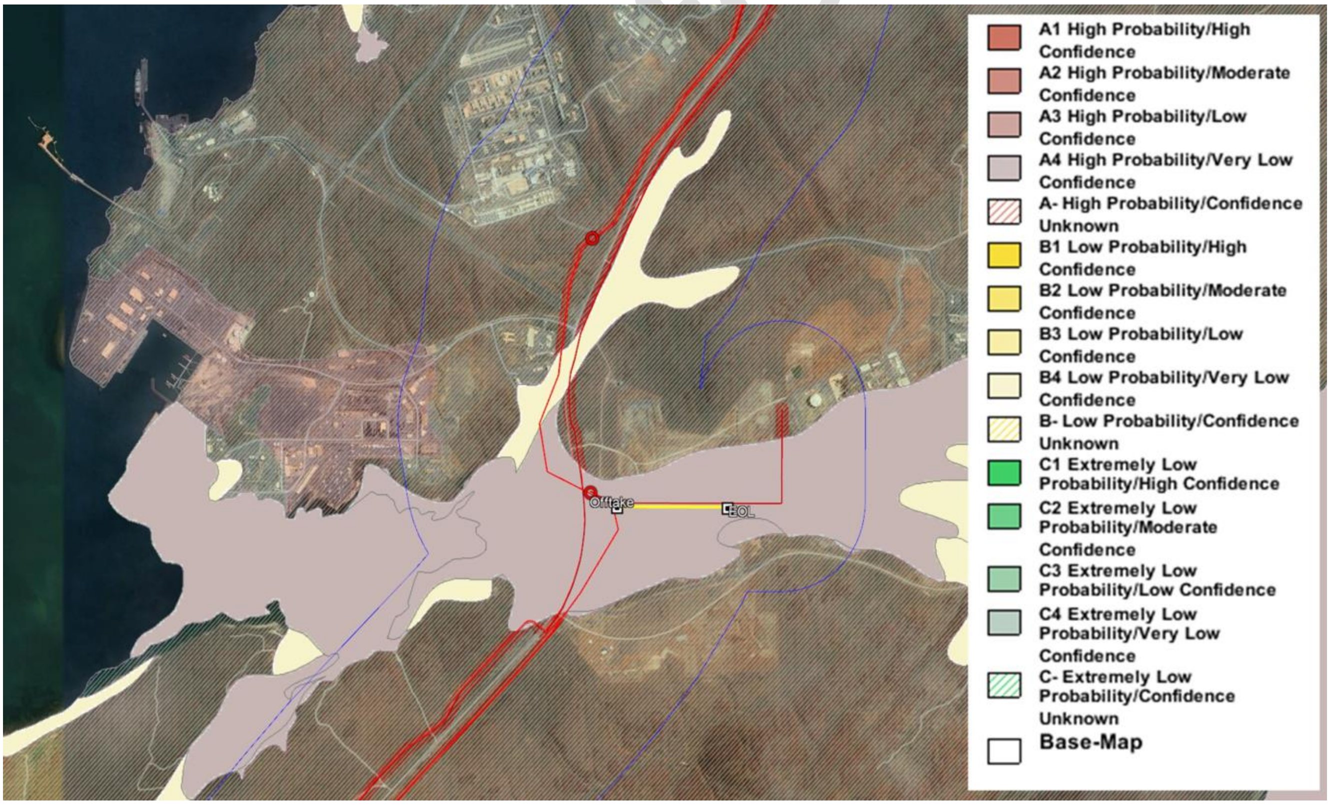
Based on ARIS mapping of ASS potentials, PIPECRAFT notes that the Project area falls within a ‘high probability of occurrence / very low confidence’ area for potentially Acid Sulphate Soils (ASS).

Preliminary advice from the Owner is that all excavated soils require dosing with lime to neutralise the potential soil acidity. Dosing rates are yet to be advised.

The following activities will be undertaken as part of the PASS management:

- Excavated soils will be mixed with ‘ag lime’ at the required dosing rate:
  - Soil will be excavated from the ditch;
  - Spoil will be dressed with ‘ag lime’ and the excavator will turn the soil to mix it in the stockpile.
- If excavated soils are not immediately mixed once excavated, the spoil will be placed on a bed of ‘ag lime’ or limestone crushed rock and the spoil pile dressed with ‘ag lime’. Spoil may be mixed with the ‘ag lime’ when it is returned to the ditch during backfill operations.

Figure 25: Acid Sulphate Soils Mapping



4.11 Pipe Haul

For the project, DN400 line pipe will be loaded out by PIPECRAFT from the stockpile location at the DBNGP Nichol Bay Pipe Yard on the Burrup Peninsula. Once loaded, the line pipe will be hauled to site using single trailers. Road trains will not be used to haul the line pipe due to the limited number of trailers required to support the project.

Unloading will be direct strung along the CROW using an excavator (requiring the line pipe to be pre-slung in the stockpile) or a Franna crane operating behind the trailer as it traverses the causeway.

PIPECRAFT will provide quality inspection during loading and unloading.

Figure 26: Line Pipe Haulage

Pipe Specification	Joint	No. Joints	Lineal Weight	Loads
DN400 x 9.53 mm WT API 5L PSL2 X65 30mm CWC	12m	~42 pcs	176 kg/m	10 joints/ trailer

Figure 27: Line Pipe Haul Route

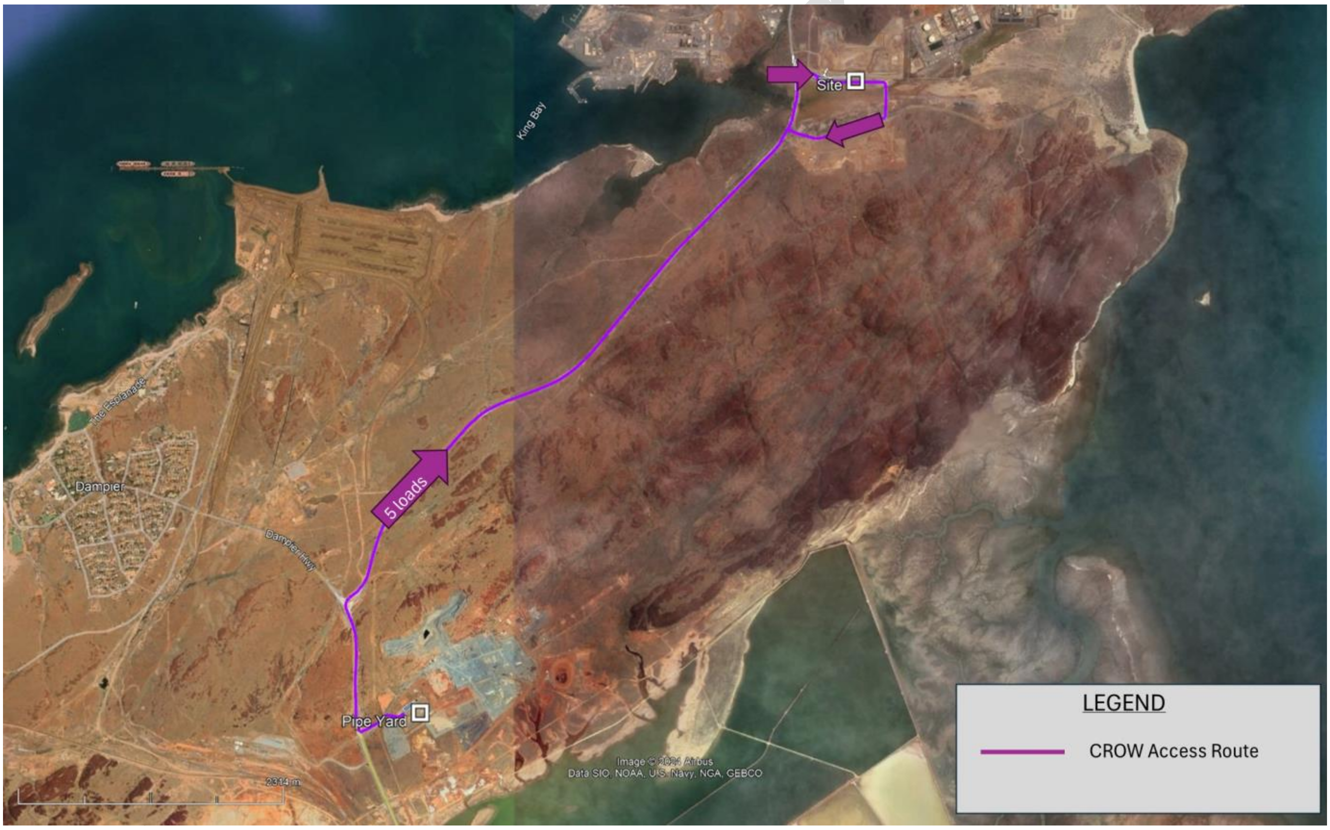
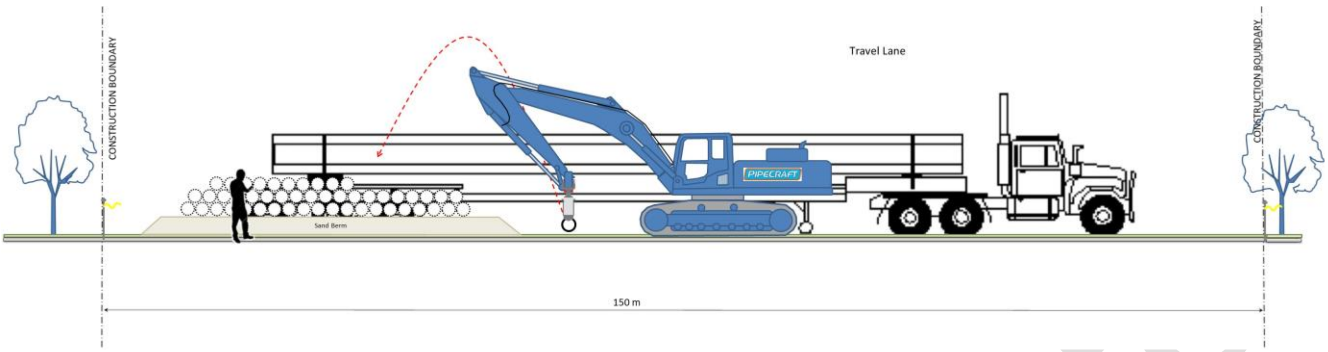


Figure 28: Typical Pipe Load Out



4.12 Line Pipe Custody Transfer

Custody transfer of line pipe occurs when line pipe is loaded out from the stockpile as each joint is inspected, in preparation for stringing.

4.13 Pipe Stringing

Stringing refers to the transportation and laydown of line pipe joints along the length of the CROW, in preparation of line up and welding operations. Stringing occurs immediately prior to welding.

Free issued line pipe joints will be strung direct on to the CROW using an excavator or placed with a crane.

Stringing shall be timed prior to welding and to minimise the amount of time the pipe sits along the right-of-way. Line pipe stringing shall be completed as follows:

- Line pipe is loaded onto trailers using an excavator or crane from the stockpile. If an excavator is to be used, the line pipe will be pre-slung;
- The line pipe joints are to be strung along the CROW onto skids and sawdust bags;
- All lifting plant and equipment shall be certified, in good condition and correctly rated, and shall comply with the relevant Australian Standards. All lifting equipment shall be inspected for wear and rating tags confirmed intact and legible;
- The skid crew will place timber skids and bags along the CROW, in preparation of stringing operations;
- The pipe will be strung out along the causeway at a 2-3m offset from the top of the causeway batter, so that sufficient workspace is provided to the welding crew during fabrication.
- Pipe shall be strung to avoid damage to the pipe by placing the pipe on top of timber skids and dunnage (typically in the form of saw dust bags or rolled hessian bags);
- Pipe ends will be slightly staggered to allow for subsequent end buffing during welding operations;
- Pipe shall be strung to avoid interference with normal use of any land / traffic lanes at access roads; and
- A visual inspection of the line pipe will be completed once strung out, to check for any visible damage to both the line pipe and the line pipe coating. Damaged pipe shall be flagged and noted on the ITR and / or quarantined.

Figure 29: Typical Stringing

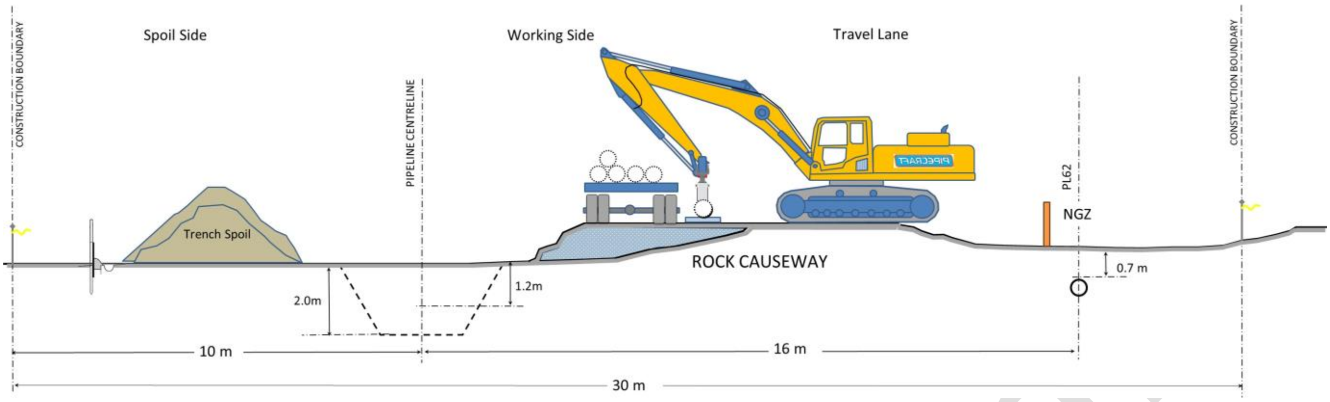
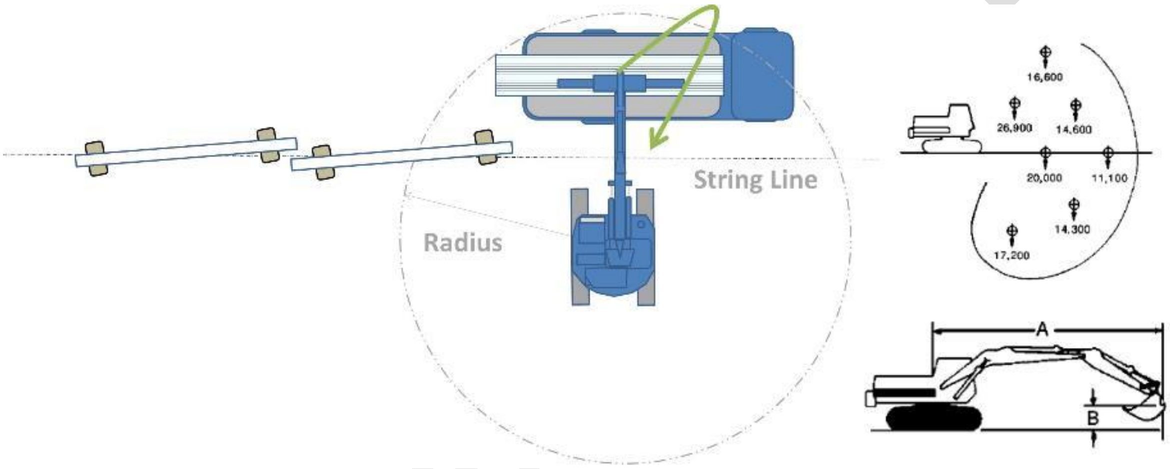


Figure 30: Typical Stringing Layout



4.14 Pipe Bending

Cold field bending of the line pipe is not required under the scope of work.

4.15 Welding, NDT and Field Joint Coating

The pipeline shall be fabricated in a single 502m long string.

The proposed welding process is MMAW using cellulosic electrodes by qualified (coded) welders. Prior to commencement of production welding, all Weld Procedure Specifications (WPS) shall be qualified and approved in accordance with AS2885, the CLIENT and relevant standards,

The NDT procedure shall also be qualified and subject to approval by the CLIENT.

- All pipeline welders shall qualify to nominated Weld Procedure Specifications;
- Production weld parameters and process inspection will be tracked in accordance with the pipeline ITP and CLIENT Specification;
- Immediately prior to being lifted for welding, the pipe ends shall be buffed to remove loose rust and scale, and the weld end checked for damage prior to fit up. All pipe numbers shall be verified to be on the outside of the pipe for traceability. If the pipe number cannot be verified, the relevant pipe shall be placed to the side of the CROW and quarantined, until verification has been carried out.

- A swab shall be pushed or pulled through the pipe to remove any internal foreign matter;
- A length of pipe is lifted and stabbed onto the raised pipe or string. Alignment will be achieved with an internal or external clamp, as applicable. Only qualified welders shall perform welding in accordance with the applicable approved Weld Procedure Specification;
- During welding, skids (timber gluts) or pipe cone supports shall be used to provide a support, to ensure no movement of the pipe during welding. Depending on the pipe external coating, protection mats may be placed on the pipe during welding to protect the pipe coating;
- Due to the risk of ignition from grinding sparks, heating torches and welding, the crew shall maintain constant visual checks for potential sources of combustible material in the vicinity of their work location and have fire-fighting unit available for use in accordance with minimum DFES firefighting volumes based on fire danger rating (Moderate 500L, High 1000L, Very High 1500L, Severe 2000L, Extreme 2500L). During very high to severe rating, the welder fire-fighting unit will be supplemented with a watercart that will be operating in the vicinity;
- The welding crew will have a nominated fire watch who will also act as a fire first responder;
- Welding refuse, including electrode stub-ends shall be retrieved for disposal at an approved waste disposal site and shall not be discarded on the CROW or in the trench;
- Pipe will be welded in a 502m long string;
- End caps will be installed on ends of welded pipe strings;
- All welds (100%) will be subject to radiographic inspection and evaluated against AS2885 workmanship criteria (Tier 1) by a qualified and NATA endorsed NDT company subcontracting to PIPECRAFT;
- NDT will be completed using internal crawlers. Computer Radiography will be employed;
- All joints shall be coated with the design nominated high build epoxy coating system to 800 microns after clearance by NDT. Surface preparation shall be abrasive blasting in accordance with the manufacturer’s recommended procedure. Application of the coating systems will also be completed in accordance with the manufacturer’s procedure;
- All FJC applicators shall be qualified to the coating system. The first production joint is used as the applicator qualification joint and will be witnessed and approved by the CLIENT;
- All coating materials shall be stored as per the manufacturers written storage requirements. Epoxy part A and part B components shall be kept in their original containers until they are to be used. Liquids shall be stored at location away from ignition sources. SDS sheets will be kept at the storage location and in the crew work vehicles;
- 100% of field-applied coating will be holiday tested in accordance with the specification to ensure the coating is free from holidays over its entire surface. Test voltages may be derated based on CLIENT instruction;
- After the coating system has achieved its minimum hardness requirement, the coated joint may be overcoated – based on CLIENT design instruction; and
- It is noted that there will be no CP test posts installed on the pipeline due to its short length and therefore cadwelding of test leads is not required.

Figure 31: Typical Pipe Gang

Figure 32: Typical NDT

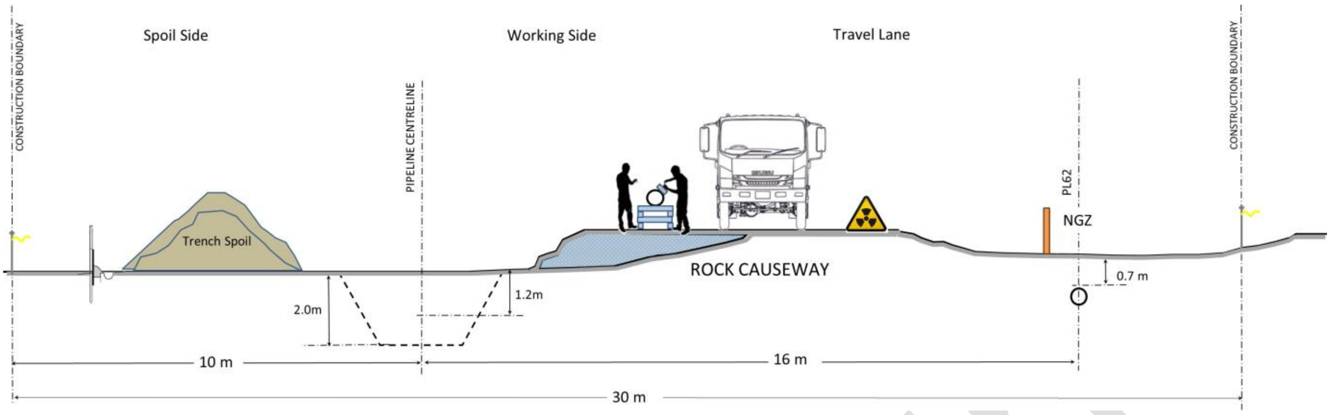


Figure 33: Typical Abrasive Blasting and HBE Coating

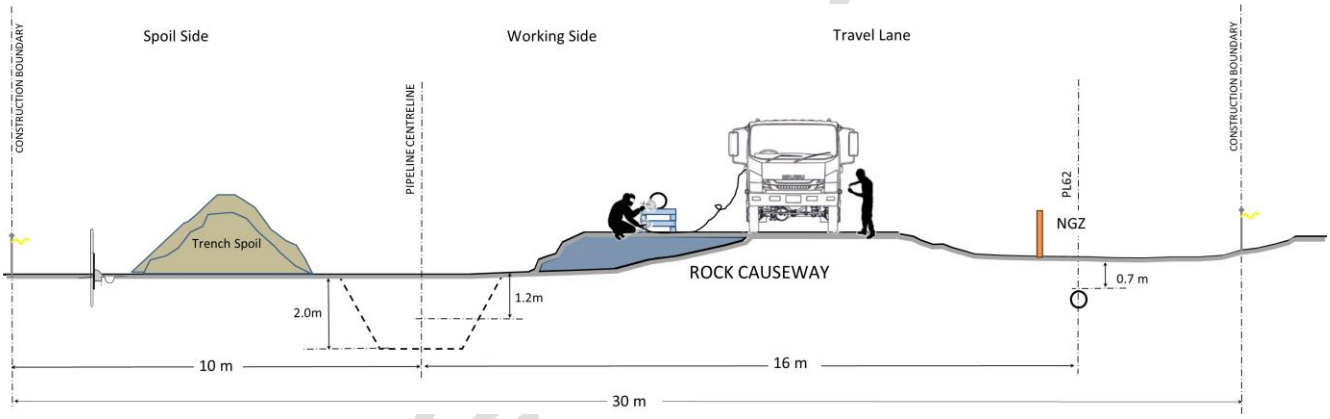
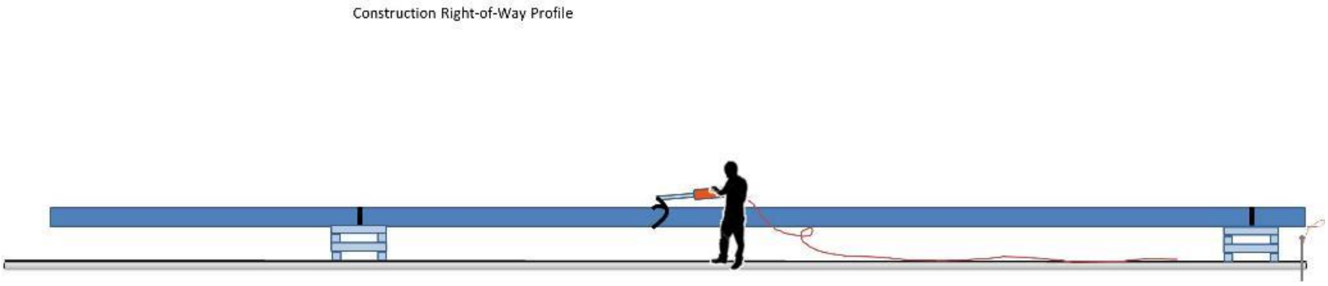


Figure 34: Typical Jeeping of Coating Applications



4.16 Ditch Preparation and Lower-In

Lowering-in refers to the lifting of a pipeline string and continuously lowering it into the trench using either pipelayer / side booms, excavators or a combination of this equipment. The lowering-in operation shall ensure that the pipe string has adequate and properly distributed slack, the pipe string is not unduly stressed by correct spacing of the lifting equipment and coating is not damaged. Pipe lifting belts are placed around the pipe and connected to the lifting equipment.

A lift plan will be developed demonstrating the lifting operation does not place undue stress on the pipe string during installation and equipment is operating within their lifting charts. Lift plans shall be subject to CLIENT approval. Any lift plans over 20Tn are considered a complex lift and shall be submitted to the CLIENT for review and approval.

As the pipe string is fabricated using Concrete Weight-Coated pipe, the string will be belted in using a number of pipelayer sidebooms and excavators, as the pipe string will not ‘rope’ into the ditch as per normal pipeline lowering-in operations.

Sandbags (hessian bags filled with stabilised sand) will be placed along the bottom of ditch to provide set-down pillars for the pipe string prior to padding with in-situ spoil. Spacing of pillars shall be at 4m c/c separation. Screening buckets may also be employed or a ‘ditch lizard’ run the length of the trench to ensure the ditch bottom is level.

After lowering-in, the pipe string will be padded using in-situ spoil.

Lowering-in considers:

- 100% of installed pipe (by lowering-in) shall be monitored to ensure the coating is not damaged and that the pipeline is bedded in a natural manner;
- Bedding and padding material shall be the in-situ ditch spoil. Care shall be taken that backfill at field joint locations is non-sharp material free of contaminants, vegetation and other debris, and with a well-distributed particle size. Bedding and padding material shall not impinge into, or otherwise damage the pipeline coating.

Lowering-in shall be completed as follows:

- Confirm lifting method and inspect lifting equipment. All lifting plant and equipment shall be certified, in good condition and correctly rated, and shall comply with the relevant Australian Standards, prior to pipe lifting activities commencing. All lifting equipment shall be inspected for wear and rating tags confirmed intact and legible;
- Excavate bell holes at tie-in locations, as required;
- An inspection of the trench shall be made prior to lowering-in to determine correct depth, the need for bottom padding (if required), and removal of any protuberances in the trench wall and bottom that may damage the pipe or pipe coating. Trapped fauna will be removed from the trench. If present, water in trench sections shall remain as dewatering is not permitted;
- Immediately prior to lowering-in of the pipe string, all coating shall be visually inspected and tested using a holiday detector (for any non-CWC segments). Any defects shall be clearly marked for repair. All holidays and visual defects shall be repaired in accordance with the PIPECRAFT Field Joint Coating Procedure;
- Complete the string lowering-in using pipeline belts with head irons. The equipment slowly moves forward and slowly starts to jib out and position the pipe into the trench. Once the end of the pipe string is in the trench, the equipment continues to move forward, with care taken to keep the pipe centrally located within the trench until the entire string has been installed. As the pipe is being ‘belted’ in, excavators may be required to ‘leap-frog’ forward whilst the sidebooms track along and provide continuous lifting stability;
- As-built survey will be taken at fixed intervals and of all buried appurtenances, prior to shading.

Figure 35: Typical Bedding Using Sandbag Pillars

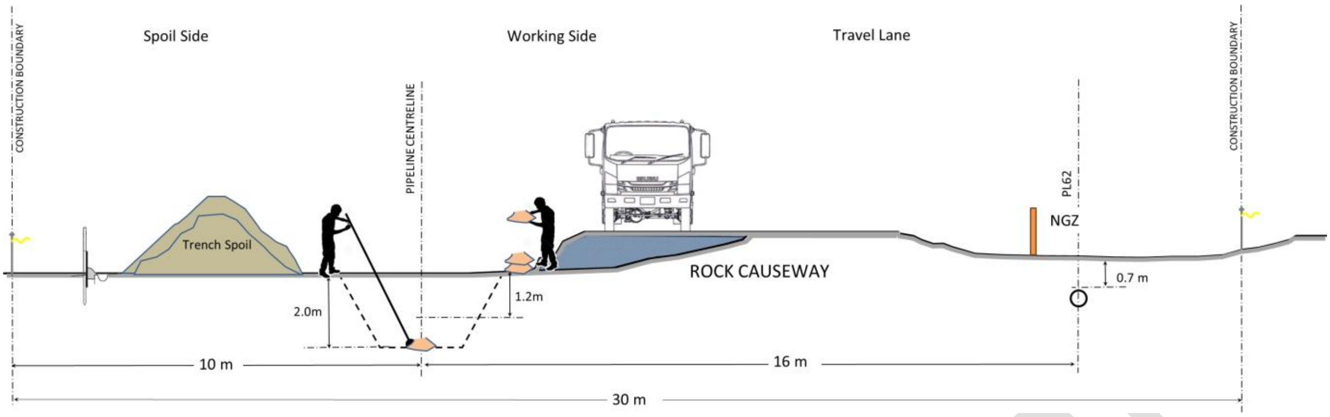


Figure 36: Typical Lowering-In

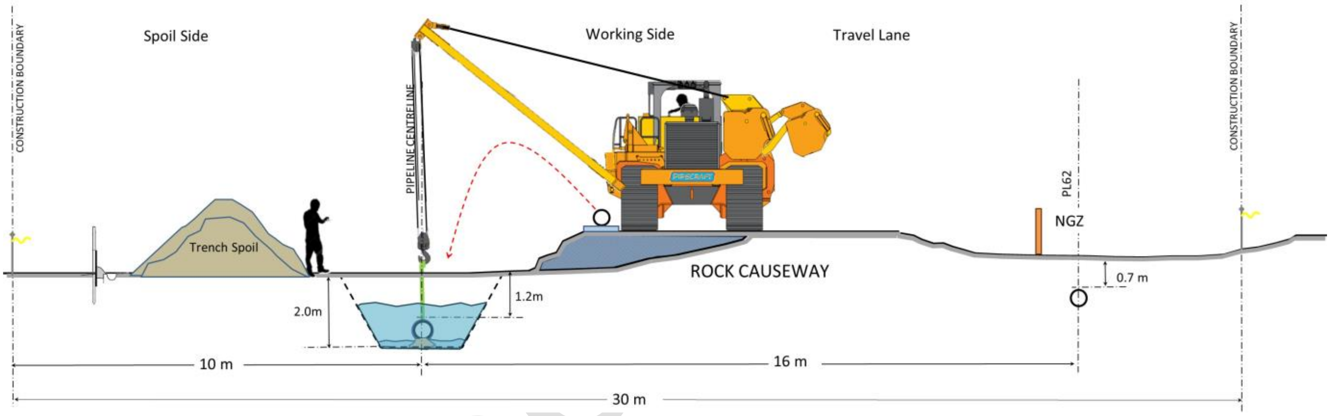
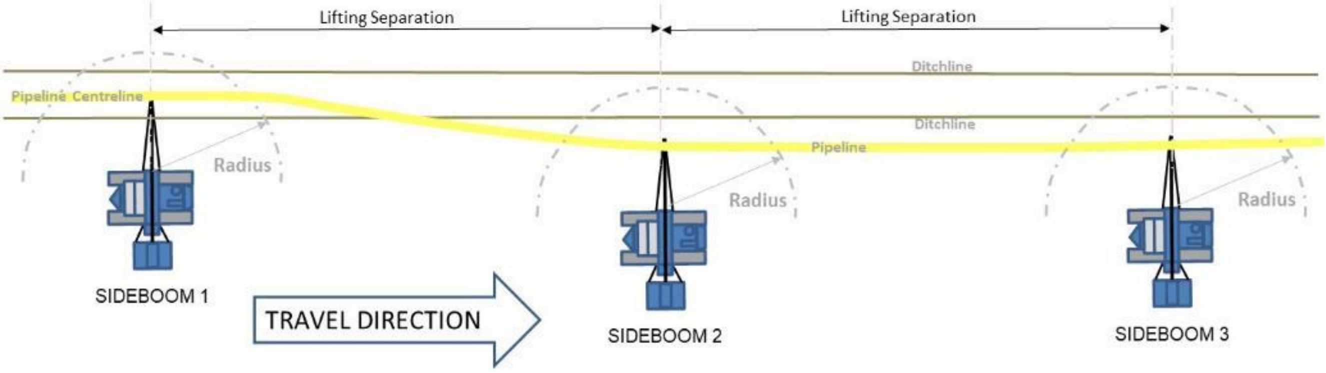


Figure 37: Typical Lowering-In Lift Plan



4.17 Shading and Backfill

Backfill refers to the refilling of the excavated pipeline trench to install the pipeline to the design depth of cover. Whether shading is required or if the pipeline can be direct backfilled is a function of the gradation of the backfill material and the type of protective barrier coating on the pipeline.

The pipeline shall be shaded and backfilled with the in-situ spoil, wet or dry.

Backfill and compaction is as follows:

- Trench condition and spoil gradation are inspected to determine if the pipeline requires special protection and if the pipeline can be direct backfilled;
- The pipeline is 'shaded' or padded with in-situ material. Ditch tape is run after padding (as required);
- Once shaded, the pipe trench is backfilled using in-situ materials in a single lift. Backfill may be consolidated by tracking equipment over top, subject to the water saturation of the soils and subsurface conditions. Other approved compaction method may be employed to ensure no voids are present within the trench;
- If the trench is water filled (noting that dewatering is not permitted), the backfill may be placed in the wet trench and allowed to consolidate. This is a time dependent activity as the water is 'squeezed' out of the spoil due to the weight of the backfill material;
- If required, excavators with shaker buckets having 150mm aperture will be utilised to sort backfill material that is not suitable for direct re-use. This method is anticipated for the sections that required rock breaking during trenching. Alternatively, a screening bucket may be employed;
- Mechanical vibratory compaction is not utilised;
- Marker tape complying with the technical specification and denoting "Buried High Pressure Gas Pipeline" shall be installed as detailed on the alignment sheets and drawings, typically at a minimum 300mm below the surface, on the padding layer prior to general backfill; and
- The trench shall be backfilled such that a crown is formed typically 200 mm in height (if required under the Specification). The crown width is typically 500mm to 750mm each side of the trench centreline. A crown is critical if the trench is backfilled 'wet'.

Figure 38: Typical As-Built of the Pipeline

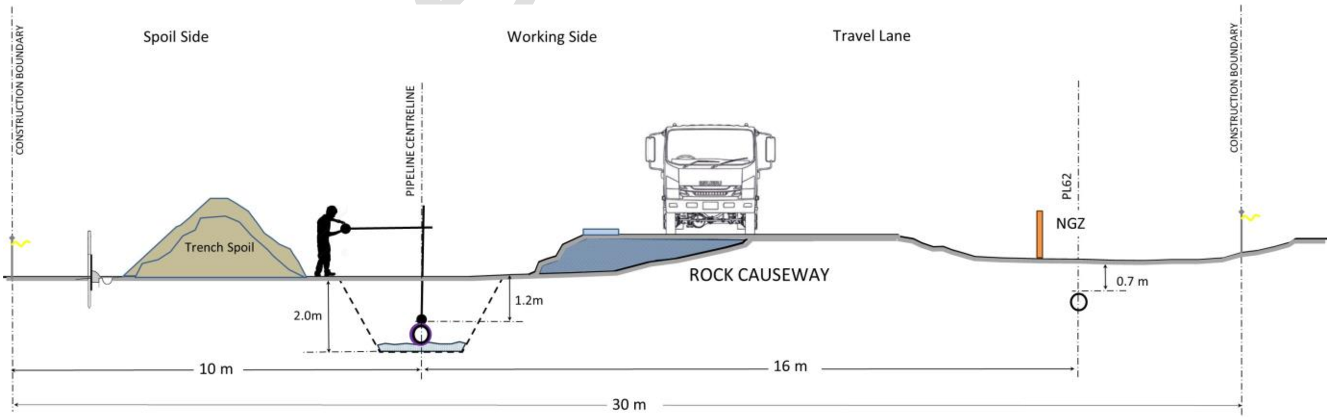


Figure 39: Typical Shading of the Pipeline

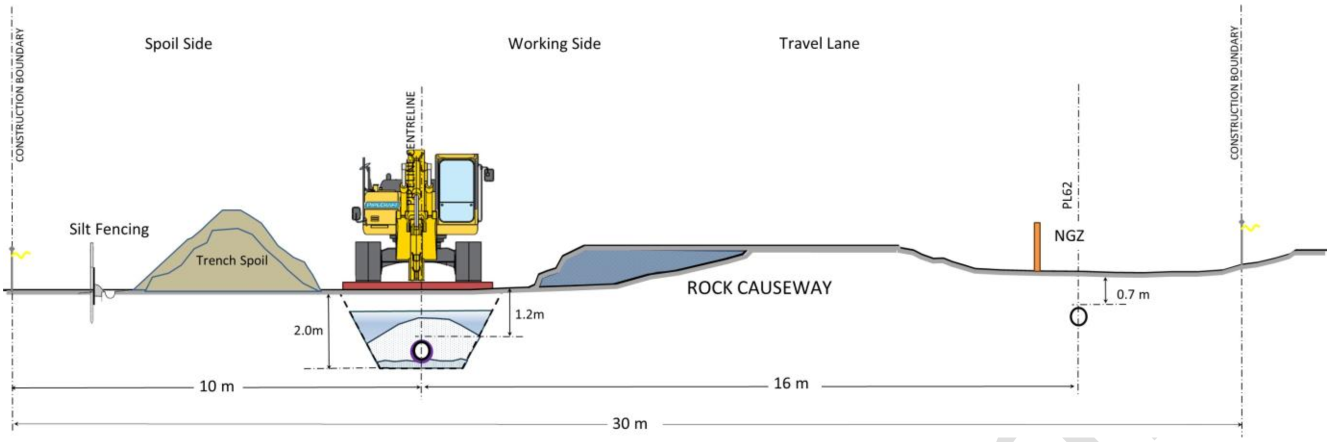
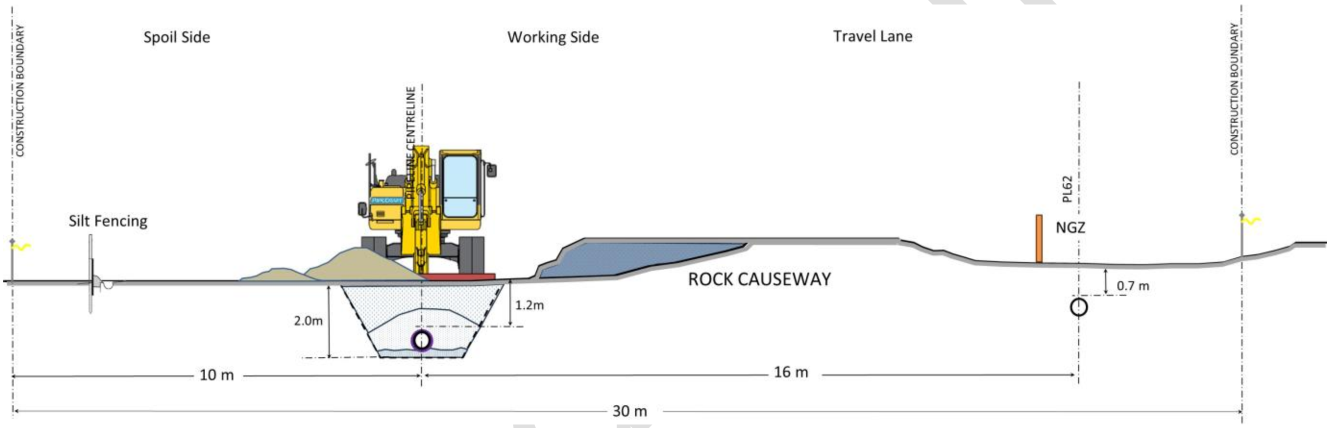


Figure 40: Typical Backfill of the Pipeline



4.18 Tie-ins and Special Crossings

Tie-ins will be completed at the start and finish of the pipe string at the riser locations. The tie-ins will most likely occur within the facility hardstands (off-take and delivery stations).

These tie-ins shall be completed as follows:

- Bell holes will be constructed to allow safe ingress and egress, with bell holes typically 4-8m in length and excavated to allow nominally 500mm clearance below the pipe and 1m each side;
- All joints shall be made at low-stress, with line pipe joints lined up properly to prevent any cold springing;
- The pipe overlap shall be cut off and the tie-in weld completed;
- NDT and coating of the welds will be completed; and
- Backfill of the bell hole. Compact the backfill to meet the specification or compact level of the surrounding soils.

As the riser tie-ins will occur within the facility hardstands, it is not foreseen that dewatering will be required for trench entry. If dewatering is required, trench water shall be managed and controlled in accordance with CLIENT requirements which may include containment (with the use of holding tanks or equivalent).

It is the prerogative of the Pipeline Superintendent to weld on the pipeline risers prior to string lowering-in and rolling the pipeline after lowering-in to position the risers, if ground water infiltration prohibits in-ditch tie-in welding.

Figure 41: Typical Tie-in of Pipeline Strings

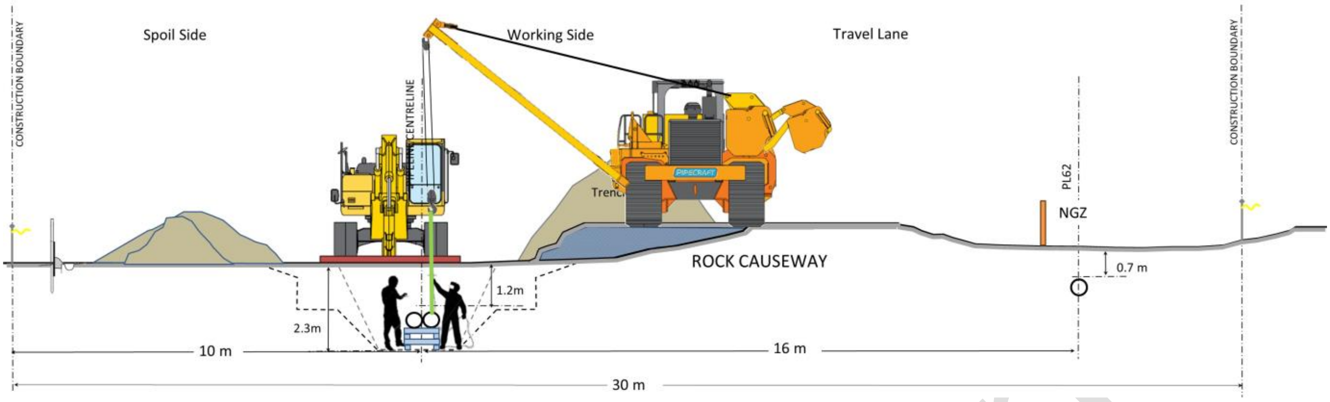
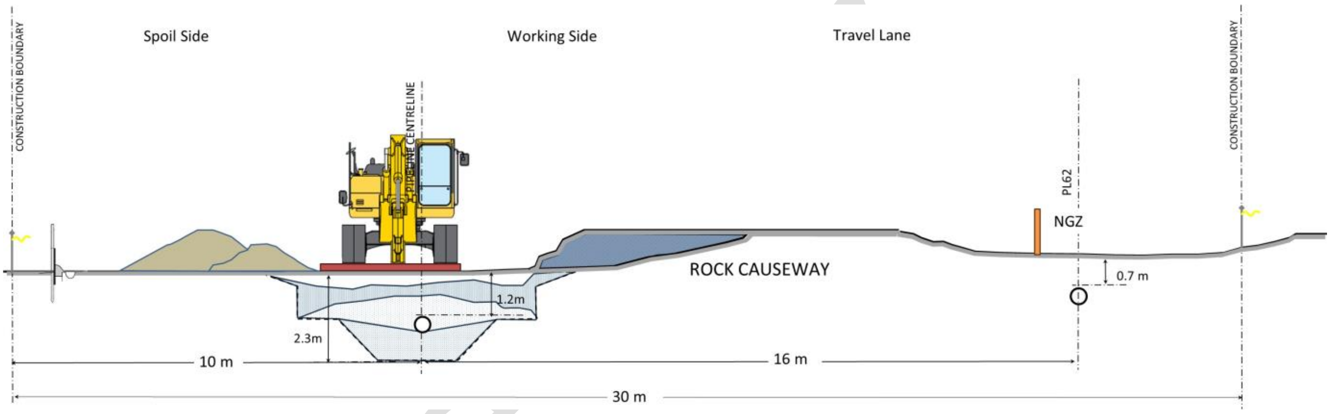


Figure 42: Typical Backfill of a Tie-in



Tie-ins also typically occur at crossing locations (roadways, watercourses, utilities). There are no foreign crossings under the scope of work.

Figure 43: Pipeline Crossings

KP	Type	Description	Method	Crew
		Nil to report		

4.19 Reinstatement

Reinstatement involves the restoration of the CROW that was disturbed during construction, and involves the following:

- Clean up and restoration is a similar operation to that of clear and grade using the same equipment, but in reverse order;
- The CROW is restored to pre-construction grades with the respreading of all subsoil stripped during grading;

- As there is no clearing of vegetation or stripping of topsoil under the scope of work, there will be no material to roll-back during reinstatement, other than the top layer of estuarine muds stripped during trenching operations.
- The trench and CROW shall be restored to the natural contours of the ground and shall allow for normal surface drainage;
- Pipeline warning marker posts and signs will be installed in accordance with the drawings and specifications. The marker posts are typically installed once all earthworks have been completed;
- Laydown areas shall be reinstated to a condition closely matching it original state and free of waste; and
- Clean up and remove any rubbish directly produced from the works, including temporary signage, CROW boundary demarcation, survey pegs and general construction debris.

Reinstatement work is carried out in accordance with the Environmental Management Plan to preserve and promote in the regeneration of natural vegetation, erosion control and provide animal habitation (as applicable).

Figure 44: Typical Reinstatement of the Pipeline

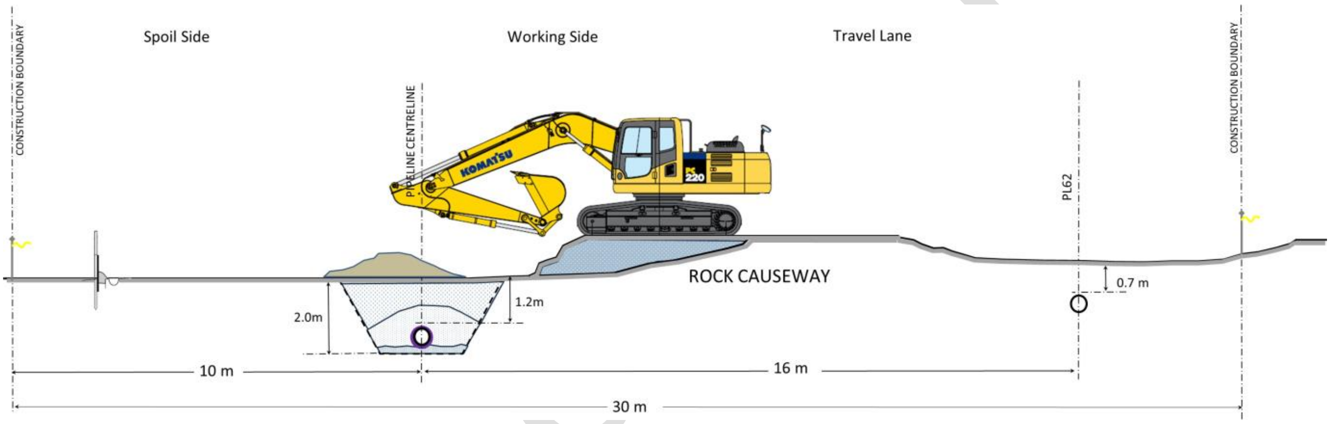
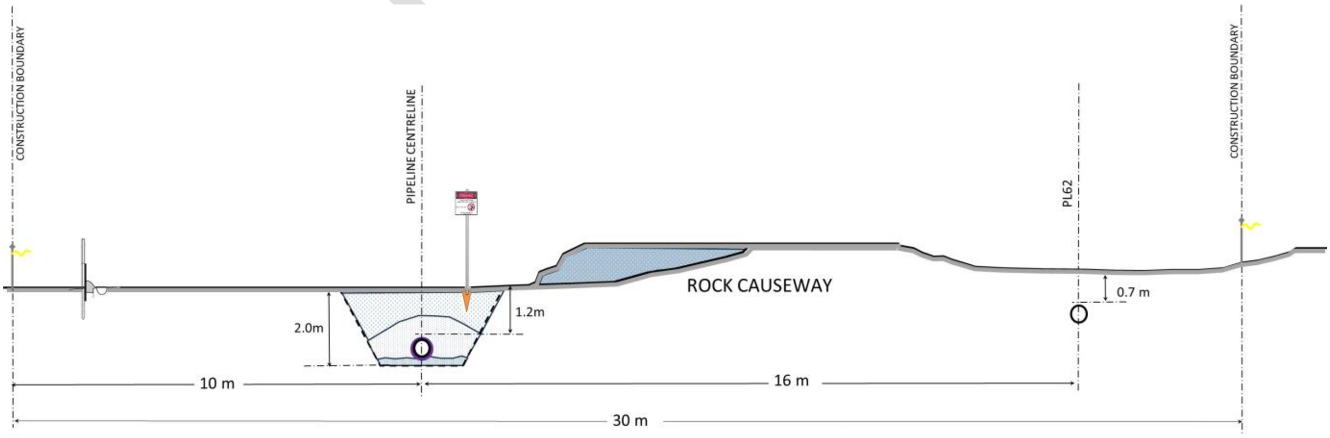


Figure 45: Typical Pipeline RoW – Post Rehabilitation

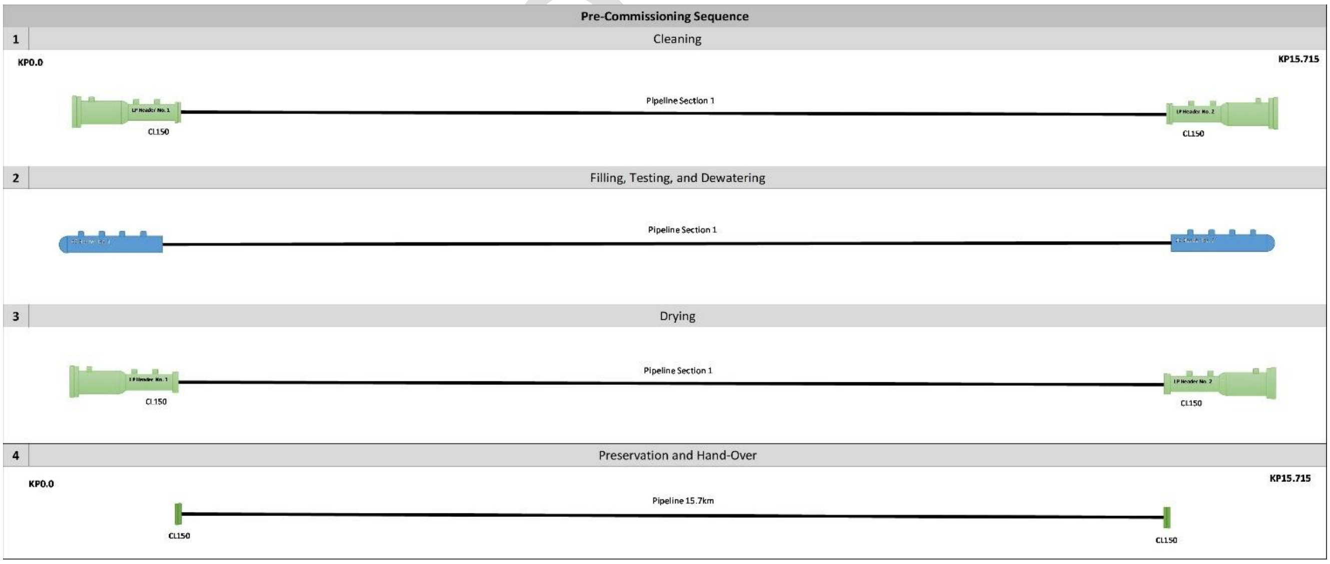


4.20 Hydrostatic Pressure Testing

Once installed, the pipeline shall be hydrostatic pressure tested to confirm design compliance with the maximum allowable operating pressure.

- Works will be completed by a dedicated NATA certified subcontractor test crew;
- Testing will be completed in accordance with the specification for the strength and leak testing;
- The pipelines will be tested in one section (which includes the pipeline risers) using test headers. The testing program will be developed by the hydro testing subcontractor and procedures submitted and approved by CLIENT and PIPECRAFT;
- Cleaning – The pipeline shall be cleaned with scrubbing and cleaning pigs prior to filling;
- Filling - with water sourced from the CLIENT standpipe and pigs shall be used to maximize air removal. Thermal stabilization shall be achieved prior to testing;
- Pressure testing to be completed to the specification;
- Dewatering – using pigs to dewater the pipeline. Test water is to be pumped into water tankers and hauled off-site for disposal;
- Gauging – will be performed during filling using a Bi-Directional pig with an aluminium gauge plate attached;
- Drying – After the hydrostatic pressure test, the pipeline will be dewatered and dried. Drying consists of running foam pigs until dry followed by desiccant drying to -20°C dewpoint; and
- Hydro test flanges will be left in place to maintain pipeline preservation. The tie-in crew will cut off the flange to facilitate final tie-in of the pipeline;
- After completion of testing, adjoining test sections will be tied-in by two “Golden Welds” or via a flanged connection.

Figure 46: Typical Hydrostatic Test Sequence



4.20.1 Interim Manufacturer's Data Record

The MDR is compiled progressively whilst the pipeline is constructed. The interim MDR shall be submitted prior to hydrostatic pressure testing for interim approval by the CLIENT as a hold point prior to proceeding with hydrotesting.

The minimum requirements for the interim MDR include the Weld Book and installation as-built survey with all fabrication ITP's signed by PIPECRAFT and the CLIENT.

4.21 CP Installation

The Design does not require any Cathodic Protection (CP) test posts on the pipeline.

4.22 DCVG Survey

Once installed, the pipeline shall be subject to a Direct Current Voltage Gradient (DCVG) survey to identify any coating anomalies.

- The survey is completed by a NATA certified technician;
- All identified anomalies 1% IR and above are to be dug-up and investigated with coating defects repaired.

The practicality of a DCVG Survey will be limited as the pipeline is overcoated with a Concrete Weight Coat (CWC). The DCVG Survey is considered optional and to be confirmed by the CLIENT as required.

4.23 Final Tie-ins

After pre-commissioning, the pipelines will be tied into existing infrastructure using 'golden welds' or bolted up to facility piping. Golden welds are subject to additional NDT requirements.

NDT for the final tie-ins shall comply with CLIENT Specification.

Once the final tie-ins are completed, the pipeline is handed over to the CLIENT for gasification.

Final tie-in sequence is as follows:

- Pipeline construction is completed;
- The mainline hydrostatic pressure test is completed;
- The test headers are cut from the pipeline. EOL piping is prepared for tie-in;
- Final tie-in welds or final bolt-up is completed to the facility piping based on the Scope Break locations.

4.24 Demobilisation

Demobilisation refers to the removal and transportation of all personnel, plant, equipment and material from the Project Site back to their point of origin or to a PIPECRAFT yard. Demobilisation shall be completed as follows:

- Muster all materials, consumables and equipment back to the main laydown staging area;
- Complete staged transport of all equipment, materials, consumables and personnel back to their respective point of hire (origin); and
- Complete final review of the site and clean-up.

4.25 Project Close-Out

4.25.1 Manufacturer's Data Record

An MDR shall be developed and approved for the Project. PIPECRAFT shall prepare, on an on-going basis through the course of the Project, necessary documentation and traceability records to be compiled in a Manufacturers Data Report upon completion of works. Formatting of the MDR shall be in accordance with an approved MDR Index.

4.25.2 Punch-Listing

The Project Manager shall ensure that punch-listing is progressed and communicated to facilitate the handover of the works to the Client Representative and Commissioning team.

Required resources and forecast time frames are identified in order to achieve the handover of the assets:

- Appropriate resources are set aside;
- Risks and hazards are appropriately identified and managed; and
- Personnel are informed of and understand their roles and responsibilities to safely manage the entire process throughout the punch-listing phase.

4.25.3 Practical Completion

Once all Contractual obligations have been completed, PIPECRAFT will apply for a certificate of Practical Completion, and the Project shall be deemed closed for construction purposes.

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APPENDIX A: ROLES AND RESPONSIBILITIES

All personnel managing or executing this CEP shall be responsible for its implementation. All personnel associated with execution of the works shall be required to comply with the requirements of all applicable legislation, regulations, codes of practice as well as PIPECRAFT standards, procedures and work practices. Depending on the execution plan for the works, a single person may assume more than one role listed below.

An outline of the responsibilities of key personnel are given below.

Role	Responsibilities
Senior Management	• Demonstrate visible leadership and commitment to best-in-class project performance and implementation of risk management; • Ensure that adequate resources are allocated for the requirements of the Project to be met; • Establish business objectives and KPIs and monitor to ensure their achievement and effectiveness; • Ensure the business is in full compliance with the requirements of the Project and measure the effectiveness of the BMS by ensuring internal audits are completed; and • Ensure that all Project staff and PIPECRAFT management understand and implement this Plan in their area of responsibility.
Operations Manager	• Audit the effectiveness of the BMS implemented on the Project; • Manage change and ensure control and corrective actions are implemented by reviewing Project and business processes; • Ensure the Project systems defined in this plan meets all statutory and CLIENT requirements by completing intermittent reviews; and • Ensure that all Project staff and PIPECRAFT management understand and implement the PEP in all their area of responsibility.
Project Manager	• Demonstrate visible leadership and commitment to best-in-class project performance and implementation of risk management; • Manage interfaces with the CLIENT and subcontractors in relation to risk issues including maintaining uninterrupted communication; • Adopt business objectives and KPIs into the Project and monitor to ensure their achievement and effectiveness; • Approve management plans and associated documents, reviewing and authorising proposed changes to or deviation from the approved plans; • Monitor effective implementation of the Project systems and providing training to ensure that each member of the project team is competent to implement the BMS; • Review the project inspection and audit results and ensure that required corrective/preventive measures are identified and executed; • Convene periodic project meetings for reviewing project progress, cost and status of HSEQ issues; coordinating and resolving any identified issues; and • Support the Quality and HSE representatives in executing the Project systems.
HSE / Quality Representatives	• Assist the Project Manager and the Project personnel in effective execution of risk-based tasks; • Coordinate Subcontractor risk management plans, documents and enquiries;

	• Ensure the Project systems complies with current statutory and standards obligations; • Ensure that required Project plans and procedures are developed in support of the effective implementation of the BMS; • Ensure that the contents of this plan are fully understood and adhered to by Project personnel, and verify the effective implementation of the PEP in the Project; • Ensure appropriate measures are taken to meet the Project objectives and KPIs, identifying and reporting any unresolved issues to the Project Manager; • Provide HSEQ support to the Project Personnel as required; • Prepare the Project internal audit scope and schedule and obtain Project Manager approval; • Complete daily HSEQ inspections to identify at risk conditions; • Maintain HSEQ registers including fuel use, waste generation, etc.; • Coordinate project internal audits and assisting in identification and execution of required corrective actions; • Assist Project Personnel to report non-conformances and to identify required corrective actions; • Develop and maintain the non-conformance register; and • Oversee the management of the Project risk registers (HAZIDs and ENVIDs).
Supervisor / Leading Hand	• Ensure that all PIPECRAFT employees and Subcontractors understand and implement the Project systems in all their areas of responsibility; • Review Project Personnel risk assessment documentation produced in the field and approve where required i.e. JHAs; and • Ensure all works are conducted in accordance with the Project systems based on visual review throughout the working period.
Subcontractors	• Ensure that all work is completed in accordance with the Project systems. Adopt the risk management within the PIPECRAFT BMS as applicable; • Report all non-compliance issues that may arise during execution of the works; • Complete all reporting requirements; and • Adhere to all HSEQ Project requirements and participate in all project meetings and programs.
Project Personnel	• Complete all work in accordance with the Project systems by applying risk management processes including the use of risk management tools associated with their work. Assist and participate in hazard identification and risk assessment process; • Identifying potential hazards in their area of responsibility before starting work/task and throughout performance of work; • Continually monitoring and reviewing the effectiveness of risk control measures; • Undertaking training in risk management tools as applicable; • Communicating identified hazards and or improvement opportunities to Senior Management or Supervisor as soon as practicable if risks exceed the business tolerability levels; and

	• Adhere to all HSEQ Project requirements and participate in all project meetings and programs.

APPENDIX B: REFERENCE DOCUMENTS

Codes and Standards

The following Codes and Standards set the requirements for onshore pipeline construction works in Australia. Unless otherwise specified, the latest editions shall apply. Common to all work is AS/NZS ISO 31000:2009; the industry guide for development of a risk management system.

Risk Guides

Document Number	Document Name
AS/NZS ISO 31000:2009	Risk management - Principles and guidelines
AS/NZS ISO 14001:2015	Environmental management systems - Requirements with guidance for use
AS/NZS ISO 45001:2018	Occupational health and safety management systems — Requirements with guidance for use
AS/NZS ISO 9001:2015	Quality management systems—Requirements

Risk Based Codes and Standards

Document Number	Document Name
AS 1885	Measurement of occupational health and safety performance
AS 1885.1	Part 1: Describing and reporting occupational injuries and disease (known as the National Standard for workplace injury and disease recording)
AS/NZS 2436-1981	Guide to Noise Control on Construction, Maintenance and Demolition Sites
AS 2865 –2001	Safe working in a confined space
OHS 2008 Part 2	Occupational Health and Safety Code of Practice 2008
	Dangerous Goods Safety Act 2004
	National Standard For the Storage & Handling of Workplace Dangerous Goods 2001
	National Code of Practice for the Storage & Handling of Workplace Dangerous Goods 2001
	National Guideline for the Storage & Handling of Workplace Dangerous Goods 1990
	Environmental Protection Act 1986
	Environmental Protection Regulations 1987
	Environmental Protection (Abrasive Blasting) Regulations 1998
	Occupational Safety and Health Act 1994

	Code of Practice Excavation (Western Australia) 2005 – Commission for Occupational Safety and Health
	Code of Practice for the Safe Use of Industrial Radiography Equipment 1989 ARPANSA – Australian Radiation Protection and Nuclear Safety Agency

Pipeline Codes and Standards

Document Number	Document Name
AS 1289	Methods of Testing Soils for Engineering Purposes
AS 1554	Structural Steel Welding; Welding of Steel Structures
AS 1627	Metal Finishing – Preparation and pre-treatment of metal surfaces
AS 1742	Manual of Uniform Traffic Control Devices Part 2 and 3
AS 1940	The Storage and Handling of Flammable and Combustible Liquids
AS 2177	Non Destructive Testing – Radiography of Welded Butt Joints in Metal
AS 2207	Ultrasonic Testing of Fusion Welded Joints
AS 2832.1	Cathodic Protection of Metals – Pipes and Cables
AS 2885.1	Pipelines – Gas and Liquid Petroleum Part 1: Design and Construction
AS 2885.2	Pipelines – Gas and Liquid Petroleum Part 2: Welding
AS 2885.3	Pipelines – Gas and Liquid Petroleum Part 3: Operations and Maintenance
AS 2885.5	Pipelines – Gas and Liquid Petroleum Part 5: Field Pressure Testing
AS 2906	Fuel containers – Portable – plastic and metal
AS 3000	Electrical Installations
AS 3600	Concrete Structures
AS 3780	The storage and handling of corrosive substances
AS 3862	External Fusion-Bonded Coating for Steel Pipes
AS 3833	The storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers
AS 3894	Site Testing of Protective Coatings
AS 3961	The storage and handling of liquefied natural gas
AS 4100	Steel Structures

AS 4326	The storage and handling of oxidizing agents
AS 4332	The storage and handling of gases in cylinders
AS 4452	The storage and handling of toxic substances
AS 4645	Gas Distribution Network Management
AS 4645.2	Gas distribution networks – Steel pipe systems
AS 4822	External Field Joint Coating for Steel Pipes
AS 4839	The safe use of portable and mobile oxy-fuel gas systems for welding, cutting, heating and allied processes
AS 4853	Electrical Hazards on Metallic Pipelines
AS 4855	Welding Consumable
API 5L	Specification for Line Pipe
API RP 1102	Steel pipelines crossing railroads and highways
API RP 5LT	Recommended Practice for Truck Transportation of Line Pipe
CSA Z245.20	External Fusion Bonded Epoxy Coating for Steel Pipe

Client References

Document Number	Document Name
DBP-PR-PME-PIP-0	DBNGP - Emergency Response Procedure for Pipelines
DBP-WI-PMC-PIP-01	DBNGP - Excavations on the DBNGP & Associated Laterals
DBP-WI-PMC-PIP-05	DBNGP - Potholing on the DBNGP And Associated Laterals
GST-0031-01	DBNGP - WARNING MARKER PLATE AND POST ASSEMBLY
GST-C-1033-01	DBNGP Standard DRG Typical Pipe Concrete Cover Slab Details
GST-G-0113-01	DBNGP Cathodic Protection Test Point Dead Fronting Test Terminals Standard Drawing
GST-G-1012-01	DBNGP Standard Drawing Type 3 Crossing Typical Road Crossing Open Cut
GST-G-1013-01	DBNGP Standard Drawing Type 5 Crossing Typical Farm Track or Access Road Non Gazetted
GST-G-1017-01	DBNGP Standard Drawing Typical Major Water Crossing
GST-G-1018-01	Epic Energy Standard Drawing Typical Minor Water Crossing

GST-G-1019-01	DBNGP Standard Drawing Typical Minor Water Crossing Type 3
GST-G-1022-01	Epic Energy Standard Drawing Typical Silt Fence Details Floodways & Watercourses
GST-G-1024-01	Epic Energy Standard Drawing - Typical Trench Details
GST-G-1025-01	DBNGP - Standard Drawing - Typical Foreign Pipe Crossing
GST-G-1026-01	Epic Energy Standard Drawing - Typical Sign Location Plan
GST-G-1028-01	DBNGP - Standard Drawing -Typical Row Fence and Gate Details
GST-G-1030-01	DBNGP - Standard Drawing - Typical Type 2 Water Crossing
GST-G-1031-01	DBNGP - Standard Drawing - Typical Flume Pipe Crossing Through Watercourses
GST-G-1032-01	DBNGP - Standard Drawing - Typical Station Site Fence Detail
GST-G-1041-01	DBNGP - Standard Drawing - Typical Sign Location Plan Pipeline Looping
GST-G-1045-01	DBNGP - Standard Drawing - Typical Trench Details
GST-G-1046-01	DBNGP - Standard Drawing - Telephone Cable Crossing Details
GST-G-1047-01	DBNGP - Standard Drawing - Underground Powerline Cable Crossing Details
GST-G-1049-01	DBNGP - Standard Drawing - Pipeline Sign Detail
S-FRM-033	DBNGP - Working at Heights Certificate
S-FRM-035	DBNGP - Excavation Entry Certificate
S-PRO-001	Standard Procedure - Permit to Work
S-PRO-003	Standard Procedure - Isolation Locking and Tagging
S-PRO-004	Standard Procedure - Job Hazard Analysis and Take 5
S-PRO-005	Standard Procedure - Severe Weather
S-PRO-007	Standard Procedure - Asbestos Handling Procedure
S-PRO-008	Standard Procedure - Health Safety and Environmental Induction
S-PRO-009	Standard Procedure - HAZID Hazan Procedure
S-PRO-014	Standard Procedure - Event Reporting and Investigation
S-PRO-015	Standard Procedure - Air Operations
S-PRO-016	Standard Procedure - Hazardous Materials Handling and Storage

S-PRO-017	Standard Procedure - Fitness for Work
S-PRO-022	Standard Procedure - Manual Tasks
S-PRO-023	Standard Procedure - Confined Spaces
S-PRO-024	Standard Procedure - Driving
S-PRO-025	Standard Procedure - Mechanical Lift Procedure
S-PRO-032	Standard Procedure - Hot Work
S-PRO-033	Standard Procedure - Working at Heights
S-PRO-035	Standard Procedure - Excavation and Excavation Entry
S-PRO-038	Standard Procedure - Gas Testing and Monitoring
S-PRO-043	Standard Procedure - Alcohol and Other Drugs
S-PRO-048	Standard Procedure - Injury Management
S-PRO-073	Standard Procedure - Personal Protective Equipment
TEB-001-0020-05	DBNGP - Environment Plan
TEB-003-0004-01	DBNGP Safety Case
TEB-003-0021-01-01	DBNGP - Emergency Response Plan Part 1

Appendix B: Aglime Specification Sheet

Aglime of Australia

Freecall : 1800 644 951 Tel : 9277 5529
Loading : Hobbs Logistics
Troy Hobbs 0427 272 042

LIME WA INC.
Independently audited
by DPIRD.

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Code of Practice
Approved Laboratory

Agrifood TECHNOLOGY

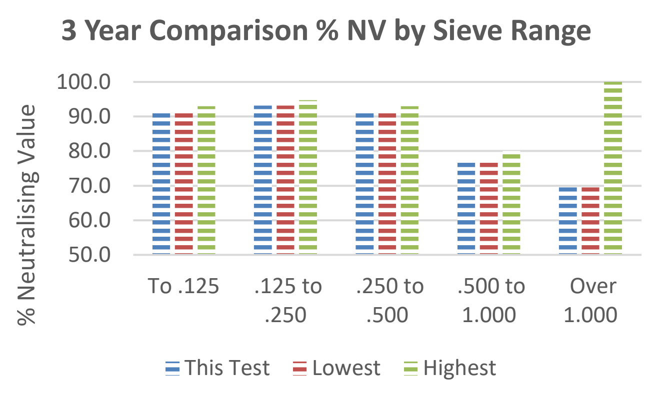
PRODUCT INFORMATION SHEET

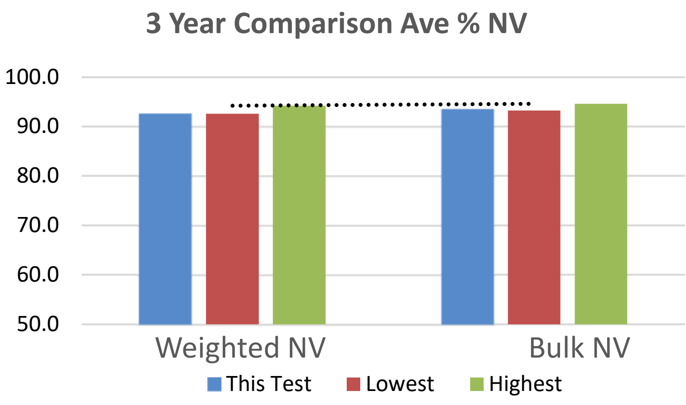
GENERAL INFORMATION

PIT NAME	Aglime of Australia	**DATE**	December 12th 2023
LOCATION	Dongara	**LIME WA REF. | LAB NO.**	LWA 24-12 B2311-0686-0126702
DESCRIPTION	Limesand	**SCREENED|SCREEN SIZE**	Yes 1.0mm
WEIGH SYSTEM	Loadrite Loader Scales [Weigh system verified by licensed verifier approved by National Measurement Institute]		

CODE OF PRACTICE APPROVED LABORATORY REPORT

SIEVE RANGE (MM)	**% WEIGHT**			**% NEUTRALISING VALUE**	
	THIS TEST	3 YEAR PIT RANGE		**THIS TEST**	3 YEAR PIT RANGE
0.000 - 0.125	**4.8**	2.6 : 8.4		**92.0**	92.0 : 93.0
0.125 - 0.250	**74.4**	42.0 : 82.7		**93.2**	93.2 : 94.7
0.250 - 0.500	**20.4**	8.5 : 54.3		**91.0**	91.0 : 93.0
0.500 - 1.000	**0.3**	0.3 : 0.4		**76.7**	76.7 : 80.0
> 1.000	**0.1**	0.1 : 0.7		**69.5**	69.5 : 100.1
CALCIUM (1M HCL)	**36.3**	35.3 : 36.3			
MAGNESIUM (1M HCL)	**1.1**	0.9 : 2.4	**WEIGHTED AVE NV**	**92.6**	92.6 : 94.2
SODIUM (1M HCL)	**0.2**	0.2 : 0.4	**BULK NV**	**93.5**	93.2 : 94.6





Department of
Primary Industries and Regional Development

GOVERNMENT OF WESTERN AUSTRALIA

This product sample was collected by the Department of Primary Industries and Regional Development, and was submitted directly to an approved laboratory for testing as part of the Lime WA Inc. independent audit program.

DISCLAIMER & SUPPLIER STATEMENT : Although the above analysis, provided by a Lime WA Inc Agricultural Lime Industry Code of Practice approved laboratory, is a true representation of the product being supplied, the test results are for a single lime sample collected on one day. The pit ranges show audit results obtained within the past three years, but analyses over a longer timeframe are available on request. Lime WA Inc makes no claims and provides no guarantees on the quality or suitability of the product supplied. Product supplied by members occurs naturally and has a moisture retention capacity that varies according to seasonal conditions. As this cannot be controlled by suppliers, moisture levels are not stated. Lime WA Inc is not responsible for any claims and/or liabilities arising from the supply and/or use of these products. However, lime users are invited to contact the Association on 0419 575 737 in the event of any concerns with the product details.

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