



# **REMEDIATION ACTION PLAN (RAP) – UNDERGROUND PETROLEUM STORAGE SYSTEM (UPSS)**

**24 Bolong Road  
LOT 31-DP1222627  
BOMADERRY, NSW, 2541**

Prepared For: **Shoalhaven Starches Pty Ltd (Manildra Group)**  
Project Number: **ENRS0536.25**  
Date: **August 2020**



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## Record of Distribution

Copies	Report No. & File Name	Version	Date	Commissioned By:
1 x PDF	ENRS0536.25_Manildra Bomaderry UST_RAP	Rev.1	12 <sup>th</sup> August 2020	Shoalhaven Starches
1 x PDF	ENRS0536.25.r2e1_Manildra Bomaderry UST_RAP	Rev.2	14 <sup>th</sup> August 2020	Shoalhaven Starches

## EXECUTIVE SUMMARY

Environment & Natural Resource Solutions (ENRS Pty Ltd) was commissioned as independent environmental consultants in April 2020 by *Shoalhaven Starches Pty Ltd* (the client) to prepare a Remediation Action Plan (RAP) for the decommissioning and removal of Underground Petroleum Storage Systems (UPSS) comprising one (1) Underground Storage Tank (UST) located at 24 Bolong Road, Bomaderry, NSW, 2541 (*herein referred to as the Site*).

ENRS understand the remediation works are required in anticipation of development and construction works within the UPSS area. This report is required to document the management procedures for potentially hazardous materials at the Site including and not limited to the one (1) UST.

This report documents the procedures for remediating the Underground Petroleum Storage System (UPSS) and in accordance with the NSW Environment Protection Authority (EPA) *Technical Note for Investigation of Service Station Sites* (EPA;2014); the amended *Underground Petroleum Storage Systems Regulations* (EPA;2019); the EPA endorsed *UPSS Technical Note on Site Validation Reporting* (DECCW:2010); the *National Environment Protection (Assessment of Site Contamination) Amendment Measure 2013 (No. 1)*; and the *Guidelines for Consultants Reporting on Contaminated Sites* (OEH;2011).

The objectives of this Remediation Action Plan (RAP) are to:

- Set remediation goals for the UPSS decommissioning and removal;
- Document in detail all procedures and plans to be implemented to reduce risks to acceptable levels for future site use;
- Establish the environmental safeguards required to complete the remediation in an environmentally acceptable manner;
- Identify and include proof of the necessary approvals and licences required by regulatory authorities;
- Outline requirements for a final validation report and clearance certificate upon completion of remedial works incorporating an assessment of the wider site suitability for the proposed ongoing land use; and
- Comply with condition 20ca of the Shoalhaven Starches Development Consent 06-028 which states:
  - *Prior to commencement of construction of the specialty products building described in MOD 16, the Applicant shall conduct further investigations to determine the location of an underground storage tank (UST). The Applicant must provide a report of the investigations to the Planning Secretary, with recommendations to manage or remove the UST and any associated contamination. The Applicant must implement the recommendations of the contamination investigation, prior to construction of the specialty products building and provide evidence to the satisfaction of the Planning Secretary.*

The scope of work for the preparation of this RAP included the review, assessment and reporting of site data under the following tasks:

- Review of regulatory requirements and previous reports;
- Review of ENRS scope of work and proposed UST decommissioning methodology;
- Preparation of Remediation Action Plan for submission to the local authority (NSW Department of Planning & Environment) to support works approvals.

Based on the Site information reviewed during the preparation of this RAP, the following conclusions and recommendations are provided.

- The activities and physical changes proposed for the site include:
  - Decommission of one (1) known UST by excavation and off site removal;
  - Disposal of waste materials
  - Reinstatement of the excavation with validated Site materials and imported certified VENM/ENM.
- The remediation objectives are to remove any remaining **UPSS** infrastructure as the primary source/s of potential contamination, and any impacted soil, sufficient to remove any future contaminant risk. The UST is required to be removed as it is located within the footprint of proposed construction works;
- The preferred remediation strategy is assessed to be suitable based on the results and assumptions of previous investigations which did not identify significant ground contamination in the UPSS area. The UST is located in an accessible area which is practical for excavation and removal which indicates the site can be made suitable for the proposed ongoing industrial landuse if this RAP is implemented;
- The available site records indicate there is a low risk that the Site will be impacted by any environmental limitations upon completion of the works. The backfilling operations will require geotechnical requirements which should be considered separately. Should the soil validation results identify elevated residual levels, the aim will be to expand the excavations to remove the material and re-validate the area. Where validation results are not conclusive, a groundwater monitoring event shall be conducted to further characterise the area, and where necessary an Environmental Management Plan will be prepared with protocols for long-term management of residual contamination (if any); and
- It is recommended this RAP be submitted to the regulator for approval, and ENRS liaise with the preferred contractor prior to commencement to ensure the Site supervisor and key staff are familiar with the RAP and the site proposal.

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## 1.0 INTRODUCTION

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## 1.2 SCOPE OF WORK

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- Review of regulatory requirements and previous reports;
- Review of ENRS scope of work and proposed UST decommissioning methodology;
- Preparation of Remediation Action Plan for submission to the local authority (NSW Department of Planning & Environment) to support works approvals.

## 2.0 SITE DESCRIPTION

### 2.1 SITE IDENTIFICATION

The site is located on the southern side of Bolong Road, Bomaderry, adjacent to the Shoalhaven River, Bomaderry Creek, as shown in **Figure 1**. The key features required to identify the Site are summarised in **Table 1**.

**Table 1: Site Identification**

ITEM	DESCRIPTION
<b>Site Name/Description</b>	Manildra Bomaderry Plant
<b>Street Address</b>	24 Bolong Road, Bomaderry, NSW, 2541
<b>Lot / Deposited Plan</b>	31/-/DP1222627
<b>Easting/Northing</b>	N6140290 E281753 (MGA56)
<b>Current Owners</b>	Manildra Group
<b>Current occupiers</b>	Shoalhaven Starches
<b>Area</b>	~1,100 m <sup>2</sup>
<b>Local Government Area</b>	Shoalhaven City Council
<b>Current Zoning</b>	IN1 (Industrial)
<b>Locality Map</b>	Berry 9028-3-N
<b>Trigger for assessment</b>	UST required to be removed for proposed building construction at the Site.
<b>Statutory controls</b>	State significant project
<b>Authority for Site access</b>	Email approval received from landowner representative.
<b>Adjoining landowner consent for access</b>	No access required for this scope of work. Boundary observations considered adequate.

**Figure 1 Site Location Map**



Source: [www.google.com.au/maps](http://www.google.com.au/maps) (cited 04/08/2020)

## 2.2 TOPOGRAPHY

A review of the Site topography was conducted with reference to the current series topographic map sheet (9028-3N Berry) supported by Site inspections. The Site is positioned on levelled hardstand within an area of low topographic relief. The regional gradient dips to the south towards Shoalhaven River approximately 200m from the Site. Site inspections identified a stormwater drain on the southern and eastern boundary of the Site which is likely to capture any surface runoff.

## 2.3 ACID SULFATE SOILS

A review of NSW DPIE eSPADE online tool for assessing Potential Acid Sulfate Soil Risk was completed and identified the Site as having a low probability, >3m below the ground (L4). Proposed remediation works are not expected to reach depths of 3 mbgl, thus PASS are not expected to be encountered.

## 2.4 GEOLOGY

A review of the geological setting was conducted with reference to the Wollongong 1:250,000 Geological series sheet. The mapped geology shows the Site is largely underlain by the Quaternary aged sediments (Qal) characterised as quartz and lithic fluvial sand, silt, and clay.

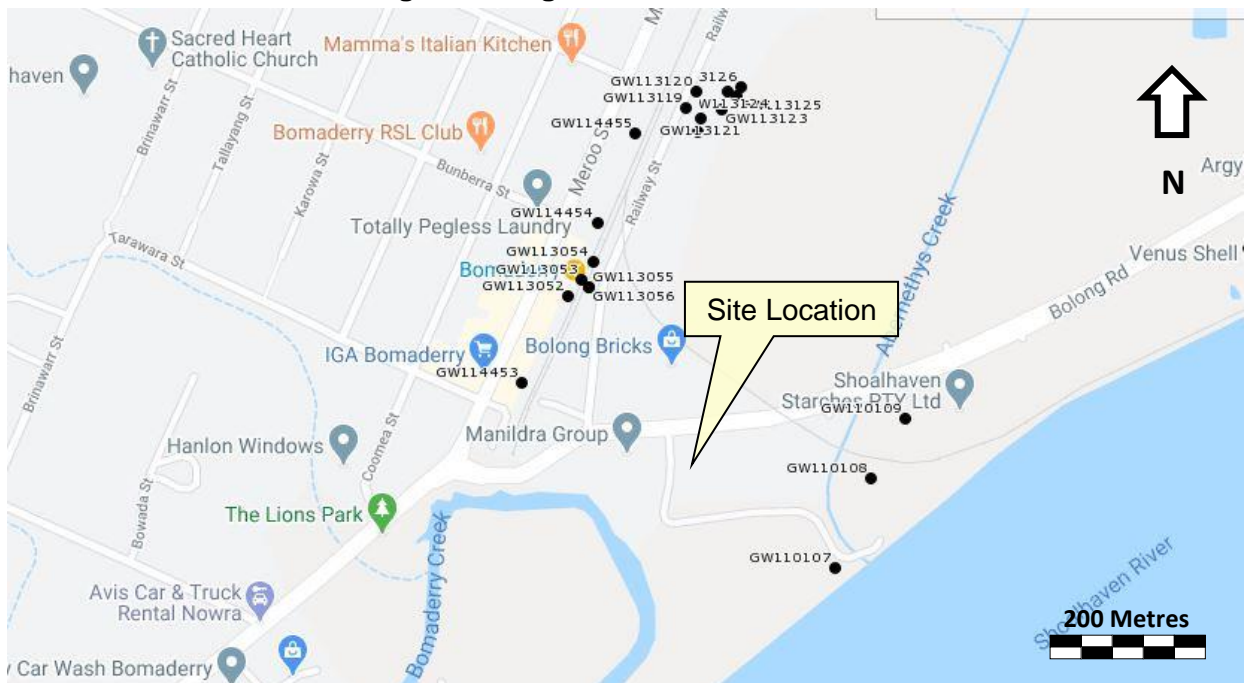
## 2.5 HYDROGEOLOGY

Based on the Site geology groundwater in the area is expected to be associated with the following aquifer systems;

- *Shallow unconfined* systems hosted in the unconsolidated sands and sediments in direct connection with Shoalhaven River situated approximately 200 metres from the Site.

Review of the NSW Office of Water (NOW) registered bore database identified multiple groundwater bores within a one (1) kilometre radius of the Site. Groundwater is expected to be located at depths greater than 5 m below ground level based on previous Site works which did not encounter groundwater at 4.5 mbgl. Natural groundwater flow is presumed in a South to South-Easterly direction towards Abernethys Creek and the Shoalhaven River.

**Figure 2 Registered Bore Locations**



Source: <https://realtimedata.waternsw.com.au/> (cited 04/08/2020)

## 3.0 SITE HISTORY (SUMMARY)

ENRS understand the Site has been subject of two (2) previous environmental investigations, including one (1) Preliminary Site Investigation (PSI) completed by *Coffey Geosciences Pty Ltd* (2003). A GPR survey of the UPSS areas was also conducted by ENRS to support the preparation of this RAP. The following points summarise the key findings of the previous report and GPR Survey:

### 3.1 COFFEY GEOSCIENCES PTY LTD PSI (JULY 2003)

- Plans show installation of 300-gallon (~1,136 L) UST in the 1960's near the south-eastern corner of warehouse;

- Records indicate the UST was abandoned in-situ by filling with concrete approx. 30 years ago (early 1980's);
- No leakage from the UST was known by the owner;
- Area where UPSS identified was covered with hardstand. No surface evidence of UPSS visible. Black oil staining visible on adjacent wall of building where former bowser was reported to be located;
- Sampling investigation noted termination of CBH2 borehole at 0.65m on what was inferred to be the former abandoned UPSS;
- Borehole samples from CBH3 (~3m south of CBH2) recorded a faint hydrocarbon odour between 0.5m and 0.95m. No other odours were noted in soils during sampling. Samples tested with PID returned readings of 0 hydrocarbons present;
- Laboratory testing of soil sample collected from CBH3 returned results below NSW EPA (1998) Guidelines threshold values for Heavy Metals, Petroleum Hydrocarbons, BTEX, PAHs, Organochlorine Pesticides, and PCBs;
- It was noted that contamination of soils surrounding UPSS is common and though none was found in analysed samples it was likely that contamination of soils surrounding the UPSS existed. Removal of UPSS and testing/removal of any contaminated soil was recommended as part of any Site redevelopment and to remove future liabilities associated with UPSS; and
- Standing groundwater measured at a depth of 3m below ground surface several hours after drilling. Based on level of information collected at the site there was a low likelihood that there was significant groundwater contamination. Alluvial clays of medium to high plasticity underlie the site, these material tend to have a low vertical permeability and tend to inhibit movement of contamination deep into the soil profile.

### 3.2 GPR SURVEY (ENRS; JULY 2020)

A GPR survey of the UPSS area was conducted by Laneyrie Electrical in July 2020. The following points summarise the key observations:

- GPR survey identified area on southeast edge of Manildra Maintenance Building where an underground object was located. The area identified is consistent with the previous records of the UPSS location. The area was delineated on the ground with survey marker paint;
- The location of the Coffey (2003) concrete cores for drilling, were observed on the ground surface, consistent with the PSI report. A solid structure was found ~0.7 mBGL (metres below ground level) in the former BH2 which was re-gauged manually. Previous investigations by Coffey inferred the UST to be present below BH2;
- GPR located a possible second, small structure on the northern end of the identified (presumed UST) object. The second, smaller structure was likely piping or associated infrastructure connected to the UST;
- Unable to locate fill point/s or access to the UPSS;
- No hydrocarbon odour or staining identified during inspections, noting the areas if covered by concrete hardstand; and
- Photographic records of GPR investigation and outline of located object reported in **Appendix B**.

## 4.0 SITE CONDITION & SURROUNDING ENVIRONMENT

The following **Table 2** outline the observed Site conditions and surrounding environment at the time of this investigation based on the requirements of the ASC NEPM Field Checklist for ‘Site Information’. A Site layout plan is provided in **Figure 3** with a photographic record of Site conditions tabled in **Appendix C**.

**Table 2: Summary of observed Site Conditions & Surrounding Environment**

ITEM		DESCRIPTION
1.	Site inspection (date, by whom)	GPR survey & walkover (3/08/2020, Gary Laneyrie and Mark Tupalski)
2.	Topography of site and in relation to surrounding land	The site conforms with the surrounding environment. The area generally slopes gently to the south and is covered with concrete hardstand and some areas of asphalt.
3.	Elevation	Review of the topographic maps indicates the site area is generally less than 10 m Australian Height Datum (AHD).
4.	Position on slope (e.g. Crest, upper slope, mid slope, lower slope, flat), including direction	The PSI documents the Site is relatively flat with a slope to the south
5.	Quantification of slope (if required) as percentage slope	<1%
6.	Summary of local meteorology - nearby weather stations (e.g. Annual range in monthly temperature, precipitation, seasonal variations)	The area is characterised by warm and temperate weather. Average rainfall is ~1219 mm and temperature is ~16.9°C.
7.	Climatic conditions	The site was dry at the time of inspection with no heavy rainfall within 24 hrs.
8.	Current land use	Industrial facility with steel warehouse building/s.
9.	Surrounding land uses (north, south, east, west) noting apparent condition.	<b>North:</b> Neighbouring commercial properties and Manildra Private Railway
		<b>East:</b> Shoalhaven Starches Plant industrial complex and Abernethys Creek

ITEM		DESCRIPTION
		<b>South:</b> Shoalhaven Starches Plant industrial complex further to Shoalhaven River ~200m <b>West:</b> Commercial properties further to Bomaderry Creek ~250m
10.	Density of residential use in surrounding area	N/A
11.	Boundary conditions	Site is clearly delineated with security fencing.
12.	Location and conditions of all visible features, including current buildings and surface structures, roads, foundations, positions of former buildings, tanks, pits, wells, drains and bores	➤ Steel warehouse immediately west of UPSS; ➤ Various industrial buildings within 80 m.
13.	Site building information:	Summary of observations provided below:
	➤ Occupancy and use of buildings	Daily use by site workers
	➤ Age of buildings	Varied between ~10-20 years
	➤ Construction of buildings including materials (e.g. Wood frame), openings (e.g. Windows, doors), and height (e.g. One storey, multistorey)	Single storey, steel and timber
	➤ Number of storeys	Single
	➤ Height of storeys	Standard single
	➤ Foundation type (e.g. Basement, crawlspace, slab on ground), if combination then percentage	Concrete slabs
	➤ Depth below grade to base of foundation	At ground level
	➤ Foundation construction for both floor and subsurface walls (e.g. Poured concrete, concrete block, brick, timber)	Variable brick, timber and poured concrete.
	➤ General condition of foundation (cracks, openings)	Good, no significant cracks or openings observed.
	➤ Elevator shafts	None observed.
	➤ Sub-slab ventilation systems or moisture vapour barriers below buildings	None observed.
	➤ Sumps or drains or wells inside buildings	None observed.

ITEM	DESCRIPTION
➤ Attached garage	None observed.
➤ Below building parking	None observed.
➤ Chemical use and storage	None observed.
➤ Type of cooling and heating systems (e.g. Natural gas, oil, radiant, steam, electrical)	None observed.
➤ Equipment location (e.g. Basement, crawl space, roof)	None observed.
➤ Air intake and exhaust units	None observed.
➤ Source of return air (e.g. Inside air, outside air, combination)	None observed.
➤ System design consideration relation to indoor air pressure (e.g. Positive pressure is often the case for commercial buildings)	None observed.
14. Condition and type of surface cover e.g. Bare ground, asphalt, concrete, gravel etc and estimate of percentage of site occupied by buildings, landscaped areas, paved or non-paved areas	Concrete and asphalt.
15. Chemical storage and transfer areas, including the presence of waste or chemical containers	Non observed in immediate proximity.
16. Details of above ground and underground storage systems and associated infrastructure (number, location, capacities, contents, age, construction, condition, bunding & spill control)	Records indicate 1x former UST 300 gallon (~1,136 L) UST in the 1960's
17. Underground storage tanks (USTs)- product stored, volume, direct or remote fill points, dispenser bowsers, contained or uncontained fill points, underground piping and ventilation points, dip stick volume gauge, age of tank, records of spills or stock loss	No above ground infrastructure observed.  Anecdotal evidence indicates the UST may have been abanded with concrete (unconfirmed)

ITEM	DESCRIPTION
18. Above ground storage tanks (ASTs)- product stored, volume, remote fill, bunded or unbunded containment area, staining within bund, staining outside bund, bund plug in place, staining around bund plug, nearby drains, record of spills or stock losses	Non observed.
19. Evidence of debris, waste disposal, lagoons, drums, chemical storage or other indicators of potential contamination sources	Non observed
20. Locations of settlement ponds	Non observed
21. Description and location of services and utilities including on-site septic systems	Non observed
22. Identification of electrical transformers/substation/capacitors	Non observed
23. Odours	Non detected
24. Visible signs of contamination such as discolouration or staining on the surface of soil or water, bare soil patches - on-site and at site boundaries	Staining on building wall where former bowers may have been positioned.
25. Presence of any <u>stockpiled</u> material, imported soil or fill material as well as any signs of settlement, subsidence or disturbed ground	Non observed
26. Vegetation type and extent of cover (e.g. Scattered, sparse, dense, absent, invasive, native)	Non observed
27. Condition of vegetation (noting visibly distressed, disturbed or dead vegetation)	Non observed
28. Assessment of soil loss or deposition that has occurred in the past and evaluation of the future erosion potential	Non observed
29. Visible signs of erosion (on and off-site)	Non observed

ITEM	DESCRIPTION
30. Surface water bodies (e.g. Lakes, rivers, streams, wetlands), fresh/marine and distance from site	Aberneyths Creek / drainage approximately 80m east of the Site, further to the Shoalhaven River.
31. Surface water drainage (e.g. Drainage bores, soak wells, sumps) and run-off and identification of ponding areas (and potential for flooding)	site appears drained across the hardstand towards Abernethys Creek.
32. Direction of flow of water runoff from the site and adjacent properties	subtle slope to the east/southeast.
33. Depth of any standing water, the direction and rate of flow of rivers, streams or canals, together with their flood levels and any tidal inundations	None observed.
34. Surface water and groundwater use on site including rate and location of abstractions (current and historical)	None observed.
35. Evidence of possible naturally occurring contaminants	Non observed
36. Identification of environmentally sensitive or significant features or habitats	<ul style="list-style-type: none"> <li>➤ Site users;</li> <li>➤ Abernethy's Creek and Shoalhaven River environs downgradient of the Site, trending South.</li> </ul>
37. Evidence chemical substances have migrated or are likely to have migrated to a neighbouring site and is or is likely to be causing contamination of the neighbouring property	Non observed
38. Photographs of site and surrounding adjacent land, showing significant features, topography, nature of surface and existing structures)	Refer to photographic log or Site conditions attached.
39. Differences between current site condition and site history	No discernible difference in Site conditions documented in previous PSI report.

## 5.0 REMEDIATION CRITERIA

### 5.1 REFERENCE GUIDELINES

The requirements for the management and operation of Underground Petroleum Storage System (UPSS) infrastructure in NSW is documented in the amended UPSS Regulation (2019). The NSW EPA provides a number of advisory technical notes for Investigating Service Stations Sites (EPA;2014), and Site Validation Reporting (DECCW;2010).

ENRS have adopted the most appropriate Site Assessment Criteria (SAC) in accordance with current state and national guidelines. Where available, Australian and NSW EPA endorsed guidelines have been referenced in preference to international standards.

#### 5.1.1 National Environment Protection Measure (NEPM)

The NSW EPA has endorsed the use of the Health Investigation Levels (HILs) given in the 2013 National Environment Protection (Assessment of site Contamination) Measure (NEPM) 'Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater'. The NEPM provide a framework for risk-based assessment of soil and groundwater contamination. Health Screening Levels (HILs) are provided for four (4) landuse categories:

**Table 3: Summary of NEPM Landuse Categories**

NEPM	Description of Landuse Categories
HIL A	Residential A with garden/accessible soil also includes; children's day care centres, preschools and primary schools.
HIL B	Residential B with minimal opportunities for soil access; includes buildings with fully & permanently paved yard space such as high-rise buildings & apartments.
HIL C	Recreational C includes public open space such as parks, playgrounds, playing fields (e.g. ovals), secondary schools and unpaved footpaths.
HIL D	<b>Commercial/industrial D includes premises such as shops, offices, factories and industrial sites.</b>

Given the Site proposal for construction and continued industrial use the relevant assessment criteria is **NEPM D for commercial/industrial landuse**.

In addition to the HILs the amended ASC NEPM (2013) provides the following Site Assessment Criteria (SAC):

- **Management Limits** for petroleum hydrocarbon compounds (Table 1B [7]);
- **Health Screening Levels (HSLs)** potential vapour intrusion (Table 1A [4]) should be selected based on the; land use; medium (sand, silt, clay); and depth.
- **Groundwater Investigation Levels (GILs)** should be applied based on the receiving environment and groundwater resources. GILs are provided in NEPM Table 1C for; Fresh Waters; Marine Waters; and Drinking Water; and
- **Ecological Investigation Levels (EILs)** and Ecological Screening Levels (ESLs) for common contaminants in the top 2 m of soil based on three (3) generic land use settings; areas of

ecological significance; urban residential areas and public open space; and commercial and industrial land uses.

### 5.1.2 CRC CARE

The Cooperative Research Council for Contamination Assessment and Remediation for the Environment (CRC CARE) Technical Report no. 10 (Friebel and Nadebaum, 2011) documents Health Screening Levels (HSLs) for petroleum hydrocarbons in soil and groundwater. HSLs are provided for the four NEPM land-use categories and intrusive maintenance workers with consideration of vapour intrusion and direct contact pathways.

### 5.1.3 ANZECC Guidelines

Assessment criteria for water quality are provided in the Australian and New Zealand Guidelines for Fresh and Marine Waters (ANZECC Guidelines) Trigger Values (TV) for fresh water. The Trigger Values are categorised by the per cent of species possibly affected. The EPA (DECC;2007) endorsed groundwater management guidelines recommend assessment for aquatic ecosystems based on the 95 per cent of species level of protection. For some metals, the standard TV may be recalculated based on the impact of water hardness, pH, and alkalinity. In those cases, a hardness-modified trigger value (HMTV) may be derived to support a site specific assessment of the bioavailability of potentially toxic metals

### 5.1.4 Aesthetic Criteria

The NEPM (2013) *Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater* advises that there exist no numeric Aesthetic Guidelines, however site assessment requires balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity. General assessment considerations include:

- That chemically discoloured soils or large quantities of various types of inert refuse, particularly if unsightly, may cause ongoing concern to site users;
- The depth of the materials, including chemical residues, in relation to the final surface of the Site; and
- The need for, and practicality of, any long-term management of foreign material.

## 5.2 ADOPTED SOIL CRITERIA

The adopted Site Assessment Criteria (SAC) for soil based on the available reference guidelines are summarised in **Table 4** and **Table 5**.

**Table 4: Soil Assessment Criteria for Land Use Suitability**

Analyte	Units	NEPM D	HSL D Direct Contact	Maintenance Worker
Polycyclic Aromatic Hydrocarbons	Naphthalene	mg/Kg	370 <sup>B</sup>	11,000 <sup>E</sup>
	BaP TEQ	mg/Kg	40 <sup>A</sup>	-
	Total PAHs	mg/Kg	4,000 <sup>A</sup>	-
Metals & Metalloids	Arsenic	mg/Kg	3,000 <sup>A</sup>	-
	Cadmium	mg/Kg	900 <sup>A</sup>	-
	Chromium	mg/Kg	3,600 <sup>A</sup>	-

Analyte	Units	NEPM D	HSL D Direct Contact	Maintenance Worker
	Copper	mg/Kg	240,000 <sup>A</sup>	-
	Lead	mg/Kg	1,500 <sup>A</sup>	-
	Mercury	mg/Kg	730 <sup>A</sup>	-
	Methyl Mercury	Mg/Kg	180	-
	Nickel	mg/Kg	6,000 <sup>A</sup>	-
	Zinc	mg/Kg	35,000 <sup>A</sup>	-
Phenolics	T.Phenols	mg/Kg	240,000	-
BTEX	Benzene	mg/Kg	95	430
	Toluene	mg/Kg	135	99,000
	Ethyl benzene	mg/Kg	185	27,000
	m+p-Xylene	mg/Kg	95	81,000
	o-Xylene	mg/Kg	95	81,000
Total Recoverable Hydrocarbons	F1 TRH C6-C10	mg/Kg	700	26,000
	F2 TRH C10-C16	mg/Kg	1,000	20,000
	F3 TRH C16-C34	mg/Kg	3,500	27,000
	F4 TRH C34-C40	mg/Kg	10,000	38,000

**Table 5: Soil Screening Criteria for Potential Vapour Intrusion**

NEPM D mg/Kg		Benzene	Toluene	Ethyl benzene	m+p-Xylene	o-Xylene	Naphthalene	F1 C6-C10	F2 >C10-C16	F3 >C16-C34	F4 >C34-C40
NEPM HSL FOR VAPOUR INTRUSION SCREENING	SAND	0-1m	3	-	-	230	230	-	260	-	-
		1-2m	3	-	-	-	-	-	370	-	-
		2-4m	3	-	-	-	-	-	630	-	-
		>4m	3	-	-	-	-	-	-	-	-
	SILT	0-1m	4	-	-	-	-	-	250	-	-
		1-2m	4	-	-	-	-	-	360	-	-
		2-4m	6	-	-	-	-	-	590	-	-
		>4m	10	-	-	-	-	-	-	-	-
	CLAY	0-1m	4	-	-	-	-	-	310	-	-
		1-2m	6	-	-	-	-	-	480	-	-
		2-4m	9	-	-	-	-	-	-	-	-
		>4m	20	-	-	-	-	-	-	-	-

Source: adapted from NEPM (2013) Table 1A(3)

### 5.3 ADOPTED GROUNDWATER CRITERIA

No permanent groundwater or evidence of gross contamination was identified during Site works or review of previous reports to trigger further groundwater assessment. The following criteria should be adopted should any significant groundwater or contamination be identified during the UPSS decommission process. The relevant criteria are the ANZG (2018) with reference to the 95% Trigger values for Freshwater.

**Table 6: Groundwater Assessment Criteria**

Analyte		Units	Freshwater <sup>A</sup>	NEPM HSL D Vapour Intrusion
Polycyclic Aromatic Hydrocarbons (PAHs)	Naphthalene	µg/L	16	-
	Acenaphthylene	µg/L	-	-
	Acenaphthene	µg/L	-	-
	Fluorene	µg/L	-	-
	Phenanthrene	µg/L	-	-
	Anthracene	µg/L	-	-
	Fluoranthene	µg/L	-	-
	Pyrene	µg/L	-	-
	Benzo(a)anthracene	µg/L	-	-
	Chrysene	µg/L	-	-
	Benzo(b+k)fluoranthene	µg/L	-	-
	Benzo(a) pyrene	µg/L	-	-
	Indeno(1,2,3-c,d)pyrene	µg/L	-	-
	Dibenzo(a,h)anthracene	µg/L	-	-
	Benzo(g,h,i)perylene	µg/L	-	-
	Benzo(a)pyrene TEQ	µg/L	-	-
	Total PAH	µg/L	-	-
Metals & Metalloids	Arsenic	µg/L	24 as As(III) 13 as As(V)	-
	Cadmium	µg/L	0.2	-
	Chromium, Cr (III)	µg/L	-	-
	Chromium, Cr (VI)	µg/L	1	-
	Copper	µg/L	1.4	-
	Lead	µg/L	3.4	-
	Mercury	µg/L	0.06	-
	Nickel	µg/L	11	-
	Zinc	µg/L	8	-
Phenols	Phenol	µg/L	320	-
	2-Chlorophenol	µg/L	340	-
	4-Chlorophenol	µg/L	220	-
	2,4-Dichlorophenol	µg/L	120	-
	2,4,6-Trichlorophenol	µg/L	3	-
	2,3,4,6-Tetrachlorophenol	µg/L	10	-
	Pentachlorophenol	µg/L	3.6	-
	2,4-Dinitrophenol	µg/L	45	-
BTEX	Benzene	µg/L	950	5000
	Toluene	µg/L	-	-
	Ethyl benzene	µg/L	-	-
	m+p-Xylene	µg/L	200	-
	o-Xylene	µg/L	350	-
TRH	TRH C6-C10	µg/L	-	6000
	TRH C10-C16	µg/L	-	-
	TRH C16-C34	µg/L	-	-
	TRH C34-C40	µg/L	-	-

<sup>A</sup> Investigation levels apply to typical slightly-moderately disturbed systems. See ANZECC & ARMCANZ (2000) for guidance on applying these levels to different ecosystem conditions.

<sup>B</sup> NEPM (2013) Groundwater HSLs for vapour intrusion Table 1A(4).

## 5.4 WASTE CLASSIFICATION CRITERIA

Liquid and non-liquid waste designated for disposal shall be assessed in accordance with the NSW EPA Waste Classification Guidelines (EPA;2014). Guidelines are defined for the specific contaminant concentration (SCC) and the toxicity characteristics leaching procedure (TCLP). To establish soil waste classification using both SCC and TCLP, the test values for each chemical contaminant must be compared with the threshold values set in Table 2 of the guidelines:

**Table 7: Waste Classification Criteria**

Classification	SCC value	TCLP value
General solid waste	≤ SCC1	≤ TCLP1
Restricted solid waste	≤ SCC2	≤ TCLP2
Hazardous waste	> SCC2	> TCLP2

## 6.0 RESULTS (PREVIOUS)

Section 9.2 of the PSI (Coffey;2003) report outlines the results of the previous UPSS investigations:

- Little evidence of petroleum hydrocarbon contamination was noted at sampling locations near the abandoned UST (AEC01). However, it is imported to note that it is common for USTs and their appurtenances to leak and contaminated the soil in their immediate surrounds. As such, it is possible that contamination with the UST could be present and was not detected. The available information would suggest that such contamination (if any) is likely to be localised. Anecdotal evidence suggests the UST was abandoned by filling with concrete, which is an acceptable method of abandoning a UST in accordance with previous and current NSW regulations. Removal of the UST with any nearby contaminated soils (if any) may be required as part of the site development. This should also be considered to remove future liability associated with the presence of the UST.

## 7.0 SITE CHARACTERISATION

Section 12.0 of the PSI (Coffey;2003) report provides the following summary of the Site Characterisation:

- evidence of petroleum hydrocarbon contamination was noted at sampling locations near the abandoned UST (AEC01). It is possible that contamination with the UST could be present and was not detected. The available information would suggest that such contamination (if any) is likely to be localised. Given the long industrial usage of the Site, there is also the potential for other USTs to be located at the Site that have not been identified; and
- It is considered that there is a low likelihood that there would be significant groundwater contamination at the Site from the previous on site activities. There is potential for localised groundwater impacts from point sources of contamination such as storage of fuels near the UST, the wash bay and concrete wastewater sump.

## 8.0 CONCEPTUAL SITE MODEL

### 8.1 SOURCES / POTENTIAL CONTAMINANTS

The UPSS identified at the Site represents the primary source of potential contamination at the Site. The Areas of Environmental Concern (AECs) and Contaminants of Potential Concern (CoPC) and are listed below in **Table 8**.

**Table 8: Potential Contaminants of Concern**

AEC	Historical Activities	Dispersion Mechanism	Potential Contaminants
<b>AEC01</b> (UPSS)	UPSS installation recorded in 1960's. Abandonment & concrete filling of UPSS in-situ reported to have occurred in 1980's	Potential leaking of Petroleum Hydrocarbons and fuel associated contaminants from UPSS localised to soils surrounding UPSS	<ul style="list-style-type: none"> <li>• Total Recoverable Hydrocarbons (TRH);</li> <li>• Benzene Toluene Ethylbenzene, Xylenes (BTEXN);</li> <li>• Polycyclic Aromatic Hydrocarbons (PAHs); and</li> <li>• Heavy Metals.</li> </ul>

Source: based on Table J1, Appendix J, in AS4482.1 (2005)

### 8.2 PATHWAYS

#### 8.2.1 UPSS Infrastructure

Given the relatively shallow construction of UPSS, generally less than three (<3 mbgl) metres below ground level, and anticipated ground works during decommission and Site redevelopment, the primary contaminant migration and exposure pathways include:

- Dermal exposure to near surface (soil & groundwater) contaminants primarily during site works;
- Inhalation and or ingestion of dust or air bound contaminants primarily during site works;
- Soil vapour/ gas (volatile hydrocarbons) migration from the vadose zone, generally along preferential pathways such as service trenches, pits, slab joins/cracks;
- Surface run-off and potential entry into the stormwater drainage system;
- Vertical migration of contaminants leaching through the vadose zone;
- Lateral migration of contaminants in groundwater, generally in the direction of the local hydraulic gradient any preferential pathways; and
- Groundwater migration and discharge to sensitive receptors, if any.

### 8.3 RECEPTORS

The nearest receptors include:

- Site users;
- Civil/Enviro workers undertaking remediation works;
- Neighbouring properties;

- Waterways and natural drainage structures downgradient of the site (Abernethys Creek and Shoalhaven River);
- Human health – dermal / ingestion / inhalation - excavations, dust, fibres and soil gas/vapour); and
- Shallow soil, stormwater and groundwater – vertical and lateral migration of contaminants and connectivity with waterways.

## 9.0 REMEDIATION OPTIONS ASSESSMENT

### 9.1 REMEDIATION OBJECTIVES

ENRS understand the remediation goals for this project are to:

- Remove any remaining **UPSS** infrastructure as the primary source/s of potential contamination, and any impacted soil, sufficient to remove any future contaminant risk;
- Sample and assess any excavated soil **stockpiles** for suitability to re-use on-site or classify as waste for off-site disposal; and
- Validate the UPSS area and wider site as suitable for the proposed landuse.

### 9.2 PREFERRED REMEDIATION METHOD

The preferred remediation strategy is based on an understanding of the following issues;

- Previous investigations by Coffey Pty Ltd (2003) did not identify significant contamination in soil adjacent to UPSS, however, further testing is required as localised contamination associated with UPSS is likely;
- The UPSS represents the primary source of potential contamination;
- Removal of potential contaminants is preferential for the future environmental liability of the site; and
- Removal of the UST is preferred where the area is likely positioned with the construction footprint for new buildings.

## 10.0 REMEDIATION STRATEGY

### 10.1 EXTENT OF REMEDIATION

Soil remediation shall be limited to the UPSS areas and any accessible areas of environmental concern identified during the UST decommission and associated Site works. Testing and removal of soil surrounding UPSS found to be contaminated is recommended.

## 10.2 UPSS LOCATION

The location of UPSS was initially identified in the Coffey PSI (Coffey 2013) and subsequently confirmed by the GPR Survey (ENRS 2020). A Site plan highlighting identified UPSS locations is provided in **Figure 3**. Initial Site plans and suspected tank location from Coffey (2003) are also provided in **Appendix A**.

## 10.3 DECOMMISSION METHODOLOGY

**Removal and Offsite Disposal** is the preferred method of remediation for the decommissioning of UPSS at the Site. The following summary is provided for the remediation methodology and scope of work:

- **Remediation Action Plan (RAP)** – Prepare and submit RAP for approval by the regulator prior to commencement;
- **Dial Before You Dig** – conducted dial before you dig survey;
- **WHS&E documentation** – prepare SWMS, Work Plans etc prior to commencing works;
- **Service location search** – locate services within and adjacent to excavation areas;
- **Ground penetrating radar (GPR) survey** (if required) – confirm the location and footprint of the UST/s (completed 03/08/2020);
- **Mobilisation** – suitably licensed decommissioning Contractor to mobilise onto site;
- **Pre-start tool box induction** – all personnel to undertake toolbox induction including SWMS and site-specific training prior to commencement of works. Minimum PPE to be inspected (long longs, lace up boots and high visibility clothing, hard hats, safety glasses and gloves);
- **Establish environmental controls** - install 200-micron thick impermeable plastic along the down gradient fence where excavated soils are to be stockpiled;
- **Lower explosive limit (LEL) monitoring** – conduct LEL monitoring prior to and whilst works are occurring to ensure that they are not conducted within an explosive atmosphere;
- **Excavate Hardstand & overburden** – excavate and stockpile onsite the concrete hardstand overburden to expose the top of the UST and associated fittings/pipe work;
- **Liquid waste removal** – removal of liquid waste (likely fuel/water mix if any) from within UST/pipes and dispose offsite at an appropriately licensed facility, or if the water quality is suitable at the on-Site Waste Water Treatment Plant;
- **Degas UST (purge)** – purge UST until monitors indicate oxygen levels within the UST at 5% or less, using nitrogen if required;
- **Onsite destruction of USTs** – render purged UST incapable of acting as vessels to eliminate vapour recharge within the UST;
- **Excavate UST concrete anchors and packing sand** – excavate and stockpile on site the UST concrete strip anchors. The packing sand adjacent to UST will be removed and stockpiled onsite to free the UST for removal from the excavation;
- **Removal of UST from excavation** – the UST will be lifted out of the excavation and made safe as per AS 4976 – 2008;
- **Excavation of remaining soil material** – Due to the extent of the potential contamination, the excavation and stockpiling of additional surrounding soils from the walls and base of the excavation should be done to maximum practical limits supported by field PID readings;

- **Removal of bowser supply line** – removal of bowser supply lines if found;
- **Offsite disposal of destroyed UST & pipe work** – offsite disposal of UST & pipe work on an appropriately licensed truck. A UST Destruction Certificate shall be included within the Validation Report upon completion of the works;
- **Offsite disposal of stockpiled concrete** – excavated concrete from the forecourt and the UST anchors will be disposed offsite. Please note, if the concrete contains strong hydrocarbon odours then it will be disposed offsite as contaminated waste at an appropriately licensed waste disposal facility;
- **Photo Ionisation detector (PID) screening of the excavation walls and floor** – Consider using a PID to screen the soil of the walls and floors of the excavations. The PID provides field readings of volatile organics (fuel) levels and assists in determining the vertical and lateral extent of the excavations. As a general indicator results from material remaining in situ should be less than ~50 ppm;
- **Environmental sampling** – collection of validation samples for laboratory analysis from the walls (4x walls or 1per 5m) and floor (1per 5m) of the UST excavation and 1per 5m of pipeline. Classification samples will be collected from the stockpiled material (1 per 25 m<sup>3</sup>) removed from adjacent to and below the UST and laboratory analysis conducted to assess its suitability for reuse in backfilling the excavation or support waste classification;
- **Tidy Up and demobilise** – demobilise until receipt of analytical results confirm the excavation walls and floors and the excavated stockpiled materials are free of contaminants i.e. below guideline criteria;
- **Remobilise & reinstatement and compaction of the UST excavation/s** – the UST excavation/s shall be reinstated in 200 mm layers with previously excavated stockpile material if deemed suitable for re-use following chemical assessment and with imported V.E.N.M. or E.N.M. (accompanied with classification certificate/s). The excavation backfilling shall be finished to near surface with a final layer of suitable material; and
- Tidy Up and demobilise

## 10.4 EXCAVATION & BACKFILLING

Excavation works shall not occur until all environmental protection measures are in place and operational. Suitable measures shall be put in place to reduce the risk of surrounding soils collapsing during tank extraction. UST should only be removed once soil material has been removed by trenching around the perimeter of the tank sufficient to release the tank during lifting. Where practical, excavations shall not extend below the water table. Maintaining the stability of the surrounding soils is critical, where necessary the excavations shall be backfilled to stabilise the excavation with certified VENM/ENM or excavated material from site may be reinstated supported by NATA testing to confirm NEPM suitability for the proposed landuse. Should it be anticipated that backfill material may need to be re-excavated the excavations should be lined with a marker layer of plastic/geotextile prior to backfilling. The principal requirement for material handling in the course of the excavation works will be to **prevent the mixing of materials having different material types**. The Contractor should at all times ensure that materials are moved to an appropriate stockpile on the basis of the Material Type. Stockpile and materials shall be managed in accordance with the EMP section within this report.

## 10.5 VALIDATION PLAN

Validation sampling shall be conducted in accordance with the principals described in AS4482.1-2005: Guide to sampling and investigation of potentially contaminated soil (Part 1: Non-volatile and semi volatile compounds) and AS4482.2-1999: Guide to sampling and investigation of potentially contaminated soil (Part 2: Volatile compounds). Soil validation sample locations shall be selected in accordance with NEPM (2013) Schedule B2 Section 6, Sampling Design, as summarised in **Table 9**:

**Table 9: UST Validation Sample Guidelines**

Location	Number of Samples	Action	Analyte
UST Pit	1 per pit wall and base or every 5m	Grid sampling from walls and base of excavations pits.	TRH, BTEX, Lead (add Phenol for waste oil tanks/sumps)
Bowlers, pipelines	1/item or every 5m	Sample from base of infrastructure.	TRH, BTEX, Lead
UPSS & AST Stockpile Classification	1 per 25m <sup>3</sup>	Representative discrete sampling.	TRH, BTEX, Heavy Metals (8), PAH's, Total Phenols.
Stockpile footprint if NOT on plastic or hardstand base.	1 per 25m <sup>2</sup>	Discrete samples from ground surface.	TRH, BTEX, Lead
Groundwater (if encountered or required)	1 per Well	1 round of sampling in existing Well/s with potential for installation of additional Wells pending results of initial testing.	TRH, BTEX, Heavy Metals (8), PAH's, Total Phenols.
Soil - downgradient & wider site area beyond the UPSS (if required)	Min two (2) boreholes downgradient & one (1) up gradient	Discrete soil samples in boreholes from depths above the groundwater table. Additional boreholes to be installed to define contamination if identified.	TRH, BTEX, PAHs, Heavy Metals (8). Asbestos if observed.

Chemical analysis shall focus on the contaminants identified to be of potential concern on this Site (**TRH/BTEX, PAHs, Heavy Metals and Total Phenols**). Additional testing for Contaminants of Potential Concern (CoPCs) shall be determined based on the results of preliminary investigations and field screening during site works. Analysis shall be carried out by a NATA certified laboratory for the specified analytical method. QA/QC analysis is recommended at the standard rate of 1 per 20 samples with daily trip blanks for groundwater sampling events.

## 10.6 STOCKPILING

The stockpile areas shall comprise hardstand or be prepared by lining the base with thick impermeable plastic or material should be contained within designated containers. Silt fencing, bunding and temporary cover may be required to control water leaching from the stockpile or during rainfall. Where necessary stockpiles should be covered to prevent dust generation and control potential release of odours. A primary principle in stockpile management shall be to maintain separate stockpiles for different material types and sources to avoid mixing waste types. All stockpiles shall be maintained in an orderly and safe condition. Batters shall be formed with slope angles which are appropriate to prevent collapse or sliding of the stockpiled material. Each stockpile shall be maintained in accordance with the environmental requirements given in this RAP. The integrity of neighbouring stockpiles of differing materials shall be maintained and all practical measures necessary to prevent mixing of material types shall be undertaken.

## 10.7 SITE REINSTATEMENT

Following excavation and waste removal the site should be reinstated by backfilling excavated areas with imported fill certified as non-contaminated. Material used as backfill must be suitable for the site and any imported fill must be certified. Copies of documentation shall be maintained with site records and included within the validation report.

## 10.8 REMEDIATION STRATEGY CONTINGENCY

A contingency plan shall be in place if the selected remedial strategy fails.

- If the UST cannot be remediated by excavation and removal, the tank may be filled with an inert substance (non-structural concrete with high ash content, or foam) and abandoned insitu, supported by soil validation sampling from all four (4) sides of the UST.
- Where soil validation results indicate residual contamination remains, groundwater monitoring Wells shall be installed adjacent and downgradient to assess for potential impacts, supported by an Environmental Management Plan (EMP).

# 11.0 SITE MANAGEMENT PLAN

## 11.1 STORMWATER MANAGEMENT PLAN

Erosion and run-off control measures shall be implemented during all stages of the remediation works to prevent stormwater and/or surface water runoff entering or leaving the works area. At no stage shall run-off from the works area be permitted to enter stormwater drains or the surrounding environment without the appropriate regulatory authority. Controls measure shall include but not be limited to the use of bunding materials including silt fencing; hay bales; and/or oil absorbing booms, as required. Different controls might be necessary at different stages over the construction phase as the nature of the site changes, e.g. changing drainage patterns, moving stockpiles to different places, etc. Controls shall be established in accordance with the *Erosion and Sediment Control – A Field Guide for Construction Site Managers* (Witheridge;2012).

In summary the Four (4) Basic Principles for sediment and erosion control are:

- Make sure everyone working on the site understands how important it is to not pollute stormwater;
- Do not disturb more of the site than required;
- Install erosion and sediment controls before starting work; and
- Maintain your erosion and sediment control works throughout the construction phase.

### **11.1.1 Installation of Controls**

Before works start, set up the erosion and sediment controls and install a warning signs with penalty notices. Make sure that all site workers understand their individual responsibilities in preventing pollution. A recommended sequence for setting up controls is:

- (i) Establish a single stabilised entry/exit point to the site;
- (ii) Install sediment fences along the low side of the site;
- (iii) Divert upslope water around the site and, if necessary, stabilise the channels and outlet;
- (iv) Put up barriers to fence off areas where no disturbance is required;
- (v) Ensure that stockpiles are on site land – not the footpath or the next-door neighbours land. Where necessary, seek approval from Council or your neighbour(s) for any offsite stockpiles. Ensure stockpiles have appropriate erosion and sediment controls;
- (vi) Install onsite waste receptacles, such as skips or bins, and wind-proof litter receptacles, etc.;
- (vii) Commence site works;
- (viii) Stabilise any exposed earth works progressively.

### **11.1.2 Maintenance of Controls**

Best practice includes anticipation of the likely risks and being prepared for unusual circumstances, e.g. having spare sediment fence material on the site. All erosion and sediment control works should be checked at least once each week and after each rainfall event to ensure they are working properly. Maintenance might include:

- (i) Removing sediment trapped in sediment fences, catch drains or other areas;
- (ii) Topping up the gravel on the stabilised access;
- (iii) Repairing any erosion of drainage channels; and
- (iv) Repairing damage to sediment fences.

### **11.1.3 Finalisation of Works**

Ensure that the Site is stabilised, and no exposed soil remains before removing the erosion and sediment controls. If backfilling and landscaping is not completed before handing over the site to the owners, ensure they are aware of their responsibilities to prevent pollution.

## **11.2 SOIL MANAGEMENT**

The management and tracking of soil materials shall be the responsibility of the remedial works contractor. If material needs to be stockpiled prior to loading onto trucks, it must be relocated onto hardstand or plastic sheeting to reduce the potential for cross contamination. The management and tracking of stockpiled materials should be recorded on a site diagram and daily site logs. These documents should be kept in the site office. The daily site log should record the area in which work was conducted for that day, general description of the works completed, movement of materials onsite, movement of materials offsite, etc. The site diagram will record the locations and types of the stockpiled materials.

### **11.2.1 Traffic Control Plan**

Movement of excavation equipment, trucks and other vehicles involved in the remediation works, to and from the site will be strictly controlled and restricted to a minimum and only take place during appropriate working hours.

All trucks carting soil material are to have their loads covered. No trucks will be allowed to leave the site without covers on. Trucks without load covers are not to be admitted to the site during the removal of waste materials from the site.

All vehicles will be visually free of soil before permission to leave a remediation area is granted.

## **11.3 NOISE CONTROL**

Noise control methods may vary dependent upon the equipment being used for particular remedial activities. Recommended methods include:

- Site work will be restricted to the hours specified in this RAP;
- The use of construction vehicles on-site will be kept to a minimum;
- All equipment in operation in open areas on-site shall comply with the requirements of AS 2436-1981 *Guide to Noise Control on Construction, Maintenance and Demolition Sites*; and
- NSW EPA Interim Construction Noise Guidelines (DECC 2013).

## **11.4 DUST CONTROL**

Site personnel, the public, adjacent neighbours and the environment shall be protected from the effects of dust created during the works. Dust suppression techniques shall be employed, such that there shall be minimal visible generation of dust. The site and open working areas used by machinery will be dampened down periodically to reduce dust generation. The factors that contribute to dust generation include:

- Wind blowing across a cleared surface of the ground;
- Loose stockpiled material; and
- The movement of machinery over the loose unsealed surface of the working site.

During the remediation works, the following methods will be employed to manage dust generation and distribution:

- Dampening the surface of the site and working area;
- Wetting down the surface of the stockpiles;

- Plastic sheeting shall be available to cover stockpiles;
- Ceasing work in strong winds; and
- Undertaking the loading or unloading of dry soil as close as possible to the stockpiles to prevent the spread of loose material around the site.

## **11.5 ODOUR CONTROL**

During the course of any remediation works odour control measures shall be undertaken to ensure that possible odours generated on-site are controlled to within acceptable levels. Control measures shall consider the site conditions, and are likely to include (but not necessarily be limited) to the following:

- The prevailing weather conditions shall be considered in the manner in which work is undertaken;
- Plastic sheeting will be made available at all times on-site to allow for any excavated or disturbed contaminated soils to be covered, if necessary to reduce odour;
- Stockpiled contaminated materials will be removed from the Site as soon as practical/or will be securely covered; and
- Use of portable misting system in conjunction with application of odour control.

## **11.6 WORK HEALTH & SAFETY PLAN**

This RAP establishes the standard health and safety procedures for the personnel involved in remedial works. The levels of protection and the procedures specified in this plan are based on the available information and represent the minimum health and safety requirements to be observed by all personnel involved in remediation works and on site activities during remediation works with respect to contamination. Higher levels may be necessary due to unforeseeable site conditions or personal preferences. Employees and their subcontractors must read this document carefully and complete a sign off sheet prior to site activity.

The ultimate responsibility and authority for the health and safety of the individual rests with the individual themselves and their colleagues. Each employee is responsible for exercising utmost care and good judgment in protecting his/her own health and safety and that of fellow employees. It is the responsibility of the employer to bring any observed potentially unsafe condition or situations to the attention of the Project Manager.

Should employees find themselves in a potentially hazardous situation, the employee shall immediately discontinue the hazardous procedure and take effective corrective or preventative action.

### **11.6.1 Personal Hygiene**

The following personal hygiene and work practice guidelines are intended to prevent injuries and adverse health effects. These guidelines represent the minimum standard procedures for reducing potential risks associated with this project and are to be followed by general personnel and subcontractors on site during excavation works, as follows:

- A complete field first aid kit will be maintained on site;

- Eating, drinking, smoking, taking of medicine, chewing gum or tobacco is prohibited in the immediate vicinity of the primary remedial works;
- All employees involved in the primary remedial works are to wear long longs (long sleeve shirts and trouser pants). ;
- Avoid touching contaminated soil with hands. If dermal contact is made wash the affected area with soap and water immediately;
- Hands and if necessary, face will be thoroughly washed before eating or putting anything in your mouth;
- Always be alert to potential changes in exposure conditions such as strong odours, unusual appearance in soil, etc; and
- The site induction should include decontamination procedures and WH&S procedures for all staff involved with contaminated material.

### **11.6.2 Potential Hazards**

Potential Hazards include:

- Inhalation of volatile contaminant vapours;
- Exposure and possible absorption through the skin of contaminants;
- Slips, trips, bumps falls, cuts, falling objects, crushing injuries, etc. typical of every construction - related job site; and
- Physical hazards such as noise and hot weather.

Exposure through the ingestion route can be controlled effectively by preventing dermal contact, good personal hygiene habits and the restrictions on smoking, eating and drinking in contaminated areas. The use of appropriate personal protective clothing and conscientious personal decontamination procedures can eliminate the risk of skin exposure. All soil and water should be treated as if it were contaminated.

### **11.6.3 Personal Protective Equipment**

The level of personal protective clothing required at the site during remediation will consist of the following:

- Steel toed boots;
- Hard hat;
- Respirator suitable for volatile chemicals (eg P3 ABEK)
- P2 dust mask if required;
- Hearing protection if required;
- Safety glasses if required;
- Safety vest;
- Long sleeved shirts, trousers; and
- Gloves as dermal barrier if required.

Site personnel and subcontractors are expected to provide their own personal protective clothing and equipment equivalent to those recommended above.

## 11.7 REMEDIATION SCHEDULE

The project objective is to complete the remediation works as soon as practical to prepare the Site area for the next stage of Site works. The following schedule is provided for time estimate and planning purposes:

**Table 10: Preliminary Remediation Schedule**

Duration	Tasks	Description
<b>Week 1</b>	UPSS Removal	Expose UPSS, dispose of liquid waste if any, purge, render non-combustible, excavate and remove, deconstruction certificate to be issued prior to offsite transport.
	validation sampling	Environmental validation sampling from the walls and base of the excavation.
<b>Week 1-2 (min 2-3 days from collection)</b>	Laboratory testing to inform	Lab results required to confirm if the excavation can be validated or if more excavation is required. Confirm if excavated soil can be re-instated or issue waste classification certificate.
<b>Week 2-3</b>	Waste disposal	Transport waste materials offsite
	Reinstatement	Reinstate with site soils if suitable, and import ENM/VENM.
<b>Week 5-6</b>	Validation report	Compile results and prepare validation report or EMP if contamination remains.

## 11.8 HOURS OF OPERATION

The timing of various stages of the works needs to be agreed in advance with the **Site Manager** so that appropriate traffic operating plans can be put in place for the duration of the works. All Works, including the arrival and departure of heavy vehicles, shall be restricted to the following working hours:

- Monday to Saturday, 7:00 am to 6.00 pm
- Sunday and Public Holidays, no works pending prior approval.

Should the contractor wish to work outside the above working hours, the contractor shall obtain written approval from the **Site Manager** prior to the work occurring.

## 11.9 CONTINGENCY PLAN

The following procedures have been established to deal with unforeseen circumstances. Site employees and subcontractors should familiarise themselves with the nearest medical facilities. In the event of an emergency the procedures specified below will be followed. If an unanticipated, potentially hazardous situation arises as indicated by instrument readings, visible contamination, unusual or excessive odours etc., site personnel and subcontractors shall follow the **Unexpected Find Protocol (UFP)** provided in **Appendix D**;

- Temporarily cease operations;
- Move away to a safe area and assess the situation.

The unexpected conditions that could feasibly occur at the site include:

- The uncovering of additional USTs and greater amounts of ground contamination than presently estimated;
- The uncovering of presently unknown types of contamination;
- The uncovering of presently unknown contamination related to the historical use as a mechanics workshop. Including the discovery of degreasers (chlorinated hydrocarbons), greases (metals Cu, Ni, Cr) and asbestos brake linings;
- The generation of unacceptable levels of dust;
- The generation of unacceptable odours;
- The generation of unacceptable noise and/or vibration levels; and
- Spills and leaks of hazardous materials.

Procedures that will be used to address these contingencies are provided in the following sections of this document.

### 11.9.1 Emergency – DIAL 000

In the event of an emergency situation, employees shall contact the local fire brigade or paramedics by dialling 000.

### 11.9.2 Fire and Explosion

In the event of fire or explosion, if the situation is readily controllable with available resources, take immediate action to do so. This may include;

- Assessment to determine whether the situation is controllable;
- If the situation is controllable, dispatch fire-fighting equipment to the site of the fire and take immediate action;
- Attempting to put out the fire using methods compatible with the burning materials;
- Isolating the fire to prevent spreading, if possible; and
- If the situation is not immediately controllable, notify the local fire department (000) and evacuate all non-essential personnel from site.

### 11.9.3 Asbestos Contingency Plan

If any potential asbestos containing materials (ACM) is encountered during Site works, all works in proximity to the area are to **cease immediately**. In the interim an asbestos competent person or licensed asbestos contractor may stabilise the area by covering with plastic or spraying with water to suppress any dust pending further assessment. The project manager shall notify the *ENRS Asbestos Assessor to inspect the area and provide site specific instructions to manage the asbestos in accordance with the Codes of Practice*:

- Code of Practice - How to Manage and Control Asbestos in the Workplace; and
- Code of Practice - How to Safely Remove Asbestos.

### 11.9.4 Increased Volumes of Contaminated Material

The vertical and horizontal extent of any contaminated soil shall be assessed during UPSS excavation works. In the case of a significant increase in the volume of Waste identified during primary remedial works, a review of the remediation strategy should be undertaken by the Project Manager.

### 11.9.5 Unknown Types of Materials

The presence of unknown materials would be highlighted during remedial works by the observation of any unusual physical/sensory characteristics of the “impacted” soils and/or validation sampling. In the event that any significant unknown type of material is identified at the site, an assessment of the influence of the material on the remedial works would be undertaken. If required, a variation to the RAP will be made. If evidence suggests that the level and extent of contamination is significantly greater than assumed, further investigations will be performed to determine its extent. Once it is identified, the impacted material shall be remediated.

### 11.9.6 Unforeseen Circumstances

The Health and Safety procedures specified in this plan are based on available data, which suggest minimal potential for worker exposure to significant levels of hazardous substances. Should substantially higher levels of contamination be encountered in the soil or groundwater, or should situations arise which are obviously beyond the scope of the minimal monitoring specified herein, work activities will be modified or if necessary halted pending discussion with the ENRS representative.

## 11.10 DECONTAMINATION

Clean potable water for personal and equipment decontamination is to be available on site. All visible contamination is to be scraped, brushed and/or scrubbed off boots and outer gloves. All equipment and tools will be cleaned and rinsed with potable water between separate work areas and prior to leaving the site. It is necessary to undertake the decontamination procedures each time personnel leave site, including food and toilet breaks.

### 11.10.1 Equipment Cleaning & Operation

Throughout the project, controls will be placed on the operation and movement of equipment. General procedures that will be implemented included the following:

- Equipment working within an excavation area will have all loose soil material removed from tracks, tyres etc so that any contaminated soil will remain within the excavation. Wash waters will be allowed to naturally evaporate or be removed from the excavation along with other ponded surface water;
- All trucks transporting material off-site shall be securely covered immediately after loading the fill to prevent wind-blown emissions and spillage. Such covering shall be maintained until immediately before unloading the trucks;
- All truck tailgates shall be securely fixed prior to loading and immediately after unloading fill material; and
- All vehicles transporting materials on-site shall be operated in a manner so as to prevent any loss of materials during loading, transport and unloading activities.

## **12.0 WASTE MANAGEMENT**

All contaminated soils shall be stockpiled and sampled for classification in accordance with the NSW EPA Waste Classification Guidelines (EPA;2014). Material assessed as suitable for re-use in accordance with the relevant soil criteria shall be backfilled to minimise waste generation. Material classified as waste shall be remediated on site or be removed from the site and disposed in accordance with EPA requirements.

### **12.1 SOIL REMEDIATION**

Where soil conditions exceed the site assessment criteria, suitable material may be remediated on Site to meet waste minimisation objectives. Landfarming should be conducted with consideration of the EPA Best Practice Note for Landfarming (2014).

Landfarming involves the spreading of excavated contaminated soils in a thin layer (generally < 0.3 metres) on a suitably prepared surface. This is followed by the stimulation of aerobic microbial activity within the soils through aeration and/or the addition of minerals, nutrients (nitrogen and phosphorus – fowl manure) and moisture. Other materials such as gypsum and sawdust can be added to improve the properties of the substrate. The movement of oxygen through the soil promotes the aerobic degradation of organic chemicals. Landfarming is a passive form of remediation that generally requires an extended time frame, possibly up to 24 months.

### **12.2 SOIL WASTE**

All material leaving the site shall be completely and securely covered to prevent loss of loose material from the vehicle and tracked appropriately. Only vehicles which are appropriately licensed, have clean exterior bodywork and which will not pollute the offsite transportation corridors shall be permitted to leave the site.

Any material removed from the Site shall be transported in accordance with government regulations and the requirements of the WorkCover Authority. All offsite truck movements shall occur during normal working hours. All trucks carrying loads of impacted soil material off-site shall be licensed to transport the materials and tracked in accordance with EPA requirements and State Government regulations. All materials leaving the Site shall be tracked in accordance with the requirements of this RAP. Disposal of waste materials shall only be undertaken at appropriate NSW EPA licensed facilities which have been approved by the Project Manager.

## 12.3 LIQUID WASTE

Excavations should be backfilled and or covered to minimise rainfall entering the excavations. Should water accumulate in excavations the water must be sampled, tested and assessed against ANZECC guidelines to document suitability for disposal to stormwater in accordance with Council requirements and the POEO Act. Should the waters be assessed as unsuitable for release to stormwater the water should be classified as liquid waste and disposed in accordance with EPA requirements. Copies of disposal receipts should be retained by the project manager and provided to ENRS to document the validation process.

## 13.0 RESPONSIBILITIES

### 13.1 REGULATORY COMPLIANCE

Description of regulatory compliance requirements such as licences and approvals or financial assurance

The project comprises a State Significant status, refer to the conditions of consent for further details of approval.

The UPSS decommission works are required to be conducted by a suitably experienced and qualified contractor with either:

- Unrestricted Demolition Licence; or
- Restricted Demolition License with additional Chemical Installation component.

### 13.2 CONTACT PERSONS

Role / Position	Contact Details
<b>Project Manager</b>	Name..... Position..... Mob.....Email.....
<b>Environmental Consultant</b>	<b>Rohan Last (BSc, MSc)</b> Snr Env. Consultant & Licensed Asbestos Assessor Mob: 0401 518 443 e-mail: <a href="mailto:rohan@enrs.com.au">rohan@enrs.com.au</a>
<b>UPSS Contractor</b>	Name..... Position..... Mob.....Email.....

### 13.3 COMMUNITY RELATIONS

All community or media enquiries are to be directed to the **Site Manager** in the first instance. No contact or communication on the project is to be made with the media without the written permission of the Site Manager.

## 14.0 REPORTING REQUIREMENTS

This section outlines the environmental reporting requirements including. An environmental management plan may be required for ongoing management of contamination at the site, if any remains.

### 14.1 SOIL & WASTE MANAGEMENT

All material removed and import to the Site from the Site shall be accompanied by a Waste Classification Certificate.

The following points summarise the key reporting requirements for documenting the waste management and classification during the remediation process:

- UPSS Stockpile Sampling and analysis at rate of 1/25 m<sup>3</sup>. Minimum testing for TRH, BTEX, PAHs, 8 Heavy Metals and Total Phenols. Further testing for additional analytes and TCLP analysis may be required, pending review of initial results, to classify waste at the site in accordance with EPA guidelines (EPA;2014);
- Soil classification certificate required for any backfilling to confirm the material is suitable for re-use on site for the proposed landuse (ie levels below relevant Site Assessment Criteria such as NEPM HILs);
- Waste classification letter report including, Chain of Custody and laboratory certificates, shall be prepared by a suitably qualified and experienced environmental professional, and submitted to the receiving waste facility; and
- Copies of waste disposal dockets from landfill facility to be maintained with site records and incorporated within the final validation report.

### 14.2 SITE VALIDATION REPORT

A suitably qualified environmental professional shall be contracted to prepare a final Validation Report which shall document the remediation works completed and assessment results in accordance with the NSW Environment Protection Authority (EPA) Technical Note for Investigation of Service Station Sites (EPA;2014); the UPSS Technical Note on Site Validation Reporting (DECCW;2010) and the EPA (2020) Guidelines for Consultants Reporting on Contaminated Land.

The validation report must:

- clearly describe the remedial works undertaken, the validation carried out and the final condition of the site. Whilst the primary remediation goal is to validate the UPSS decommission works, the validation report is required to consider the wider site area beyond

the UPSS and provide an overall assessment of the site suitability for the proposed ongoing **Industrial land use with minimal access to soil.**

- confirm statistically that the remediated site complies with the remediation criteria set for the site (for guidance, see Contaminated Sites Sampling Design Guidelines (EPA 1995) (or update made under the CLM Act);
- assess the results of the post-remediation testing against the remediation criteria stated in the remedial action plan. Where these criteria have not been achieved, reasons must be stated and additional site work proposed to achieve the original objectives, or a management plan put in place.

The validation report shall be submitted to the regulator within 60 days of the completion of site remediation and validation in accordance with the UPSS Regulation (2019) Part 5 clause 23 (2a).

## 15.0 CONCLUSIONS & RECOMMENDATIONS

Based on the Site information reviewed during the preparation of this RAP, the following conclusions and recommendations are provided.

- The activities and physical changes proposed for the site include:
  - Decommission of one (1) known UST by excavation and off site removal;
  - Disposal of waste materials
  - Reinstatement of the excavation with validated Site materials and imported certified VENM/ENM.
- The remediation objectives are to remove any remaining **UPSS** infrastructure as the primary source/s of potential contamination, and any impacted soil, sufficient to remove any future contaminant risk. The UST is required to be removed as it is located within the footprint of proposed construction works;
- The preferred remediation strategy is assessed to be suitable based on the results and assumptions of previous investigations which did not identify significant ground contamination in the UPSS area. The UST is located in an accessible area which is practical for excavation and removal which indicates the site can be made suitable for the proposed ongoing industrial landuse if this RAP is implemented;
- The available site records indicate there is a low risk that the Site will be impacted by any environmental limitations upon completion of the works. The backfilling operations will require geotechnical requirements which should be considered separately. Should the soil validation results identify elevated residual levels, the aim will be to expand the excavations to remove the material and re-validate the area. Where validation results are not conclusive, a groundwater monitoring event shall be conducted to further characterise the area, and where necessary an Environmental Management Plan will be prepared with protocols for long-term management of residual contamination (if any); and
- It is recommended this RAP be submitted to the regulator for approval, and ENRS liaise with the preferred contractor prior to commencement to ensure the Site supervisor and key staff are familiar with the RAP and the site proposal.

## 16.0 REFERENCES

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- NSW EPA (2014). Waste Classification Guidelines.
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- NSW EPA (2006) Guidelines for the NSW site Auditor Scheme. 2nd edition.
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NSW Government (2019). How to Safely Remove Asbestos Code of Practice.

NUDLC (2012). National Uniform Drillers Licensing Committee, *Minimum Construction Requirements for Water Bores in Australia*, 3rd edition.

NZME (2003) 'Checklist for the removal of petroleum underground storage tank' in Contaminated Land Management Guidelines No. 1: Reporting on contaminated sites in New Zealand, New Zealand Ministry for the Environment.

Safe Work Australia (2020). Excavation Work Code of Practice.

## 17.0 LIMITATIONS

This report and the associated services performed by ENRS are in accordance with the scope of services set out in the contract between ENRS and the Client. The scope of services was defined by the requests of the Client, by the time and budgetary constraints imposed by the Client, and by the availability of access to the site.

ENRS derived the data in this report primarily from visual inspections, and, limited sample collection and analysis made on the dates indicated. In preparing this report, ENRS has relied upon, and presumed accurate, certain information provided by government authorities, the Client and others identified herein. The report has been prepared on the basis that while ENRS believes all the information in it is deemed reliable and accurate at the time of preparing the report, it does not warrant its accuracy or completeness and to the full extent allowed by law excludes liability in contract, tort or otherwise, for any loss or damage sustained by the Client arising from or in connection with the supply or use of the whole or any part of the information in the report through any cause whatsoever.

Limitations also apply to analytical methods used in the identification of substances (or parameters). These limitations may be due to non-homogenous material being sampled (i.e. the sample to be analysed may not be representative), low concentrations, the presence of 'masking' agents and the restrictions of the approved analytical technique. As such, non-statistically significant sampling results can only be interpreted as 'indicative' and not used for quantitative assessments.

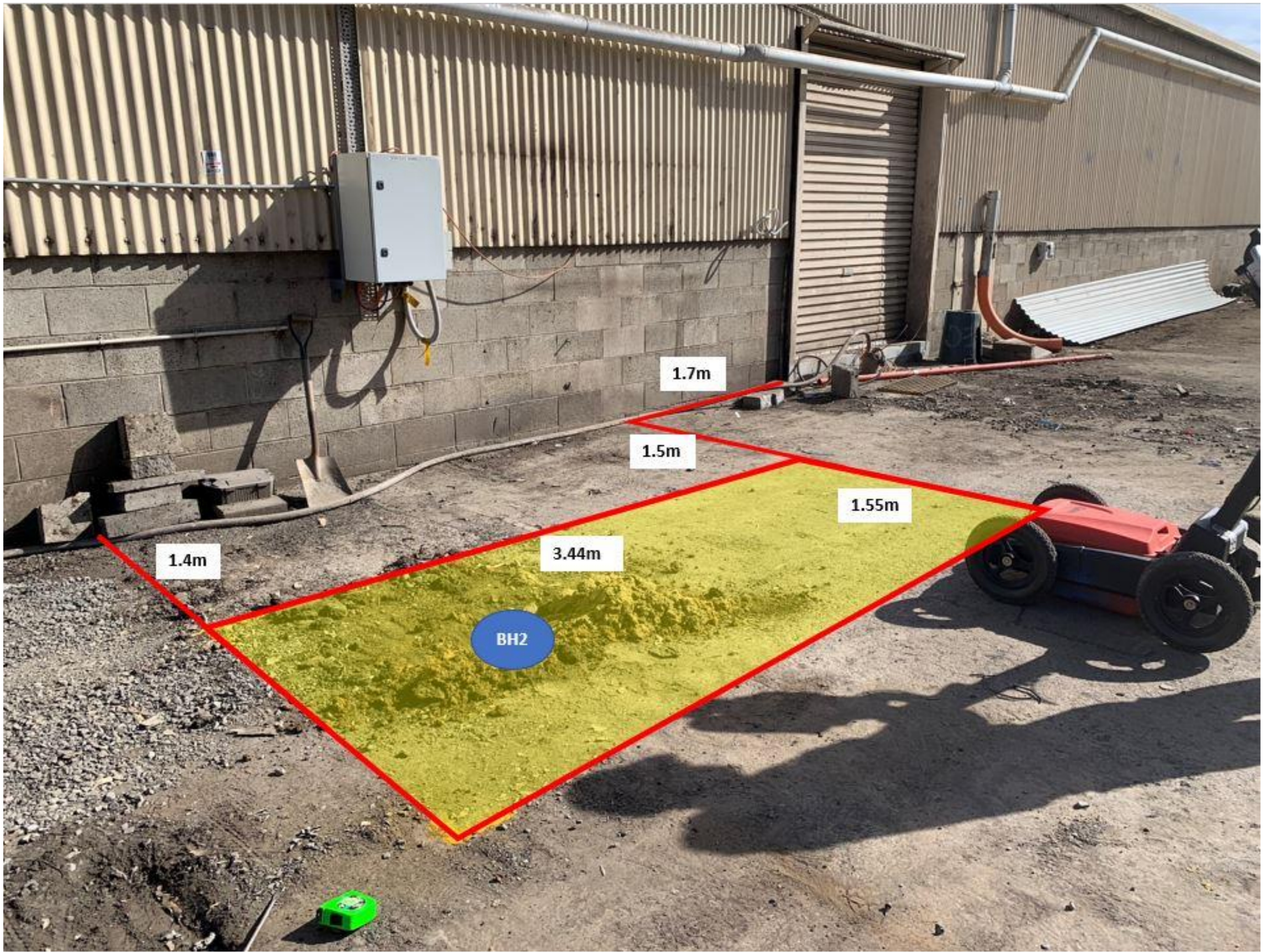
The data, findings, observations, conclusions and recommendations in the report are based solely upon the state of the site at the time of the investigation. The passage of time, manifestation of latent conditions or impacts of future events (e.g. changes in legislation, scientific knowledge, land uses, etc) may render the report inaccurate. In those circumstances, ENRS shall not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the contents of the report.

This report has been prepared on behalf of and for the exclusive use of the Client, and is subject to and issued in connection with the provisions of the agreement between ENRS and the Client. ENRS accepts no liability or responsibility whatsoever and expressly disclaims any responsibility for or in respect of any use of or reliance upon this report by any third party or parties.

It is the responsibility of the Client to accept if the Client so chooses any recommendations contained within and implement them in an appropriate, suitable and timely manner.

# FIGURES

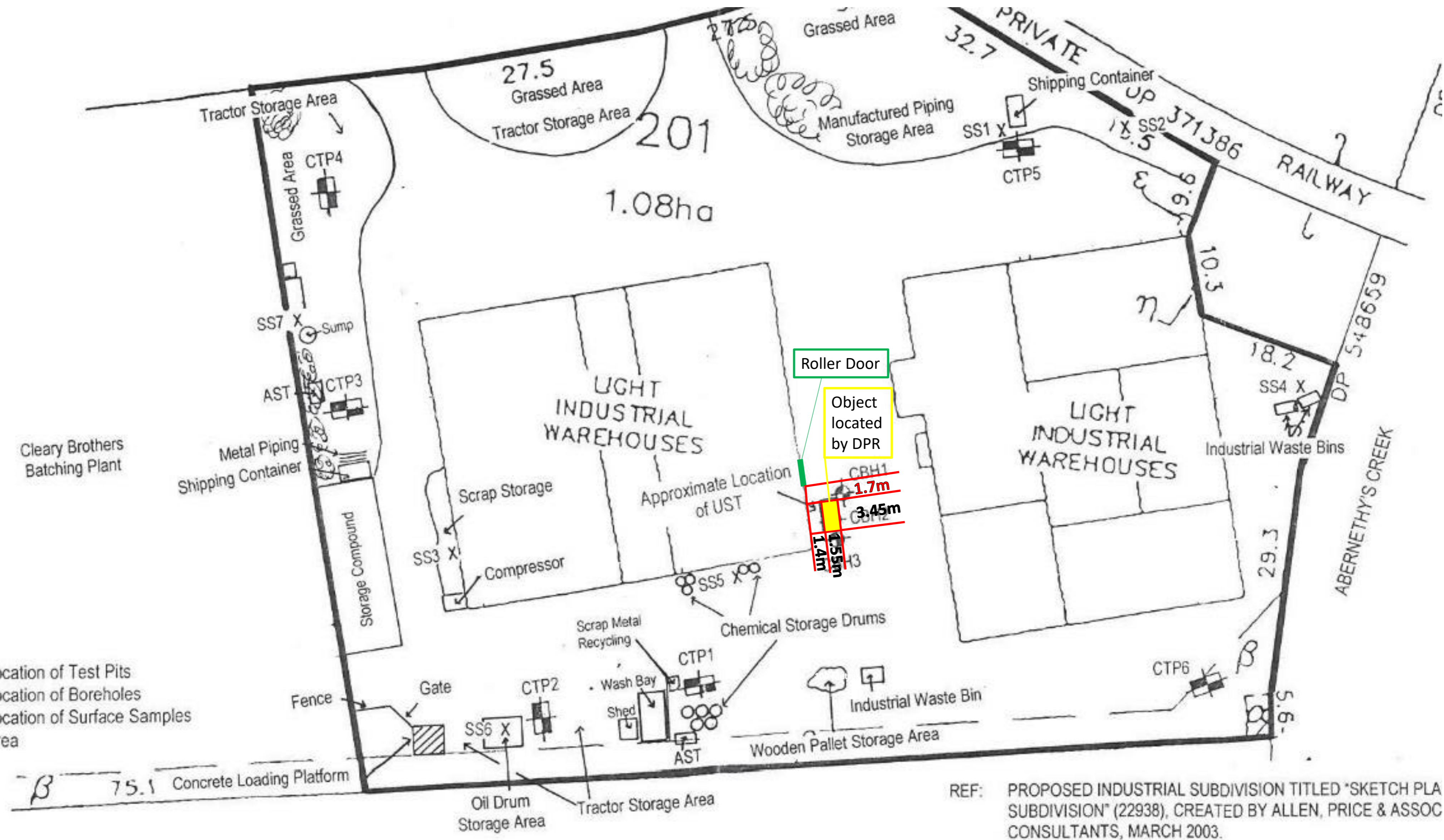
**Figure 3 Site Plan**



Client:	Shoalhaven Starches (Manildra)	Drawn:	MT	Figure:	
Project:	ENRS0536.25	Source:	Photos	Date:	05/08/2019
Location:	Fire Pump Car Park	Scale:	NA	Title:	Object Location
		Status:	Rev 1		

# **Appendix A**

## **Original Site Drawings**



# **Appendix B**

## **GPR Investigation**



Client:	Shoalhaven Starches (Manildra)	Drawn:	MT	Figure:	
Project:	ENRS0536.25	Source:	Photos	Date:	05/08/2019
Location:	Fire Pump Car Park	Scale:	NA	Title:	Object Location
		Status:	Rev 1		

# **Appendix C**

## **Photographic Record of Site Conditions**







# **Appendix D**

## **Unexpected Find Protocol**

# **UNEXPECTED FIND PROTOCOL**

## **Step 1 Stop Work**



Stop all work in the immediate area as soon as it is safe to do so and move to a designated meeting point;

## **Step 2 Notify**



Immediately notify the Project Site Supervisor (PSS).

## **Step 3 Assess Safety Risk**



Assess the potential risk to human health posed by the unexpected find and assess if evacuation or emergency services need to be contacted

## **Step 4 Exclusion Zone**



Establish an exclusion zone around the impacted area. An example of a typical exclusion zone is a 10 metre radius with demarcation/barriers or fencing and warning signs at regular intervals and all points of entry. Some hazardous materials may require additional controls including, no smoking signage, and dust suppression

## **Step 5 Environmental Investigation**



Contact an Environmental Professional to investigate the unexpected find and provide recommendations for immediate management controls (if any), and how to remediate and validate the Site area in accordance with contaminated site regulations and guidelines

## **Step 6 Remediate**



Remediation works to be completed by suitably licensed contractor/s (where applicable);

## **Step 7 Validate / Clear**



Validation in accordance with contaminated site regulations and guidelines

## **Step 8 Recommence Works**



If it is deemed safe to do so, the environmental consultant will provide a validation report or clearance certificate for works to proceed in the affected area. If it is not considered to be safe, works must remain on hold until appropriate assessment, management, remediation and/or validation measures have been completed.