Prepared for
AGL Energy Limited
ABN: 74 115 061 375

AECOM

Remedial Action Plan - Localised Petroleum Impacted Soils

Broken Hill Battery Energy Storage System Project

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Broken Hill Battery Energy Storage System Project
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Broken Hill Battery Energy Storage System Project

Client: AGL Energy Limited

ABN: 74 115 061 375

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Prepared by Alana Mitchell

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Executive Summary

AECOM Australia Pty Ltd (AECOM) was commissioned by AGL Energy Limited (AGL) to prepare a Remediation Action Plan (RAP) for the excavation of localised petroleum hydrocarbon impacted material at 74-80 Pinnacles Place Broken Hill NSW 2880 (Lots 57 and 58 of DP 258288) (the Site).

This RAP has been prepared to address consent condition 29 of the approved Environmental Impact Statement (EIS) in support of the State Significant Development (SSD) (ref 11437498) for the construction, operation and maintenance of a battery energy storage system (BESS) facility at the Site (the Project):

- *Condition 29 - Prior to carrying out any development, the Applicant must develop and implement a Remedial Action Plan prepared in accordance with the relevant guidelines produced or approved under the Contaminated Land Management Act 1997. Remediation works must be undertaken by a suitably qualified and experienced consultant (s).*

The objective of this RAP is to present a plan of the anticipated remedial works for the removal of localised petroleum impacted material to support the SSD, and to characterise the suitability of underlying soils for the Site's intended commercial/industrial land use.

The Site locality is shown on **Figure F1, Appendix A** and Site boundary and layout is shown on **Figure F2, Appendix A**.

The scope of the contaminated soil removal works are as follows:

- Identifying and documenting necessary regulatory approvals required for the works.
- Summarising site investigation history and conceptual site model (CSM) to inform proposed remediation works.
- Identifying the remedial objectives and the associated soil assessment criteria.
- Identifying remedial contingencies in the event that unexpected impacts are identified.
- Identifying procedures required to characterise the proposed remedial works, specifically characterisation of in-situ soils from excavations and classification of ex-situ soils for waste disposal.
- Providing a Construction Environment Management Measures (CEMM) to guide the remedial works (incorporated into this RAP).
- Excavating and disposing of petroleum hydrocarbon contaminated soils.
- Validation sampling of remaining soils for the intended commercial/industrial land use.

Preparation of this RAP has been prepared in general accordance with the NSW EPA *Guidelines for Consultants Reporting on Contaminated Sites* (EPA 2020).

A Site Validation report will be prepared for the Site after remedial works have been completed to meet consent condition 30 of the approved EIS.

List of Acronyms

Term	Description
AECOM	AECOM Australia Pty Ltd
AGL	AGL Energy Limited
ASC NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended on 16 May 2013
ASS	Acid Sulfate Soil
BESS	Battery Energy Storage System
bgl	Below ground level
BTEXN	Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene
CEC	Cation Exchange Capacity
CEMP	Construction Environment Management Plan
CLM Act	*Contaminated Land Management Act 1997*
CoPC	Contaminants of Potential Concern
CRC CARE	Cooperative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DA	Development Application
DQI	Data Quality Indicators
DQO	Data Qualitive Objectives
DSI & Assessment	Detailed Site Investigation and Assessment
EIL	Ecological Investigation Levels
EIS	Environmental Impact Statement
ENM	Excavated Natural Material
EP&A Act	*Environmental Planning and Assessment Act 1979*
ESL	Ecological Screening Levels
HIL	Health Investigation Levels
HSL	Health Screening Levels
IBC	Intermediate Bulk Containers
LGA	Local Government Area
LNAPL	Light Non-Aqueous Phase Liquid
LOR	Limit of Reporting
NATA	National Association of Testing Authorities
OCP	Organochlorine Pesticides
OPP	Organophosphorus Pesticides
PAH	Polycyclic Aromatic Hydrocarbons
PCB	Polychlorinated biphenyl
PFAS	Per- and polyfluoroalkyl substances
PID	Photo-ionisation Detector

Term	Description
POEO Act	*Protection of the Environment Operations Act 1997*
the Project	Construction, operation and maintenance of a battery energy storage system (BESS) facility at 74-80 Pinnacles Place Broken Hill NSW 2880
QA/QC	Quality Assurance/Quality Control
RAP	Remediation Action Plan
SEARs	Secretary's Environmental Assessment Requirements
SEPP	State Environmental Planning Policy
SEPP 55	State Environmental Planning Policy No. 55 - Remediation of Land
the Site	74-80 Pinnacles Place Broken Hill NSW 2880
SOP	Standard Operating Procedures
SPR	Source-Pathways-Receptors
SSD	State Significant Development
SVOCs	Semi-volatile Organic Compounds
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
USCS	Unified Soil Classification System
VENM	Virgin Excavated Natural Material
VOCs	Volatile Organic Compounds
WHS	Work, Health & Safety
WHS Act	*Work Health and Safety Act 2011*
WHS Regulation	Work Health and Safety Regulation 2017

1.0 Introduction

1.1 Background

AECOM Australia Pty Ltd (AECOM) was commissioned by AGL Energy Limited (AGL) to prepare a Remediation Action Plan (RAP) for the excavation of localised petroleum hydrocarbon impacted material at 74-80 Pinnacles Place Broken Hill NSW 2880 (Lots 57 and 58 of DP 258288) (the Site).

This RAP has been prepared to address consent condition 29 of the approved Environmental Impact Statement (EIS) in support of the State Significant Development (SSD) (ref 11437498) for the construction, operation and maintenance of a battery energy storage system (BESS) facility on the Site (the Project):

- *Condition 29 - Prior to carrying out any development, the Applicant must develop and implement a Remedial Action Plan prepared in accordance with the relevant guidelines produced or approved under the Contaminated Land Management Act 1997. Remediation works must be undertaken by a suitably qualified and experienced consultant (s).*

A Detailed Site Investigation and Assessment (DSI & Assessment)[1] was prepared to address the Secretary's Environmental Assessment Requirements (SEARs) and to support the SSD application for the Project. The DSI & Assessment concluded that localised petroleum hydrocarbon impacts in surface and subsurface soils currently preclude the suitability of the Site for ongoing commercial and/or industrial land use (discussed further in **Section 3.5**). Thus, suitable remedial works are required to support the development.

The Site locality is shown on **Figure F1, Appendix A** and Site boundary and layout is shown on **Figure F2, Appendix A**.

1.2 Objectives

The objective of this RAP is to present a plan of the anticipated remedial works for the removal of localised petroleum impacted material to support the SSD, and to characterise the suitability of underlying soils for the Site's intended commercial/industrial land use.

The anticipated remedial works documented in this RAP are limited to the vicinity of the Intermediate Bulk Containers (IBC) at the southern boundary, where petroleum hydrocarbon impacted soils were encountered within an estimated area of 1 m x 0.5 m, to 0.5 m depth (approximate volume of 0.25 m³).

1.3 Scope of Works

In order to achieve the objectives, the following scope of works was undertaken:

- Identifying and documenting necessary regulatory approvals required for the works (**Section 2.0**).
- Summarising the site investigation history (**Section 3.0)** and conceptual site model (CSM) (**Section 4.4**) to identify areas proposed for remediation.
- Identifying the remedial objectives (**Section 6.1**) as well as the assessment criteria that are required to meet the remedial objectives (**Section 6.1)**.
- Identifying remedial contingencies in the event that unexpected impacts are identified (**Section 6.5**).
- Identifying the procedures required to characterise the proposed remedial works, specifically characterisation of remaining soils from excavations and classification of ex-situ soils for waste disposal (**Section 6.3).**

[1] AECOM (2021) Broken Hill Battery Energy Storage System Project Detailed Site Investigation & Assessment Report, dated 21 May 2021.

- Provision of a Construction Environment Management Measures (CEMM) to guide the proposed remedial works associated with the petroleum hydrocarbon impacted soils (**Appendix B**).
- Validation sampling of remaining soils for the intended commercial/industrial land use.

2.0 Regulatory and Legislative Requirements

2.1 Development Application

The Project is considered SSD under the Environmental Planning and Assessment Act 1979 (EP&A Act), as such an Environmental Impact Statement (EIS) has been prepared in accordance with the relevant provisions of the Act. The EIS was submitted to Department of Planning, Industry and Environment (DPIE) on 21 May 2021 and subsequently approved by DPIE on 8 September 2021.

This RAP is a requirement of the approved EIS and will be submitted to DPIE for the proposed remediation activities at the Site, to address consent condition 29, which states:

- *Prior to carrying out any development, the Applicant must develop and implement a Remedial Action Plan prepared in accordance with the relevant guidelines produced or approved under the Contaminated Land Management Act 1997. Remediation works must be undertaken by a suitably qualified and experienced consultant (s).*

2.2 Regulatory Requirements and Approvals

With respect to the *State Environmental Planning Policy (SEPP) No. 55 – Remediation of Land*, the remedial works will be carried out to address consent condition 29 (refer to **Section 2.1**).

No further requirements are triggered under the SEPP 55 for the remedial works.

Appropriate Work, Health & Safety (WHS) notifications should be provided by the Principal Contractor to SafeWork NSW prior to the commencement of the remedial works.

2.3 Relevant Policy and Guidelines

The following key legislation and guidelines are relevant to the works proposed as part of this RAP:

- *Protection of the Environment Operations Act 1997* (POEO Act).
- POEO (Waste) Regulation 2014.
- *Contaminated Land Management Act 1997* (CLM Act).
- POEO (Clean Air) Regulation 2010.
- Work Health and Safety Regulation 2017 (WHS Regulation).
- *Work Health and Safety Act 2011* (WHS Act).
- National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended on 16 May 2013 (ASC NEPM, 2013).
- CRC CARE, 2011. Health Screening Levels for petroleum hydrocarbons in soil and groundwater. CRC CARE, Technical report series No. 10. Friebel, E. and Nadebaum, P., 2011 (CRC CARE, 2011).
- NSW EPA 1995. Sampling Design Guidelines, September 1995 (NSW EPA, 1995).
- NSW EPA 2020. Contaminated Land Guidelines: Consultants reporting on contaminated land, May 2020 (NSW EPA, 2020).
- Waste Avoidance and Resource Recovery Act 2001 No 58.
- NSW EPA (2014) Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA 2014).
- NSW EPA (2015) Technical Note: Light Non-Aqueous Phase Liquid Assessment and Remediation, August 2015.
- NSW EPA (2017) Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition).
- NSW DECCW (September 2010) – Vapour Intrusion: Technical Practice Note.

- Environmental Planning and Assessment Act 1979 (EP&A Act).
- State Environmental Planning Policy No. 55 - Remediation of Land (SEPP 55), Managing Land Contamination.

3.0 Background Information

3.1 Site Setting

Table 1 Site setting

Items	Details
Site Address	74 to 80 Pinnacles Place, Broken Hill 2880
Title Identification (Lot & DP)	Lots 57 and 58 of DP 258288, Local Government Area (LGA) Broken Hill City Council, Parish of Picton, County of Yancowinna
Approximate Site Area	Approximately 7,900 m² (six maps NSW Government)
Local Govt. Authority:	Broken Hill City Council
Zoning of Site and Surrounding Area	The Broken Hill Local Environmental Plan (LEP) (2013) lists the zoning of the Site and surrounding area as follows: • The Site: IN1 – General Industry • North: SP2 – Infrastructure (rail infrastructure facility) • South: SP2 – Infrastructure (water supply system) • East: SP1 – Special activities (mining) • West: IN1 – General Industry
Current Site Use	The Site is an empty lot primarily used for storage of infrastructure, equipment, vehicles and other materials.
Adjacent Site Uses	• **North**: Commercial/industrial land use on Pinnacles Place followed by the Adelaide-Broken Hill Railway and associated access roads. Further north is a wastewater treatment facility which is visible to the north-west as well as the Broken Hill Community Recycling Centre which are both situated on Wills Street. • **South**: Commercial/industrial land use on Pinnacles Place including Mildura Broken Hill and Farwest Transport. Further south is Pinnacles Road followed by open space including the ephemeral creek line running south-east. • **East**: Commercial/industrial land use on Pinnacles Place, Pinnacles Road and Kanandah Road and Kanandah Place including a service station and numerous transport/logistics and a sand mining premises. • **West**: Land subject to an undetermined Aboriginal land claim, an access road running north-south across the railway line and joining with Pinnacles Road. Further west is the TransGrid Broken Hill substation, followed by numerous large commercial/industrial premises including Cristal Mining Australia Limited.
Nearby sensitive site uses	• The Site drains in a south-westerly direction towards an ephemeral drainage line about 60 m west (inferred to be down-gradient) • The ephemeral drainage line passes through a culvert under Pinnacles Road and joins Kelly's Creek, approximately 3.5 kilometres (km) south of the Site • The nearest residential receivers are located (>1.1 km) south (cross-gradient), east (up-gradient) and north-east (down-gradient) • Industrial and commercial properties are located adjacent to and surrounding the Site.

The Site is rectangular in shape and is currently used as a storage area for disused equipment, vehicles and other materials. A Site inspection conducted by AECOM on 14 January 2021 indicated the presence of waste materials such as metal, wood and tyre waste, and infrastructure including truck drop trailers. The Site was also used for storage of vehicle fuels and oils in IBCs, drums and jerry cans. Two stockpiles were visible on Site.

The vegetation on the Site is in a degraded and moderate to low condition with broad areas of bare sand present and, as such, there is very limited fauna habitat.

The Site is accessed from Pinnacles Place, via Pinnacles Road to the south.

3.2 Geological Information

The DSI & Assessment report indicated that the Site is located within the Precambrian aged Willyama Complex (AECOM, 2021). South-east of the Site are three geological units in order of distance – amphibolite, sillimanite gneiss, adalusite-, chiastolite-, mica-, schist, phyylite, quartzite, sandstone, slate and granite gneiss. Soils within the Site and surrounding area are classified as Tenosol soil type – hilly with small valley plains, shallow dense loamy soils, shallow calcareous loam soils and shallow loams and sand occur on the hills.

During the DSI & Assessment, the natural red-brown soil observed at surface at all borehole locations was classified as a clayey silt. The grainy texture was characteristic of silt material. It displayed low plasticity when moistened. The soil layer ranged in depth from 0.9 m below ground level (bgl) to 3.2 m bgl across the property (AECOM, 2021).

Three of the boreholes were extended into the bedrock for installation of proposed groundwater wells. The bedrock encountered at these locations comprised a gneiss ranging from extremely weathered to high strength, with some layers of mica also encountered during drilling (AECOM, 2021).

The DSI & Assessment also indicated that the Site and immediate surrounds have an extremely low probability (1-5% chance) of Acid Sulfate Soil (ASS) and no naturally occurring asbestos or occurrences of mining subsidence on or within 500 m of the Site. In addition, The Dryland Salinity National Assessment indicated that there were no data for the Site or surrounding area.

3.3 Hydrogeology

Review of the NSW Department of Primary Industries – Office of Water dataset as part of the DSI & Assessment indicated that there are no registered groundwater bores located onsite and 13 registered groundwater bores within 1 km of the Site. Based on the information reviewed for registered bores, it was expected that there is potential for shallow groundwater to be present at the Site at less than 2 m bgl (AECOM, 2021).

During the DSI & Assessment conducted, there were no observations of moisture in the soil and bedrock at any boreholes to depth. Groundwater was not encountered in the investigation. The deeper boreholes (BH001, BH005, BH006) were terminated as the depth exceeded the depths proposed for construction works. BH005 was the deepest borehole and terminated at 8.0 m bgl (AECOM, 2021).

It does not appear that groundwater is beneficially reused within 1 km of the Site with the exception of the aquaculture bore located approximately 928 m east (inferred hydraulically cross-gradient to the Site) (AECOM, 2021). It is also noted that there is potential that groundwater is dewatered at the Perilya mine which traverses beneath the Site (AECOM, 2021).

3.4 Potential Receptors

The following potential receptors were identified:

Table 2 Identified Potential Receptors

Receptor	Onsite	Offsite
Human Health	• On-site commercial workers and site users • Intrusive maintenance works during construction and operation	• Not applicable due to no groundwater migration pathway having been identified as part of the DSI & Assessment
Ecological	• Terrestrial soil environments	• Aquatic environment of the ephemeral creek located east of the Site

Refer to **Section 4.4** for an updated Conceptual Site Model (CSM) which considered source pathway receptor linkages.

3.5 Previous Investigations

The relevant previous investigations undertaken at the Site is the AECOM (2021) Detailed Site Investigation & Assessment Report and is summarised below.

- The objective of the investigation was to identify and document contaminants of potential concern (CoPC) to inform future development works at the Site and evaluate if there is a requirement for further assessment and/or management.
- The scope of works comprised:
  - A desktop review of available background/historical information and development of a preliminary CSM.
  - A contamination investigation which involved drilling at six borehole locations and sub surface sampling at 'Tank' locations where staining and odours were observed (refer to **Figure F3, Appendix A**). Soil samples were collected and analysed for CoPC. Analytical results were compared to the adopted soil assessment criteria for commercial/industrial land use.
  - Following assessment of the soil analytical results, the CSM was updated based on the findings to assess potential risk to human health and ecological receptors in a commercial/industrial setting.
- The findings of the DSI & Assessment were as follows:
  - The desktop review identified that the Site had been vacant until sometime between 2005 and 2010, from which time the Site was used for storage of various equipment and building materials.
  - The contamination investigation and assessment of the soil analytical data identified localised petroleum hydrocarbon impacts as follows:
    - Surface soils (0.0-0.1 m bgs_ - TRH C10-C16 concentration (1240 mg/kg) exceeded the HSL D for vapour intrusion 0-1 m (137 mg/kg), the ESL (170 mg/kg) and the management limit (1000 mg/kg); TRH C16-C34 concentration (63,600 mg/kg) exceeded the CRC Care HSL for direct contact (27,000 mg/kg), the ESL (2500 mg/kg) and the management limit (5000 mg/kg); and TRH C34-C40 concentration (12,500 mg/kg) exceeded the ESL (6600 mg/kg) and the management limit (10,000 mg/kg); and
    - subsurface soils (0.32 – 0.4 m bgs - TRH C10-C16 concentration (360 mg/kg) exceeded the HSL D for vapour intrusion 0-1 m (137 mg/kg); and TRH C16-C34 concentration (5900 mg/kg) exceeded the ESL (2500 mg/kg) and the management limit (5000 mg/kg)

    The petroleum hydrocarbon impacts in surface and subsurface soils in the southern portion of the Site preclude the suitability of the Site for commercial/industrial land use; however, the Site could be made suitable following remedial works. No groundwater was encountered during the contamination investigation to a maximum depth of 8 m bgl.

- Based on the updated CSM, there are complete pathways from direct contact with petroleum hydrocarbon impacted surface soils by on-site commercial and intrusive maintenance workers and ecological receptors within the vicinity of the 'Tank' sample location in the southern part of the Site (refer to **Figure F3, Appendix A**).
- There is also potential for leaching of soil contaminants to surface water during heavy rainfall and off-site migration by overland flow to the ephemeral creek east of the Site. However, it is considered that total recoverable hydrocarbons (TRH) would volatilise and degrade over this distance and is therefore unlikely to present a risk to off-site human health and ecological receptors.

4.0 Environmental Site Status

4.1 Primary Sources

Based on the DSI & Assessment, potential sources of contamination may comprise:

- Stockpiles of material – no observations of potential contamination were made from the surface of the stockpile.
- Storage of waste materials such as scrap metal, building materials, plant and machinery parts including batteries and waste tyres on the Site.
- Storage of IBCs, drums, jerry cans with possible waste oils, fuels, degreasers and possible maintenance activities undertaken on plant/machinery.
- Heavy metals from mining activities within the town of Broken Hill.

4.2 Contaminants of Potential Concern

Based on the DSI & Assessment, contaminants of potential concern (CoPC) at the Site were identified as:

- Heavy metals: may occur in fill of unknown origin and quality and due to mining activities in the town of Broken Hill. Common metal contaminants include arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc.
- Petroleum hydrocarbons: from historic storage and spills of fuels, solvents and oils. Petroleum hydrocarbons are generally quantified by analytical laboratories as total petroleum hydrocarbons (TPH) and TRH and as four fractions of hydrocarbons grouped into ranges of volatility.
- Benzene, Toluene, Ethylbenzene, Xylenes and Naphthalene (BTEXN): typically found in petroleum fuels and to a lesser extent, diesel fuels.
- Polycyclic Aromatic Hydrocarbons (PAHs) and Phenols: related to some petroleum hydrocarbon use, waste and lubricating oils. PAH and phenols are also potentially present in bitumen/asphalt, creosote, ash, incompletely combusted materials and fill material of unknown origin and quality.
- Volatile Organic Compounds (VOCs) and Semi-volatile Organic Compounds (SVOCs): VOC compounds may contain monocyclic aromatic hydrocarbons (including BTEXN compounds) and volatile hydrocarbons (such as solvents potentially stored historically at the Site).
- Asbestos: Commonly used in building construction materials up until the mid-1980s. Potentially present within materials of unknown origin and quality and from dumping of old building materials.

4.3 Secondary Sources of Contamination

Potential secondary sources include soil and groundwater in the form of residual Light Non-Aqueous Phase Liquid (LNAPL) and dissolved phase impacts associated with storage of vehicle fuels and oils.

4.4 Updated Conceptual Site Model (CSM) - Exposure Assessment

A CSM is a qualitative description of the mechanisms by which potential and/or complete exposure pathways exist between known or potential sources of site impacts, and human or environmental receptors. Where an exposure pathway between a source and a receptor is incomplete, exposure to the contaminants via that pathway cannot occur. If the exposure pathway is potentially complete this is due to lack of data or there is the potential for conditions to change for the source, the pathway, or the receptor in the future which would make the exposure pathway complete.

A CSM was developed as part of the DSI & Assessment. The identified linkages between source-pathways-receptors (SPR) are provided in **Table 3**.

Table 3 Updated Conceptual Site Model

Receptors	Complete or Potentially Complete Linkages
Onsite Human Health Construction workers – contractors and employees	***Soil: Yes, complete linkage*** • Exceedances of the health screening levels (HSL) for direct contact and the management limits for TRH in the vicinity of sample location 'Tank' at 0.0-0.1 and 0.2-0.3 m bgl. *Soil Vapour: No, incomplete linkage based on there being no buildings currently on Site. The Site should be remediated prior to development and construction of the Site office building.* • Exceedances of the HSL D vapour intrusion sand 0-1 m in the vicinity of sample location 'Tank' all samples collected to 0.4 m bgl; however, depth of impact not delineated. • As noted in CRC CARE "As vapour intrusion HSLs are not presented for TPH C16-C34 and TPH C34-C40 the soil HSLs for direct contact are the relevant HSLs. *Groundwater: No, incomplete linkage* • Groundwater was not encountered beneath the Site to a maximum depth of 8 m bgl, therefore any migration pathway via groundwater is incomplete.
Offsite Human Health Disturbance maintenance workers excavating adjacent ground	*No, incomplete* • Groundwater was not encountered beneath the Site to a maximum depth of 8 m bgl, therefore any migration pathway via groundwater is incomplete. • There is potential for leaching of soil contaminants to surface water during heavy rainfall and off-site migration by overland flow to the ephemeral creek east of the Site. It is considered that TRH from localised impacts would volatilise and degrade over this distance and is therefore unlikely to present a risk to off-site human health and ecological receptors.
Onsite Ecological Terrestrial soil environments	***Yes, complete based on current data set*** • Exceedances for ASC NEPM (NEPC, 2013) ESLs for TRH in the vicinity of sample location 'Tank' at a maximum depth of 0.4 m bgl; however, depth of impact not delineated.
Offsite Ecological Ephemeral Creek to east of the Site	*No, incomplete* • There is potential for leaching of soil contaminants to surface water during heavy rainfall and off-site migration by overland flow to the ephemeral creek east of the Site. It is considered that TRH from localised impacts would volatilise and degrade over this distance and is therefore unlikely to present a risk to off-site human health and ecological receptors.

*Source: AECOM, 2021

5.0 Assessment Criteria

The primary reference for environmental site assessment in Australia is the amended ASC NEPM, 2013. This document includes criteria for use in evaluating potential risk to human health and ecosystems from chemical impacts, which are presented as generic investigation levels and screening levels appropriate to a Tier 1 risk-based assessment applicable to the first stage of site assessment. The application of these investigation levels and screening levels is subject to a range of limitations, and their selection and use must be in the context of a CSM relating to the nature and distribution of impacts and potential exposure pathways. The adopted assessment criteria for this RAP are based on the potential receptors identified in **Section 3.4** and summarised as below.

5.1.1 Soil

Table 4 below summarises the soil assessment criteria adopted based on the proposed remediation works documented in this RAP. In most instances the criteria are Tier 1 screening criteria and are not designed to be remediation criteria. An exceedance of a criterion would trigger further consideration of the site-specific circumstances, and not necessarily indicate that additional large-scale remediation is required.

Table 4 Soil Assessment Criteria

Adopted Screening Level	Rationale and Selection
Human Health Assessment Criteria	
Health Investigation Levels (HILs), ASC NEPM (NEPC, 2013)	The ASC NEPM HILs provide a framework for the use of investigation and screening levels. The framework is applicable for assessing human health risk via all relevant pathways of exposure and covers a broad range of metals and organic substances. The current and proposed Site use is commercial/industrial. **HILs adopted:** HIL D – commercial/industrial.
Aesthetics Amended ASC NEPM (NEPC, 2013)	In accordance with Schedule B1 of the ASC NEPM, the beneficial use of land referred to as “aesthetics” may be precluded where land is considered offensive to the senses – e.g. through the presence of offensive odour or unusually coloured staining.
Management Limits ASC NEPM (NEPC, 2013)	There are Management Limits for specific soil types (coarse and fine) and land uses in the ASC NEPM The Management Limits avoid or minimise the potential effects of the following and require consideration of site-specific factors to determine the maximum depth to which the limits should apply: • Formation of observable LNAPL. • Fire and explosive hazards. • Effects on buried infrastructure e.g. penetration of, or damage to, inground services by hydrocarbons. The criteria presented in this guideline are considered relevant for the upper two metres of soil. **Management Limits adopted:** TRH fractions F1-F4 in soil (mg/kg) commercial/industrial, Coarse Soil (most conservative value adopted).

Adopted Screening Level	Rationale and Selection
HSLs, ASC NEPM (NEPC, 2013)	The ASC NEPM presents HSLs for petroleum compounds which have been derived through consideration of risks to human health, with the main focus being on the vapour exposure pathway. The HSLs have been calculated using parameters that generally correspond to data available and as such aim to provide levels that are realistic rather than overly conservative. Full detail on their derivation and their application is provided in CRC CARE Technical Report No.10 - Health Screening Levels for Petroleum Hydrocarbons in Soil and Groundwater. September 2011. (Friebel, E. and Nadebaum, P., 2011). **HSLs adopted:** Vapour Intrusion: HSL D – commercial/industrial (Soil texture 'sand' was used for 0 to < 1m and non-petroleum criteria). A site office is currently proposed for the Site; however, there are currently no buildings on Site. As noted in CRC CARE Technical Report No. 10 "As vapour intrusion HSLs are not presented for TPH C16-C34 and TPH C34-C40 the soil HSLs for direct contact are the relevant HSLs"
Intrusive Maintenance Worker (Shallow Trench) Health Screening Levels, CRC CARE Technical Report No. 10, Part 2	The CRC Care (CRC Care, 2011) presents the HSLs for vapour intrusion of petroleum compounds relevant to intrusive maintenance workers (shallow trench). Health screening levels for intrusive maintenance workers is adopted for potential future disturbance work into shallow fill (sand) onsite. **HSLs adopted:** Applicable to 0 m to <2 m depth. 'Sand' soil texture was used.
Health Screening Levels for Direct Contact, CRC CARE Technical Report No. 10, Part 2 (Friebel, E. and Nadebaum, P., 2011)	The CRC CARE (Friebel, E. and Nadebaum, P., 2011) presents the HSLs for direct contact of petroleum compounds. **HSLs adopted:** Disturbance maintenance worker
Ecological Assessment Criteria	
Ecological Investigation Levels (EILs) ASC NEPM (NEPC, 2013)	The ASC NEPM requires consideration of EILs and Ecological Screening Levels (ESLs), principally in the top 2 m of soil which corresponds to the root zone and habitation zone of many species. Therefore, only soil results from the upper 2 m would be screened against ecological criteria. **EILs adopted:** • Table 1B (1) Soil-specific added contaminant limits for aged zinc, aged copper and aged nickel in soil with sample specific pH and CEC. • Table 1B (3) Soil-specific added contaminant limits for aged chromium III in soil with a clay content specific to each sample based on the bore logs. • Table 1B (4) Generic added contaminant limits for lead in soils irrespective of their physicochemical properties. • Table 1B (5) Generic EILs for aged arsenic and fresh naphthalene in soils irrespective of their physicochemical properties.

Adopted Screening Level	Rationale and Selection
ESLs, ASC NEPM (NEPC, 2013)	The ASC NEPM ESLs were developed to be protective of environmental concerns by determining the reasonable maximum exposure from site sources for a range of petroleum hydrocarbon compounds and TRH fractions commonly encountered on contaminated sites and are applicable for assessing risk to terrestrial ecosystems. ESLs broadly apply to coarse- and fine-grained soils and various land uses. They are generally applicable to the top 2 m of soil and 3 m in arid regions. **ESLs adopted:** Commercial and industrial, applicable to 0 m to <2 m depth based on existing land use. 'Fine' soil texture was used.

5.1.2 Groundwater

Groundwater was not assessed as part of the DSI & Assessment, as groundwater was not encountered during intrusive works to a maximum depth of 8 m bgl, therefore no groundwater monitoring wells were installed.

5.1.3 Waste

The criteria and guidance used for assessment of soils for off-site disposal to landfill is based on the following:

- NSW EPA (2014) Waste Classification Guidelines, Part 1: Classifying Waste.
- NSW EPA (2014) Waste Classification Guidelines, Part 4: Acid Sulfate Soils.

Soils potentially considered to be excavated natural material (ENM) and that may be proposed to be beneficially re-used, would be assessed in accordance with the *Resource Recovery Order under Part 9*, Clause 93 of the *Protection of the Environment Operations (Waste) Regulation 2014* and the excavated natural material order 2014 (ENM exemption).

6.0 Remedial Strategy

6.1 Remedial Objectives

The primary objective of this RAP is to present a plan of the anticipated remedial works for the removal and validation of localised petroleum hydrocarbon impacted soils to address consent condition (29) of the approved EIS.

6.2 Remedial Approach

The remedial approach will consider management of known petroleum hydrocarbon localised soil contamination at the Site.

The proposed work includes the following:

- Removal of IBC at the southern boundary of the Site (AECOM sample location 'Tank' (refer **F2, Appendix A**)).
- Excavation and removal of stained, odorous and petroleum hydrocarbon impacted soils in the vicinity of the IBC, that covers an approximate area of 1 m x 0.5 m to a depth of 0.5 m (estimated volume of 0.25 m³).
- Validation sampling and reinstatement of excavation area.

6.2.1 Primary Source Control

Primary source control involves the removal of the primary source of impact from the storage of material in the IBC at the southern boundary of the Site, where there may have been leakage and/or spills onto the underlying soils.

6.2.2 Secondary Source Control

6.2.2.1 Soil

Excavated material with potential contamination is expected to be limited to an area of 1 m x 0.5 m, to a depth of 0.5 m (estimated volume of 0.25 m³) in the vicinity of the IBC at the southern boundary of the Site. The preferred remedial approach consists of excavating petroleum hydrocarbon impacted materials and reinstating the excavated pit with imported fill material (quarried material, ENM or virgin excavated natural material [VENM]) (if required).

Excavation material will be characterised and disposed of off-site in accordance with NSW EPA Waste Classification guidelines[2]. The DSI & Assessment identified samples based on the contaminant concentration at this location to be classified as Hazardous Waste (HW) and Restricted Solid Waste (RSW) in accordance with the NSW EPA waste guidelines. Given the limited nature of the excavation area expected, excavated material will be sent as Hazardous Waste to avoid the need for stockpiling and re-sampling of the material on-site.

Validation samples will be taken from the excavation pit, analysed for the CoPC's, being total recoverable hydrocarbons (TRHs)/total petroleum hydrocarbons (TPH) and assessed against relevant assessment criteria (refer to **Section 5.0**). This will inform if the remediation area is suitable for ongoing commercial/industrial land use or if further remediation works are required.

The following approach will be followed to address soil impacts (refer to details in **Section 6.3**):

- Excavation and screening of visually impacted materials for disposal off-site to an appropriate landfill.
- Validation sampling of floor and walls of the excavation pit for TRHs/TPHs.

6.2.2.2 Groundwater

If groundwater or LNAPL are encountered during excavations works, extraction and management controls will need to be put in place. Based on the estimated vertical extent of excavation (1 m bgl), it is

[2] NSW EPA Waste Classification Guidelines Part 1: Classifying waste, dated November 2014

not anticipated that groundwater will be encountered during the works as groundwater was not encountered at the Site to the maximum depth of investigation 8 m bgl (refer to **Section 3.3**). However, groundwater has been encountered at depths < 1 m bgl in monitoring wells 1 km upgradient (north and north-east) of the Site, therefore it is possible that groundwater is present after heavy rainfall or seasonally (AECOM, 2021).

Should groundwater be encountered during remedial works, it will be sampled and analysed for off-site disposal. Once the groundwater has been appropriately assessed, it will be removed by a suitably qualified contractor for off-site disposal (if deemed necessary) (refer to details in **Section 6.3**).

6.3 Remedial Scope

6.3.1 Removal of localised petroleum hydrocarbon impacted soils

A summary of tasks related to contaminated soil removal works is provided in **Table 5** and **Table 6**.

Table 5 Contaminated soil removal works

Task	Details
Preliminaries	• Prior to works commencing, the Principal Contractor appointed for the works will be responsible for identifying and obtaining appropriate approvals to commence soil removal works, including preparation of appropriate safety documentation. • Regarding environmental compliance, the works will be completed in accordance with a Construction Environment Management Measures (CEMM), which relate to the remediation activities only, included as **Appendix B**.
Responsibilities	• The Principal Contractor will be responsible for managing contaminated soil removal works, including removal of associated IBC. • A suitably qualified environmental consultant will be present on-site during soil removal works to provide guidance to the Principal Contractor in defining the extent of the proposed excavation area which may require adjustment based on removal of impacted soil, and potential management of groundwater impacts (if encountered), and potential vapour impacts. • A suitably qualified environmental consultant will be required to obtain appropriate validation data from the excavation pit.
Primary Source Control – IBC Removal (general)	• The removal of the IBC will be undertaken by the Principal Contractor and disposed of at a licensed facility in accordance with the NSW environmental and safety requirements and industry best practice. • Documents pertaining to the disposal of the IBC will be maintained by the Principal Contractor.
Contaminated Soil Removal	• Excavated soils will be removed from an area that covers 2 m x 2 m to a maximum depth of 1 m, or visibly stained and odorous soils with elevated calibrated PID reading, whichever is greater volume. • Excavated soils will be disposed of off-site at a suitably licensed waste facility, accompanied by Waste Classification Letter. • Transfer of material off-site must be tracked via a material tracking form. • Visual, olfactory and PID readings will provide indications of hydrocarbon impacts and will be used to assess the condition of soils on-site during soil excavation. • Validation samples will be taken from remaining soils resulting from the excavations and will be characterised in accordance with assessment criteria for soils in **Section 5.1.1**.
Excavation reinstatement	• Imported material for reinstatement of backfill (if required) should be quarried material, VENM or ENM in accordance with the POEO Act 1997 and accompanied by a VENM and/or ENM certificate letter, if applicable. If certification is not provided, the imported VENM/ENM material should be

Task	Details
	sampled at the source and at an approximate rate of one sample per 100 m^3. Further details on sampling requirements are presented in **Section 6.3.2.1**.

6.3.2 Excavation Characterisation

Soils will be excavated, managed and characterised as per **Table 6.**

Table 6 In-situ validation / characterisation sampling of excavations

Item	Description
Field Screening	Field screening using a calibrated photo-ionisation detector (PID) will be implemented to determine soil material segregation and stockpiling, with the following suggested categories: • 0 – 100 ppm • > 100 ppm – 450 ppm> 450 ppm (based on CRC Care #13 indirect indicator of LNAPL being 500 ppm)
Characterisation	Excavated material will be sent as Hazardous Waste, as per the classification results from the DSI & Assessment.
Sample Collection	A total of five (5) soil validation samples (minimum) will be collected from the floor and walls of the excavation pit (one per each wall and one from the floor) and analysed in accordance with the soil validation criteria presented in **Section 5.1.1**.
Analytical Suite	Validation soil sampling: • TRH
Soil Sample Labelling, Storage and Transport	All samples will be clearly labelled with unique sample identification numbers consisting of the date, sample location, depth of sample and sampler's initials. In the case of field duplicates sample containers will be labelled so as to not reveal their purpose or sample location to the laboratory. All samples will be kept chilled in an ice-filled cooler or dedicated site refrigerator prior to dispatch to a National Association of Testing Authorities (NATA) registered laboratory under standard chain of custody procedures. All samples collected during soil removal works will be stored at the laboratory (14 days for organics) and could potentially be selected for analysis if further delineation of identified contamination is required.
Field Logging	Soil logging will be undertaken in general accordance with the Unified Soil Classification System (USCS) and the AECOM documented standard field procedures. Samples will be logged, and information recorded in the field (e.g. soil/rock type, colour, grain size, inclusions, moisture conditions, staining and odour etc.). Descriptions will be recorded on field log sheets for uniformity in descriptions, presentation and to aid in any future interpretations.
Decontamination	The decontamination procedures will be performed before initial use of re-useable equipment and after each subsequent use (e.g. the use of a trowel). All re-usable sampling equipment (e.g. metal trowel or spatula) will be decontaminated between each sample by scrubbing with a solution of Decon90 followed by a rinse in potable water. A new set of disposable nitrile gloves will be used to directly collect soil samples from the re-useable sampling equipment for placement into the laboratory prepared glass sampling containers.

6.3.2.1 Import Material Sampling

If materials are imported to the Site as part of the soil removal works, then these materials will be sampled, analysed and assessed against import material criteria detailed in **Section 5.0**. These requirements are presented in **Table 7**.

Table 7 Import material sampling

Item	Description
Sample Collection	Sample collection will be by grab sample from the centre of an excavator bucket from the centre of stockpile or from a minimum of 500 mm from the stockpile surface (trowel or shovel can be utilised to obtain this sample).
Field Screening	Import material will be visually inspected to ensure the material is free of building rubble, vegetation, organic matter, and general debris.
Rate / Frequency	Import materials will be sampled at a ratio of one per 100 m^3 (minimum of three samples per source)
Analytical Suite	All import material samples not covered by a VENM exemption will be analysed for: • TRH • BTEXN • PAHs • Metals (As, Cd, Cr, Cu, Ni, Pb, Zn and Hg) • Organophosphorus Pesticides (OPPs) and Organochlorine Pesticides (OCPs) • Polychlorinated biphenyl (PCBs) • Asbestos • Per- and polyfluoroalkyl substances (PFAS).

6.3.3 Reinstatement of Excavations

If required, imported quarried material, ENM, VENM or engineered material will be used to fill the excavation once it has been suitably validated. Compaction is expected to be by tamping rammer (or similar).

6.4 Quality Assurance and Quality Control Programme

A quality assurance/quality control (QA/QC) program has been developed to ensure that data collected are sufficiently accurate, precise, and reproducible to be used for the purposes of the validation works. All stages of the remedial works (i.e. data gathering, sample handling, laboratory analysis) will be conducted in accordance with the QA/QC program outlined in the following sections.

The objective of the QA/QC program is to provide an assessment of the reliability of the data presented for interpretation for the project in terms of data qualitive objectives (DQO's) required for the project.

The project data quality indicators (DQIs) have been established to set acceptance limits on field and laboratory data collected as part of the remediation programme. For both field and laboratory procedures acceptance limits are set at different levels for different projects and by the laboratories.

The DQIs for this RAP are presented in **Table 8** below.

Table 8 Summary of data quality indicators

DQI	Field	Laboratory	Acceptability Limits
Completeness	• All critical locations sampled • All samples collected using Standard Operating Procedures (SOPs) appropriate and complied with an experienced sampler • Documentation check for accuracy	• All critical samples analysed for all CoPC • Appropriate methods implemented • Appropriate Laboratory limits of reporting • Sample documentation complete • Sample holding times complied	• As per ASC NEPM (2013) • < nominated assessment criteria
Comparability	• Sample SOPs used on each occasion • Experienced sampler • Climatic conditions	• Same analytical methods used (including clean-up) • Sample limit of reporting (LORs) (justify/quantify if different) • Same laboratories (NATA accredited) • Consistent reported units of measurement	• As per ASC NEPM (2013) • < nominated assessment criteria
Representativeness	• Appropriate media sampled (soil groundwater and vapour)	• All critical samples analysed for all CoPC as required for the project objectives.	• Appropriately selected samples analysed
Precision	• SOPs appropriate and complied with • Collection of blind and split duplicate samples	Analysis of: • Intra-laboratory duplicate samples (1 in 20 samples) • Inter-laboratory duplicate samples (1 in 20 samples) • Laboratory duplicate sample	• RPD of < 30% • RPD of < 30% • RPD of < 30%
Accuracy	• SOPs appropriate and complied with • Collection of rinsate blanks at a rate of one per batch of samples. • Trip spikes to be sampled at a rate of one per batch of samples.	Analysis of: • Field/trip blanks (1/day) • Method blanks • Matrix spikes • Matrix spike duplicates • Surrogate spikes • Laboratory control samples • Laboratory prepared spikes • Reagent blank	• Non-detect for CoPC • Non-detect for CoPC • 70 to 130% • RPD of <30% • 70 to 130% • 70 to 130 % • 70 to 130% • Non-detect for CoPC

6.5 Remediation Contingencies

The remedial approach has been prepared to address potential contamination at the Site in line with the proposed remediation objectives (refer to **Section 1.2**). Note, remedial contingencies may be required should the scenarios detailed in **Table 9** arise.

Table 9 Remediation contingency options

Scenario	Contingencies/Actions Required
Groundwater encountered	During the DSI & Assessment conducted, there were no observations of moisture in the soil and bedrock at any boreholes to depth, and the maximum depth of investigation was at 8.0 m bgl (AECOM, 2021). The likelihood of encountering groundwater in an excavation to a maximum depth of 1.0 m bgl is low. Groundwater (if encountered) will be sampled and assessed prior to the collection of the validation samples from the floor and walls of the excavation pit. Once characterised, the groundwater will be removed by a suitably qualified specialist/contractor for off-site disposal to a licensed facility.
Additional hazardous material encountered	Asbestos was identified as a CoPC during the DSI and Assessment, however sampling of suspected asbestos containing material (ACM) did not indicate the presence of asbestos at the Site. The likelihood of encountering asbestos during the remedial works for removal of localised petroleum hydrocarbon impacted soils is considered low. All information relating to any asbestos identified will be recorded for provision to regulatory bodies and the environmental consultant will consult with Client Representatives on a course of action to be taken, if encountered.
Excessive vapours emanating from excavated soil or excavation pit	The petroleum hydrocarbons detected in the soils during the DSI & Assessment were the heavy end range of hydrocarbons and not likely to result in vapours being generated. Work will be suspended, and the environmental consultant will instruct on how best to proceed regarding safe management of contaminant vapours to remove risks posed to on-site construction workers and contractors. Once the assessment is complete, a decision on any changes to the remediation approach will be issued to the client for review and implementation.
Grossly impacted soils encountered	The excavation works will be supervised by the environmental consultant so that informed and immediate recommendations can be made regarding the fate of the excavated soil materials. Recommendations will be made for this purpose based on PID field screening measurements and supported by field observations (visual and olfactory). If greater than expected volume of contaminated soils is identified, landfarming or biopiling may be used to remediate soils to a standard suitable for reuse on-site, or for off-site disposal.
Contamination found in areas previously not identified	Work will be suspended and the environmental consultant will instruct on how best to proceed regarding the newly identified contamination. Once the assessment is completed, a decision on any changes to the remediation approach will be issued for review and implementation.

7.0 Validation Sampling

A suitably qualified environmental consultant will complete validation sampling and analysis. A total of five (5) soil validation samples (minimum) will be collected from the floor and walls of the excavation pit (one per each wall and one from the floor).

Validation samples will be:

- Collected from the surface soils of the wall and floor by hand or with the use of hand tools i.e. trowel, wearing dedicated disposable nitrile gloves (to be changed between samples). Where hand tools or other equipment are used, they will have been decontaminated between each sample by scrubbing with a solution of Decon90 (or similar) followed by a rinse in potable water.
- Collected into laboratory-supplied acid-rinsed glass jars with Teflon© (or similar) lined lids and stored in an ice-filled cooler box for transportation to the laboratory.
- Transported to the laboratory under Chain of Custody (COC) conditions.

Analysis of validation samples will be completed by NATA accredited laboratories. Q/QC samples will comprise: one intra-laboratory duplicate sample for analysis of TRHs/TPHs at the primary laboratory, one inter-laboratory duplicate for analysis of TRHs/TPHs at a secondary laboratory, one rinsate sample for analysis of TRHs/TPHs and a trip spike sample for analysis of TRH(C_6-C_9).

Soil validation samples will be analysed in accordance with the soil validation criteria presented in **Section 5.1.1.** Where validation samples are analysed as being below the soil validation criteria, the remediation will be considered to be complete and the Site suitable for ongoing commercial and/or industrial land use.

In the event the validation samples exceed the soil validation criteria, further remediation works will be required.

8.0 Construction Work Plans

8.1 Construction Environmental Management Measures (CEMM)

A CEMM has been prepared for the remedial works (**Appendix B**) and aims to:

- Ensure appropriate environmental management practices are followed during the remedial works to minimise adverse impacts on environmental receptors.
- Achieve the projects overall environmental objectives.
- Ensure legal and contractual compliance.

The implementation of the CEMM will be the responsibility of the Principal Contractor engaged for the remedial works. These responsibilities do not replace any other regulatory responsibilities of the parties in relation to the proposed works at the site.

8.2 Occupational Health and Safety Procedures

A detailed Occupational Health & Safety (OH&S) Plan will be prepared prior to commencement of any works at the Site. The OH&S Plan will comprise Safe Work Method Statements for tasks to be completed as part of the remedial works.

Key aspects of the OH&S Plan comprise but are not limited to:

- Objectives of the plan and need for revision
- Relevant OH&S procedures
- Roles and responsibilities
- Site security and inductions
- Emergency procedures, including reporting protocols
- Project details
- Project contact information
- Potential contaminants and personal protective equipment (PPE); and
- Job Safety Analyses.

9.0 Reporting

9.1 Validation Report

A Site Validation Report will be produced to document the works identified throughout this RAP.

The Validation Report will be required to address consent condition 30 of the approved EIS in support of the SSD (ref 11437498) for the construction, operation and maintenance of the BESS at the Site.

> *Condition 30 – Within one month of the completion of the remediation works, the Applicant must submit a copy of a validation report/letter to the Planning Secretary, which has been prepared, or reviewed and approved, by a consultant certified under the Environment Institute of Australia and New Zealand Certified Environmental Practitioner (Site Contamination) Scheme (CEnvP(SC)) of the Soil Science Australia Certified Professional Sol Scientist Contaminated Site Assessment and Management (CPSS CSAM) scheme.*

The Validation Report will be prepared in accordance with the NSW EPA reporting guidelines (NSW EPA, 2020), and comprise the following:

- Summary of key findings and observations
- Summary of site history
- Summary of work completed
- Analytical results of walls and floors of excavation pit
- Comparison of results against adopted soil remedial assessment criteria
- Summary of site updated CSM
- Assessment of any identified data gaps
- Summary soil classification, volume, and fate
- Records of waste disposal from site, volume, and fate
- Samples of imported fill and suitability for use assessed if material is imported onto the Site
- Summary of QA/QC compliance
- Conclusions and recommendations.

10.0 Conclusion

It is proposed that contaminated soil removal works will be undertaken at the Site which will involve the following key activities:

- Excavation and removal of contaminated soil and associated IBC and
- Characterisation and reinstatement (if required) of excavation area.

This RAP, if implemented provides the necessary requirements and guidelines to meet both the applicable statutory requirements and the Site's remedial objectives.

Following the remediation works, a Validation Report will be required to address consent condition 30 of the approved EIS in support of the SSD (ref 11437498) for the construction, operation and maintenance of the BESS at the Site, and to demonstrate that the remediation works are complete, and the remaining soils are suitable for ongoing commercial/industrial land use.

11.0 References

AECOM, 2021. Broken Hill Battery Energy Storage System Project Detailed Site Investigation & Assessment Report, dated 21 May 2021

CRC CARE, 2011. Health Screening Levels for petroleum hydrocarbons in soil and groundwater. CRC CARE, Technical report series No. 10. Friebel, E. and Nadebaum, P., 2011 (CRC CARE, 2011).

NSW EPA 1995. Sampling Design Guidelines, September 1995 (NSW EPA, 1995).

NSW EPA, 2020. Guidelines for Consultants Reporting on Contaminated Sites, dated 2020.

NSW EPA, 2014. Waste Classification Guidelines Part 1: Classifying waste, dated November 2014

National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended on 16 May 2013 (ASC NEPM, 2013).

NSW EPA 2020. Contaminated Land Guidelines: Consultants reporting on contaminated land, May 2020 (NSW EPA, 2020).

NSW EPA, 2014. Waste Classification Guidelines Part 1: Classifying Waste (NSW EPA 2014).

NSW EPA, 2015. Technical Note: Light Non-Aqueous Phase Liquid Assessment and Remediation, August 2015.

NSW EPA, 2017. Contaminated Land Management: Guidelines for the NSW Site Auditor Scheme (3rd Edition).

NSW DECCW, 2010. Vapour Intrusion: Technical Practice Note, dated September 2010.

12.0 RAP Limitations

This Plan is provided strictly in accordance with and subject to the following limitations:

a. This Plan has been prepared for the sole benefit of AGL Energy Pty Ltd in accordance with normal prudent practice and by reference to applicable environmental regulatory authority and industry standards, guidelines and assessment criteria in existence at the date of this Plan, and any previous site investigation and assessment reports referred to in this Plan.

b. Except as required by law, no third party may use or rely on, this Plan unless otherwise agreed by AECOM in writing. Where such agreement is provided, AECOM will provide a letter of reliance to the agreed third party in the form required by AECOM.

c. This Plan should be read in full and no excerpts are to be taken as representative of the findings. No responsibility is accepted by AECOM for use of any part of this Plan in any other context.

d. This Plan is based solely on the scope of work agreed between AECOM and AGL Pty Ltd and described in **Section 1.0** and as detailed in the proposal email dated 5/11/2021.

e. No responsibility is accepted by AECOM for use of this Plan in any other context.

f. This Plan is based solely on the investigations and findings contained in the referenced Reports and on the conditions encountered and information reviewed at the time of preparation of each referenced Report.

g. This Plan is subject to all limitations and recommendations included in the referenced Reports.

h. Where any referenced Report indicates that information has been provided to AECOM by third parties, AECOM has made no independent verification of this information except as expressly stated in the referenced Report. AECOM assumes no liability for any inaccuracies in or omissions to that information.

i. AECOM has only considered those chemicals specifically referred to in this Plan. AECOM makes no statement or representation as to the existence (or otherwise) of any other chemicals.

j. This Plan has been prepared to address on-site contamination issues only (within the context of and limited to the Scope of Work).

k. Investigations undertaken prior to this Plan are constrained by the site conditions, such as the location of buildings, services, and vegetation. As a result, not all relevant site features and contamination may have been identified prior to this Plan.

l. Subsurface conditions can vary across a particular site and cannot be exhaustively defined by the investigations carried out prior to this Plan. It is unlikely therefore that the results and estimations expressed or used to compile this Plan will represent conditions at any location removed from the specific points of sampling.

m. Except as specifically stated above, AECOM makes no warranty, statement or representation of any kind concerning the suitability of the site for any purpose or the permissibility of any use, development, or re-development of the site.

n. Use, development, or re-development of the site for any purpose may require planning and other approvals and, in some cases, environmental regulatory authority approval. AECOM offers no opinion as to whether the current use has any or all approvals required, is operating in accordance with any approvals, the likelihood of obtaining any approvals for development or redevelopment of the site, or the conditions and obligations which such approvals may impose, which may include the requirement for additional environmental works.

o. AECOM makes no determination or recommendation regarding a decision to provide or not to provide financing with respect to the site.

p. The ongoing use of the site and/or the use of the site for any different purpose may require the owner/user to manage and/or remediate site conditions, such as contamination and other conditions, including but not limited to conditions referred to in the referenced Reports.

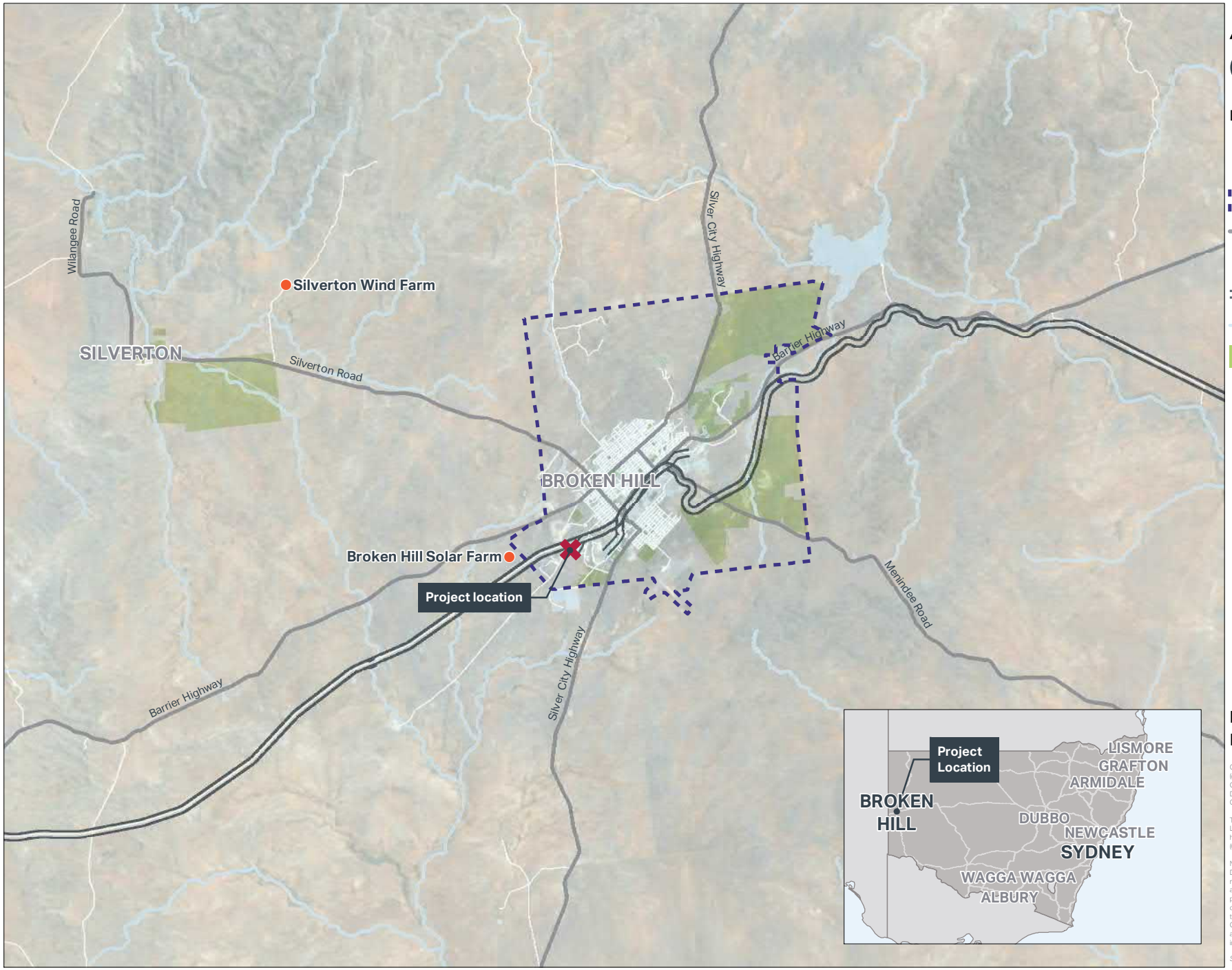
q. To the extent permitted by law, AECOM expressly disclaims and excludes liability for any loss, damage, cost, or expenses suffered by any third party relating to or resulting from the use of, or reliance on, any information contained in this Plan. AECOM does not admit that any action, liability, or claim may exist or be available to any third party.

r. Except as specifically stated in this section, AECOM does not authorise the use of this Plan by any third party.

s. It is the responsibility of third parties to independently make inquiries or seek advice in relation to their requirements and proposed use of the site.

Appendix A

Figures



AECOM

N

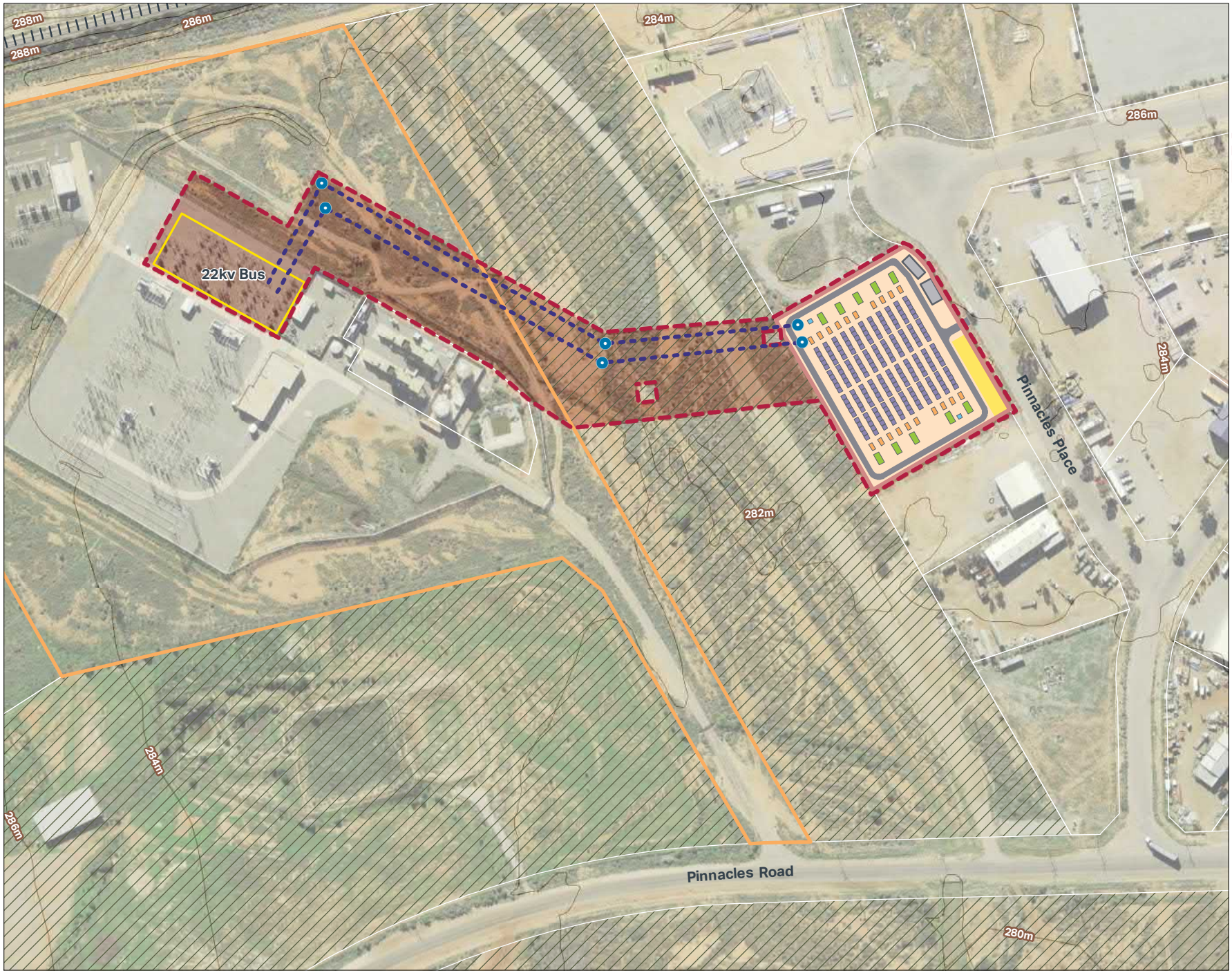
0 3 6 km

Legend

- Project location
- Broken Hill City Council
- Main road
- Local road
- Railway
- Watercourse
- Park, forest, reserve
- Existing renewable energy generating project

FIGURE A-1: SITE LOCALITY

Source: © Department of Customer Service 2020



AECOM

N

0 30 60 m

Legend

- Project Area
- Site
- TransGrid Broken Hill Substation
- 22kV Bus
- Commons
- Railway
- Contour
- Indicative overhead transmission line
- Indicative transmission line pole

Site features

- Office building
- Battery
- Inverter
- Medium voltage auxillary switchboards
- Transformer
- Laydown area/operational parking area
- Access road
- Permeable surface

FIGURE A-2: PROPOSED SITE LAYOUT

Source: © Department of Customer Service 2020

AECOM

N

0 10 20 m

Legend

- Project Area
- The Site
- Area identified for remedial works
- Indicative overhead transmission line
- Indicative transmission line pole
- Borehole (AECOM, 2021)
- Sample location (AECOM, 2021)
- Stockpile (AECOM, 2021)

FIGURE A-3:
BOREHOLE AND SAMPLING LOCATIONS

Indicative only, subject to detailed design.

Source: © Department of Customer Service 2020

Appendix B

Construction Environment Management Measures (CEMM)

Construction Environment Management Measures (CEMM)

1.0 Introduction

1.1 Background

AECOM Australia Pty Ltd (AECOM) was commissioned by AGL Energy Limited (AGL) to prepare a Remediation Action Plan (RAP) for the excavation of localised petroleum hydrocarbon impacted material at 74-80 Pinnacles Place Broken Hill NSW 2880 (Lots 57 and 58 of DP 258288) (the Site).

The RAP has been prepared to address consent condition 29 of the approved Environmental Impact Statement (EIS) in support of the State Significant Development (SSD) (ref 11437498) for the construction, operation and maintenance of a battery energy storage system (BESS) facility on the Site (the Project):

- *Condition 29 - Prior to carrying out any development, the Applicant must develop and implement a remedial Action Plan prepared in accordance with the relevant guidelines produced or approved under the Contaminated Land Management Act 1997. Remediation works must be undertaken by a suitably qualified and experienced consultant (s).*

1.2 Site details

The Site is located at 74-80 Pinnacles Place on the following land parcels:

- Lot 57 Deposited Plan (DP) 258288; and
- Lot 58 DP 258288.

The Site is zoned IN1 – General Industry under the Broken Hill Local Environmental Plan 2013 (Broken Hill LEP). The Site is approximately 0.8 ha in area. Access to the Site is from Pinnacles Place, a sealed road.

The Site is significantly disturbed and is currently used as a storage area for building materials, vehicles, truck trailers, and products relating to the maintenance of vehicle engines equipment. The vegetation on the Site is in a degraded state and there is limited fauna habitat. Numerous vehicle tracks cross through the Site and broad areas of bare sand also occur.

1.3 Scope of the CEMM

The scope of this Construction Environment Management Measures (CEMM) is for the remedial works associated with the Project and is to:

- Ensure appropriate environmental management practices are followed during the remedial works to minimise adverse impacts on environmental receptors.
- Achieve the projects overall environmental objectives.
- Ensure legal and contractual compliance.

A Construction Environment Management Plan (CEMP) is being prepared for the overall construction works for the Project.

2.0 Remedial works

It is proposed that contaminated soil removal works will be undertaken at the Site which will involve the following key activities:

- Excavation and removal of contaminated soil and associated intermediate bulk container (IBC).
- Characterisation of excavation area and reinstatement of excavation area.

Excavated soils will be removed from an area near the southern boundary of the Site that covers 2 m x 2 m to a maximum depth of 1 m, or visibly stained and odorous soils (whichever is greater). Excavated soils will be disposed of off-site at a suitably licensed waste facility, accompanied by a Waste Classification Letter. Visual and olfactory indications and readings using a calibrated photoionisation detector (PID) will be used to assess the condition of soils on-site during soil excavation works.

Validation samples will be taken from remaining soils resulting from the excavations, and will be characterised to determine if the Site is suitable for ongoing commercial/industrial land use.

3.0 Responsibilities and procedures

3.1 Roles and responsibilities

The implementation of the CEMM will be the responsibility of the Principal Contractor engaged for the remedial works. These responsibilities do not replace any other regulatory responsibilities of the parties in relation to the proposed works at the site.

3.2 Standard Operating Procedures

All activities carried out by the Principal Contractor engaged for the remedial works will be undertaken in accordance with standard operating procedures (SOPs).

4.0 Environment management measures

4.1 Soils, groundwater and contamination

4.1.1 Regulatory requirements

- *Water Management Act 2000* and its associated Regulations.
- *Protection of the Environment Operations Act 1997* (POEO Act) and its associated Regulations.
- Managing Urban Stormwater: Soils and Construction Vol. 1 (Landcom 2004).
- Project Approval (SSD-11437498) including the following relevant conditions:
  - *Condition 21: The Applicant must ensure that the development does not cause any water pollution, as defined under Section 120 of the POEO Act.*

4.1.2 Management measures

Management and mitigation measure	Responsibility
Soil, groundwater and contamination	
A Remedial Action Plan will be prepared in accordance with *State Environmental Planning Policy No 55 – Remediation of Land* for the excavation of localised petroleum hydrocarbon impacted material within the vicinity of the IBC at the southern boundary of the Site.	Contractor
Standard erosion and sediment controls will be implemented (where required) in accordance with Landcom's *Managing Urban Stormwater: Soils and Construction*.	Contractor
A suitably qualified environmental consultant will be present on-site during soil removal works to provide guidance to the Principal Contractor in defining the extent of the proposed excavation area which may require adjustment based on removal of impacted soil, and potential management of groundwater impacts (if encountered), and potential vapour impacts.	Contractor
A suitably qualified environmental consultant will be required to obtain appropriate validation data from the excavation pit.	Contractor

Management and mitigation measure	Responsibility
The removal of the IBC will be undertaken by the Principal Contractor and disposed of at a licensed facility in accordance with the NSW environmental and safety requirements and industry best practice.	Contractor

A Soil and Water Management Plan (SWMP) would be included as part of the overall Project CEMP for the construction of the BESS.

4.2 Waste

4.2.1 Regulatory requirements

Remedial activities will be undertaken in accordance with the following standard and regulatory requirements:

- POEO Act and its associated Regulations.
- *Waste Avoidance and Resource Recovery Act 2001*.
- EPA's Waste Classification Guidelines 2014.
- Project Approval (SSD-11437498) including the following relevant conditions:
  - *Condition 28: The Applicant must:*
    - *a. minimise the waste generated by the development;*
    - *b. classify all waste generated on site in accordance with the EPA's Waste Classification Guidelines 2014*
    - *c. (or its latest version);*
    - *d. store and handle all waste on site in accordance with its classification;*
    - *e. not receive or dispose of any waste on site; and*
    - *f. remove all waste from the site as soon as practicable, and ensure it is reused, recycled or sent to an*
    - *g. appropriately licensed waste facility for disposal.*

4.2.2 Management measures

Management and mitigation measure	Responsibility
Waste	
All waste would be assessed, classified, managed and disposed of in accordance with the Waste Classification Guidelines (NSW EPA, 2014a). A waste classification letter would be prepared to allow for materials to be disposed off-site to a licensed landfill in accordance with NSW EPA guidelines (e.g. material from the tank sample location excavation area, the proposed transmission pole locations and any materials surplus to Site requirements).	Contractor
Imported material for reinstatement of backfill (if required) should be quarried material, virgin excavated natural material (VENM) or excavated natural material (ENM) in accordance with the POEO Act 1997 and accompanied by a VENM and/or ENM certificate letter, if applicable. If certification is not provided, the imported VENM/ENM material should be sampled at the source and at an approximate rate of one sample per 100 m^3.	Contractor
Transfer of material off-site will be tracked via a material tracking form and collation of waste disposal dockets from the licensed landfill.	Contractor

A Waste Management Sub-Plan will also be prepared as part of the CEMM, by the nominated Contractor, prior to works commencing.

4.3 Unexpected finds procedure

In the event of an unexpected find:

- All work in the immediate vicinity should cease and the Project Manager should be contacted immediately.
- A qualified environmental consultant will instruct on how best to proceed based on the risk it may pose to the receptors.
- In the event potential asbestos material is encountered, a qualified occupational hygienist and / or asbestos consultant must be contacted.
- In the event that the area of environmental concern poses a risk to receptors, appropriate management procedures should be put in place to minimise / mitigate the risk. This could include updates to the remedial action plan, environmental management plan, asbestos management plan or similar.
- Additional sampling and analysis may be required to better characterise the area of environmental concern.
- Works should only proceed when the area of environmental concern is considered to pose a low to no risk to receptors.

4.4 Other

All other environmental management measures for the Project would be captured as part of the CEMP and associated sub-plans for the construction works of the BESS.

4.5 Incidents and compliance

An environmental incident is an unplanned event that causes or has potential to cause material harm to the environment. Environmental incidents include but are not limited to:

- Spills of chemicals including oils and fuels.
- Unintended damage to native vegetation.
- Injury to wildlife.
- Dust impacts on the surrounding community.

Environmental incidents are to be reported to the Project Manager and Environmental Manager using relevant documentation.

Incidents causing or threatening material harm to the environment, as defined by Section 147 of the POEO Act will be notified to the EPA and other relevant authorities immediately after becoming aware of the incident.

The Department of Planning, Industry and Environment (DPIE) must be notified via the Major Projects website:

- Immediately after AGL becomes aware of an incident; and
- Within 7 days after AGL becomes aware of any non-compliance with the conditions Project Approval.

A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.

All incidents will be investigated, and corrective actions identified and implemented where relevant. The Project Manager will maintain all records relating to environmental incidents.

4.6 Reporting

Following completion of the remedial works, a Site Validation Report will be prepared in accordance with the NSW EPA reporting guidelines (NSW EPA, 2020) to address consent condition 30 of Project Approval (SSD-11437498).

The report will comprise the following:

- Summary of key findings and observations
- Summary of site history
- Summary of work completed
- Analytical results of walls and floors of excavation pit
- Comparison of results against adopted soil remedial assessment criteria
- Summary of site updated CSM
- Assessment of any identified data gaps
- Summary soil classification, volume, and fate
- Records of waste disposal from site, volume, and fate
- Samples of imported fill and suitability for use assessed if material is imported onto the Site
- Summary of QA/QC compliance
- Conclusions and recommendations.