Environmental Management Plan (EMP) for Impacted Zone – Sark Grove, Minto

Prepared for: Endeavour Energy

4 May 2015

Document History and Status

Report Reference	EE/15/R002
Revision	F – Revised Final
Date	4 May 2015
Previous Revisions	A – Draft Issued on 24 October 2011 B – Final Issued on 3 January 2012 C – Revised Final Issued on 10 January 2012 D – Revised Draft Issued on 20 April 2015 E – Revised Draft Issued on 30 April 2015

Limitations

Environmental Risk Sciences has prepared this report for the use of Endeavour Energy (formerly Integral Energy) in accordance with the usual care and thoroughness of the consulting profession. It is based on generally accepted practices and standards at the time it was prepared. No other warranty, expressed or implied, is made as to the professional advice included in this report.

It is prepared in accordance with the scope of work and for the purpose outlined in the Section 1 of this report.

The methodology adopted and sources of information used are outlined in this report. Environmental Risk Sciences has made no independent verification of this information beyond the agreed scope of works and assumes no responsibility for any inaccuracies or omissions. No indications were found that information contained in the report provided by Endeavour Energy was false.

This report was revised in April/May 2015 and is based on the information provided and reviewed at that time. Environmental Risk Sciences disclaims responsibility for any changes that may have occurred after this time.

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Glossary of Terms

ANZECC	Australia and New Zealand Environment and Conservation Council
bgl	Below ground level
BTEX	Benzene, Toluene, Ethylbenzene and Xylenes
EMP	Environmental Management Plan
ENM	Excavated Natural Material
HHERA	Human Health and Ecological Risk Assessment
IBC	Industrial Bulk Container
LEL	Lower Explosive Limit
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NSW EPA	New South Wales Environment Protection Authority
PAH	Polycyclic Aromatic Hydrocarbon
PID	Photoionisation Detector
POEO Act	Protection of the Environment Operations Act, 1997
PQL	Practical Quantitation Limit
PSH	Phase Separated Hydrocarbons
QRA	Quantitative Human Health Risk Assessment
TPH	Total Petroleum Hydrocarbons
VENM	Virgin Excavated Natural Material

Executive Summary

Environmental Risk Sciences Pty Ltd (enRiskS) has been commissioned by Endeavour Energy (formerly Integral Energy) to prepare an Environmental Management Plan (EMP) for a portion of the former Integral Depot located at Sark Grove, Minto, NSW ("the site"). The EMP has been prepared for the portion of the site referred to as the "Impacted Zone". This EMP supersedes the EMP prepared for the site in January 2012 as the Impacted Zone is now likely to be developed for residential use including the presence of built structures (previously no built structures were likely to be constructed within the Impacted Zone). It is understood that this EMP will be reviewed by the Site Auditor and provided to Campbelltown City Council with the application for a Site Capability Statement.

Groundwater within the Impacted Zone is contaminated with free product (Phase Separated Hydrocarbons; PSH), and dissolved phase petroleum hydrocarbons. Soil gas concentrations within the Impacted Zone are also elevated.

Currently the site is vacant and is proposed for redevelopment.

The following potential hazards, due to the remaining groundwater contamination within the Impacted Zone, have been identified:

- If a future residential or mixed use building with a slab greater than 15 m in diameter and one or both of the following features is constructed within the Impacted Zone:
    - A lift/basement
    - More than 1-2 stories

  then people who live or work on the ground floor of this building may be exposed to unacceptable levels of petroleum hydrocarbon vapours unless vapour mitigation is installed (enRiskS 2015).
- During times when intrusive works may occur in the Impacted Zone, either during development of the site or for the purpose of maintenance of underground services in the future, controls must be implemented to ensure the protection of human health and the environment as odours may be present.

This EMP has been prepared to to provide guidance to parties involved both in the construction / development, and ongoing use and management, of the Impacted Zone. The EMP includes:

- A summary of the location of contaminated groundwater;
- A description of how the EMP should be implemented and reviewed;
  Workplace health and safety information;
- Guidance on how to manage the potential hazards within the Impacted Zone including guidance for the implementation of vapour mitigation measures that are required for certain building types;
- Contingency procedures for unanticipated contamination identified during construction; and
- Emergency response procedures.

All works conducted in the Impacted Zone are to be managed in accordance with this EMP.

In addition, a copy of this EMP must be provided to, and maintained by, any future strata corporations or property owners that are established following the construction of residential buildings within the EMP. This is due to the requirement for a vapour mitigation system to be installed for certain development types, if constructed, within the Impacted Zone.

This EMP is a “living” document that should be focused on continual improvement and should be updated as necessary.

Section 1. Introduction

Environmental Risk Sciences Pty Ltd (enRiskS) has been commissioned by Endeavour Energy (formerly Integral Energy) to prepare an Environmental Management Plan (EMP) for a portion of the former Integral Depot located at Sark Grove, Minto, NSW ("the site"). The site location is shown on **Figure 1** below.

This EMP supersedes the EMP prepared for the site in January 2012 as the Impacted Zone is now likely to be developed for residential use including the presence of built structures (previously no built structures were likely to be constructed within the Impacted Zone). It is understood that this EMP will be reviewed by the Site Auditor and provided to Campbelltown City Council with the application for a Site Capability Statement.

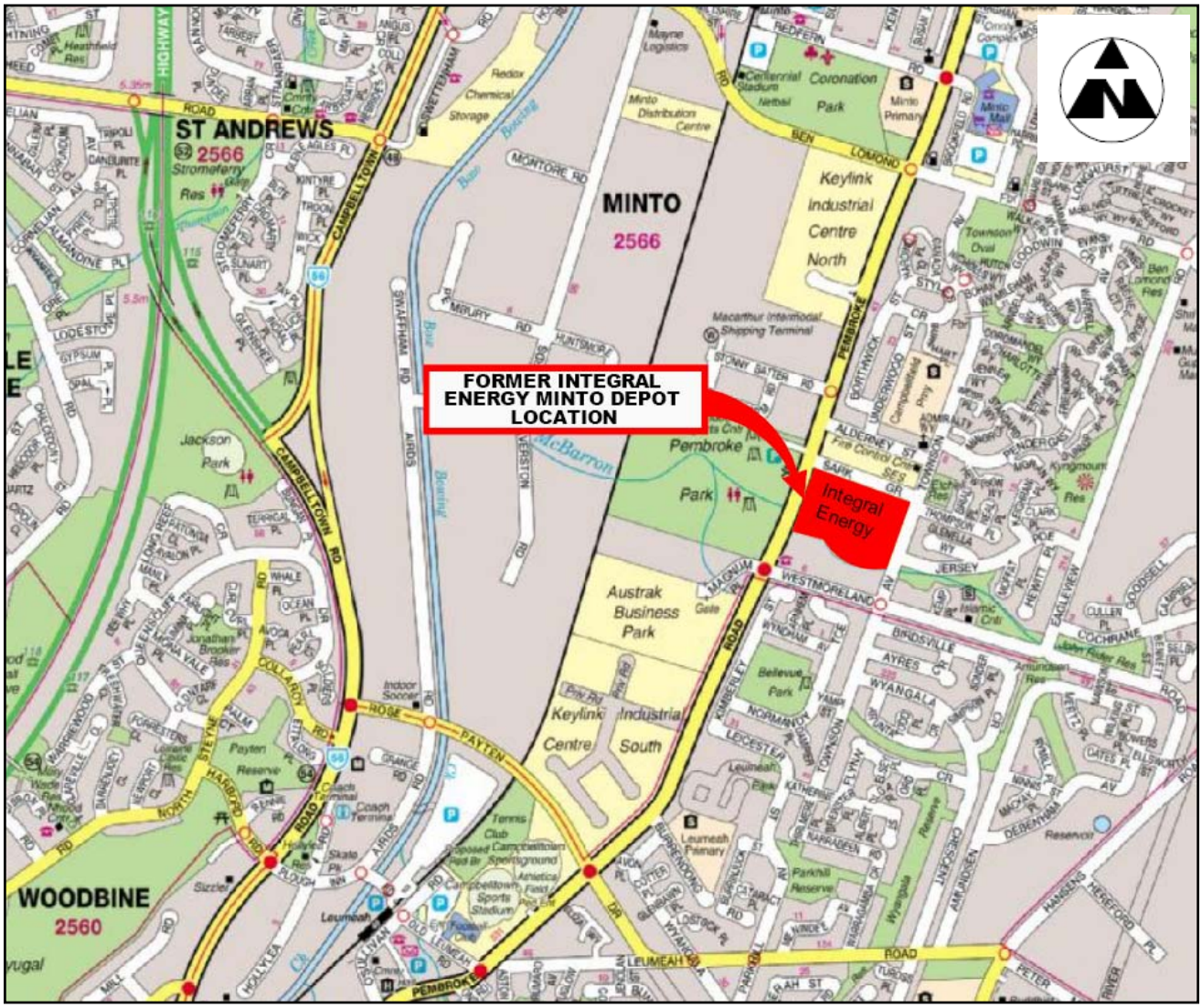

Figure 1 Site Location

The EMP has been prepared for the portion of the site referred to as the "Impacted Zone". The Impacted Zone is defined as the portion of the site that is impacted by both free product (PSH) and dissolved phase groundwater contamination associated with the former underground storage tanks (USTs). The Impacted Zone is located in the centre of the site and has been defined as an area with a lateral buffer distance of 10 m around the groundwater wells found to contain PSH or dissolved phase hydrocarbons (enRiskS, 2011c[1]; also refer **Figure 2**, and survey diagram included at **Appendix A**).

Soil remediation activities on the site were undertaken between 2003 and 2006 by various consultants and sub-contractors. These works included the removal of underground storage tanks (USTs) and impacted soil from the central portion of the site. A significant amount of work has been undertaken in relation to the remediation and validation of contamination at the whole site (refer to PB 2010b to 2010h and ERM 2006). These works were undertaken on the basis that the site was to be redeveloped for residential use. Detailed review of the work conducted (enRiskS 2012) showed that the site had been adequately assessed and was considered suitable for residential use with the exception of the defined Impacted Zone where residual groundwater contamination remained. Hence, an EMP is not required for the remainder of the site (i.e. outside of the Impacted Zone).

It is understood that rezoning of the site is being considered and a range of development scenarios (likely to be governed by the Council's Local Environment Plan or similar) are possible. Further, a proposal to consider the compatibility of the site for rezoning as a neighbourhood centre or for medium density residential is currently being developed.

In April 2015, enRiskS prepared a revised quantitative human health risk assessment (QRA; enRiskS 2015) to assess the potential human health risks in the context of different types of likely construction that could occur above the Impacted Zone (refer above).

The QRA (enRiskS 2015) concluded that:

- Risks to future users of a low or medium density residential development are low and acceptable. This is irrespective of slab configuration (size), and / or the absence of any slab, including circumstances where any normal (passive) sub ground floor air circulation system such as air bricks were to become blocked.
- Risks to future construction and intrusive maintenance workers are low and acceptable. In the event that deep excavations are placed above impacted groundwater, no unacceptable risks are identified, however petrol type odours may be noticeable (depending on the proximity of works to the contamination). **Sections 4.2.1** and **6.1** (below) provide guidance on best practice controls and monitoring procedures that are recommended to minimise the exposure of workers to odours in deep excavations.
- Risks to future users of outdoor areas (i.e. if no buildings are constructed in the future) are low and acceptable.

[1] enRiskS, 2011c. Identification of Impacted Zone Requiring Management – Future Use of Minto Site. Letter Report, dated 24 October 2011.

The QRA also assessed the potential human health risks to residents or workers who occupy future multi-storey residential or mixed used buildings within the Impacted Zone and found them to be potentially unacceptable without the installation of vapour mitigation measures.

In regards to such buildings the following was noted:

- For any building with a slab less than 15 m in diameter the shallow soil vapour data indicate vapours will be below the ASC NEPM HSLs underneath the entire slab and so risks will be low and acceptable.
- For any building with a slab greater than 15 m in diameter that is 1-2 stories only and doesn't have a lift or basement, the risks are estimated to be low and acceptable, even assuming the soil vapour concentrations found at 3 meters below ground level (m bgl) are present under the entire slab.
- For any building with a slab greater than 15 m in diameter that has more than 1-2 stories or has a lift/basement then the risks may not be acceptable and vapour mitigation will be needed if people live or work on the ground floor.

A summary of the findings of the QRA with respect to the likely development scenarios within the Impacted Zone is provided in **Table 1** below.

Table 1 Summary of QRA Findings for Likely Development Scenarios

Development Scenario	Governed by Limiting Slab Size?	Vapour Mitigation System Required?
1-2 level residential (i.e. low or medium-density residential), no basement, with residential living areas on the ground floor.	No	No
Multi-storey residential (i.e. high density residential), no basement, with residential living areas on the ground floor.	Yes	Yes – if the building slab size is greater than 15 m in diameter
Multi-storey mixed use, no basement, with car park and/or retail/commercial on the ground floor and residential living areas on the 1st floor and above.	Yes	Yes – if the building slab size is greater than 15 m in diameter
Public open space	No	No

Location	Easting	Northing
A	301056.471	6231299.912
B	301066.862	6231295.160
C	301079.312	6231282.603
D	301091.787	6231259.627
E	301085.349	6231244.783
F	301075.840	6231239.760
G	301034.654	6231245.312
H	301028.264	6231249.374
J	301031.820	6231277.426

Legend:

- Site Boundary
- PSH impacted well
- Impacted well
- Wells not Significantly Impacted
- Impacted Zone (including buffer of 10m)

Figure 2 Area Defined as Impacted Zone

1.1 Objectives

This EMP has been prepared to to provide guidance to parties involved both in the construction/ development, and ongoing use and management, of the Impacted Zone. The EMP includes:

- A summary of the location of contaminated groundwater;
- A description of how the EMP should be implemented and reviewed;
- Workplace health and safety information;
- Guidance on how to manage the potential hazards within the Impacted Zone including guidance for the implementation of vapour mitigation measures that are required for certain building types;
- Contingency procedures for unanticipated contamination; and
- Emergency response procedures.

This EMP is a "living" document that should be focused on continual improvement and should be updated as necessary (i.e. if circumstances change). Guidance on when and how the EMP should be reviewed and updated is provided in **Section 6**.

The measures outlined in this EMP relate to management of exposure to the identified contamination in groundwater and soil gas (comprising petroleum hydrocarbon vapours).

This EMP relies on the revised QRA (enRiskS, 2015). In addition, previous environmental reports for the site are referenced in relation to the environmental condition of the site. These reports should be consulted if additional information is required.

1.2 Environmental Legislative Framework

This EMP has been prepared in accordance with the Department of Infrastructure, Planning and Natural Resources "*Guideline for the Preparation of Environmental Management Plans*".

The legislative framework for the EMP is based on guidelines that have been issued and/or endorsed by the NSW Environment Protection Authority (EPA) under the following Acts and/or Policies:

- Section 105 of the *Contaminated Land Management Act* 1997 (CLM Act);
- *Protection of the Environment Operations Act 1997* (POEO Act);
- *Waste Avoidance and Resource Recovery Act 2001* (WARR Act);
- ANZECC 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. Australian and New Zealand Environment and Conservation Council;
- NSW Department of Environment and Climate Change (DECC) 2009, *Guidelines on the duty to report contamination under the Contaminated Land Management Act 1997*;
- Department of Urban Affairs and Planning 1998, *Managing Land Contamination Planning Guidelines: State Environmental Planning Policy (SEPP) No. 55 – Remediation of Land*;
- ASC NEPM 2013, *National Environment Protection (Assessment of Site Contamination) Measure 1999 (amended April 2013)*;
- NSW EPA 2014, *Waste Classification Guidelines – Part 1: Classification of Waste*;
- *Work Health and Safety Act 2011 (especially WHS Regulation 2011 – Division 3 – Excavation Work);*
- NSW Department of Environment and Conservation (DEC) 2007, *Guidelines for the Assessment and Management of Contaminated Groundwater*; and

- *Protection of the Environment Operations (Waste) Regulation 2005 – 2014 Resource Recovery Exemption, Part 9, Clause 91, 92.*

A summary of the key legislation and guidelines for the EMP is provided in **Table 2**.

Table 2 Summary of Key Legislation and Guidelines

Relevant Key Legislation and Guidelines	Applicable to Project
Work Health and Safety Act, 2011 **(WHS Act)**	Provides instruction on what must be demonstrated by the PCBU (person conducting a business or undertaking – may be individual or organisation) to ensure, so far as is reasonably practicable, the health and safety of workers or sub-contractors engaged or whose activities is likely to influence the health and safety of workers through the actions of the business or undertaking.
Work Health and Safety Regulation, 2011 **(WHS Regulation)**	Provides guidance and instruction on meeting the requirements of the WHS Act 2011.
Contaminated Land Management Act, 1997 **(CLM Act)**	Establishes a process for investigating and (where appropriate) remediating land areas where contamination presents a significant risk of harm to the environment. Applies only if contaminated lands are encountered.
Protection of the Environment Operations Act, 1997 **(POEO Act).**	This Act provides for the control of polluting activities in NSW in order to prevent pollution of the environment. Offences exist in relation to activities that cause water, soil and air pollution. Soil, water and air pollution associated with generation, handling and disposal of waste or contaminated materials from the site are controlled through this Plan.
Landcom (2004) Managing Urban Stormwater: Soils and Construction.	Provides guidance on erosion control measures to be implemented during land development activities.
NSW EPA (2014), Waste Classification Guidelines – Part 1: Classification of waste.	Defines types of wastes, procedures for assessing waste, waste storage and disposal requirements, record keeping and licence requirements. Applies to the handling, storage and disposal of contaminated materials, if uncovered during works.
Australia and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand. (ARMCANZ) (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.	Provide objectives and guidelines to protect and improve water resources and water quality. The guidelines are not mandatory. Applies to any water that may be affected by activities at the site that might result in contaminated sediment laden run-off or contamination by other chemicals. This is especially the case for the protection of Cabramatta Creek close to the site.
National Environment Protection (Assessment of Site Contamination) Measure 2013 (ASC NEPM 2013).	Provides adequate protection of human health and the environment, where site contamination has occurred, through the development of an efficient and effective approach to the assessment of site contamination.

Section 2. Groundwater Contamination

2.1 Groundwater

Groundwater within the Impacted Zone is contaminated with petroleum hydrocarbons. The extent of the contamination is limited to free product, or PSH observed in only one groundwater well (well MW06), and lower concentration (i.e. dissolved phase) petroleum hydrocarbons in 12 wells surrounding well MW06.

The extent of the petroleum hydrocarbon plume (based on BTEX data from July 2011, E2W 2011b) is shown on **Figure 3** below.

In the latest monitoring event in July 2011, the thickness of PSH in well MW-06 was 6.5 cm. Based on the remediation works that were undertaken around 2005, PSH is likely to be present as a very thin (few mm) layer in the aquifer.

The dissolved phase plume extends approximately 20 - 40 m out from well MW06. The dissolved phase plume is dominated by the presence of total petroleum hydrocarbons (TPH), benzene, toluene, ethylbenzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAHs) and phenols.

The extent of the groundwater plume, which is confined to the Impacted Zone, identified has remained consistent over the course of several years and an assessment of groundwater fate and transport (Earth2Water, 2011) has demonstrated the plume to be stable and undergoing shrinkage/contraction due to natural attenuation. Petroleum hydrocarbons are readily degraded by bacteria in situations with plenty of oxygen. No further migration of the impacted groundwater is expected on the site (and no off-site migration is expected either) with the plume expected to shrink away after approximately 15 to 25 years (Earth2Water, 2011).

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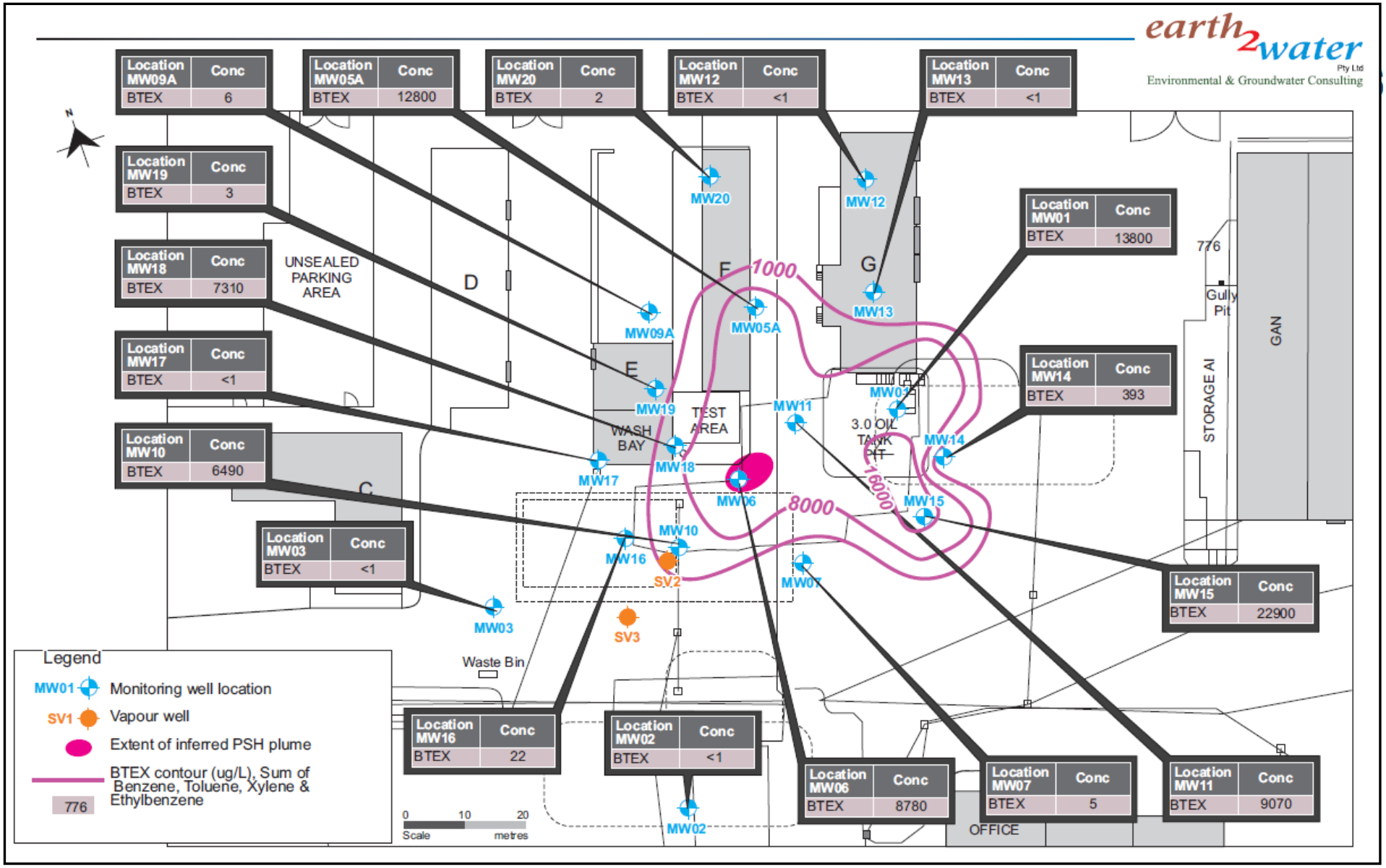

Figure 3 Extent of Petroleum Hydrocarbons in Groundwater

2.2 Soil Gas

Soil gas concentrations above the Impacted Zone are elevated, and a correlation was observed between groundwater concentration and soil gas as would be expected, with higher soil gas concentrations observed above areas with PSH. The maximum soil gas concentrations reported at different depths below ground level are summarised in **Table 3** (refer to enRiskS (2015) for further detail if required). The concentrations presented in **Table 3** are to assist in understanding the potential vapour concentrations that may be present in the subsurface. The concentrations are not representative of concentrations in outdoor air or in open excavations.

Table 3 Summary of Soil Gas Data (mg/m³)

Key Petroleum Hydrocarbons	Maximum Detected Soil Gas Concentrations	
	Shallow, 1.4-1.6 m bgl	Deep, 2.65-2.85 m bgl
Individual Petroleum Hydrocarbons		
Benzene (C6)	0.048	10
Toluene (C7)	<0.056	<0.210
Ethylbenzene (C8)	<0.064	<0.240
Total Xylenes (C8)	<0.128	<0.480
Hexane (C6)	12	63
Heptane (C7)	0.64	6.8
Cyclohexane (C6)	4.2	16
2,2,4-Trimethylpentane (C8)	19	120
Methyl tert-butyl ether (MTBE)	<0.053	16
Naphthalene (C10)	<0.31	<1.2
Total Petroleum Hydrocarbons		
C2-C4	1.38	354.26
C5	18.59	1829.57
C6	137.45	599.14
C7	114.75	696.69
C8	9.81	70.07
C9	<0.16	<3.515
C10	0.268	<3.9
C11	<0.190	<4.28
C12+	<0.210	<4.6
Basic Gases (range detected)		
Oxygen (%)	4.8 to 11	0 to 8.8
Carbon Dioxide (%)	6.8 to 16.3	0.04 to 18.8
Methane (%)[#]	0 to 0.02	0 to 0.06

Notes:

< Not reported above the analytical LOR, noted as <LOR

Methane levels reported in the field using a portable landfill gas meter are significantly affected (biased high) by the presence of elevated petroleum hydrocarbons. Refer to QRA, enRiskS 2015, for further information

Section 3. Implementation

3.1 Roles and Responsibility

The EMP will be managed and implemented by the property owner, the Strata Corporation for the site, Campbelltown City Council or Endeavour Energy depending on final agreed ownership of the Impacted Zone.

Following the identification of the party responsible for managing and implementing the EMP, key personnel who will play an important role in implementing the EMP should also be identified and recorded in a table similar to **Table 4** below.

Table 4 Key Project Personnel (Example)

Name	Position	Role / Responsibility
	Project Manager	Ensure EMP is implemented and maintained.
	Environmental Manager	Ensure EMP is implemented and maintained.
	Environmental Management Representative	Liaise with and assist Project Manager / Environmental Manager, and liaise with approval / consent authorities, and environmental authorities.
	Workers / Sub-contractors	Liaise with and follow the instructions of the Project Manager / Environmental Manager / Environmental Management Representative to ensure EMP is implemented and maintained.
	First Aider / Occupational Health Officer	Should be informed of any sickness or ill-health effects and should assess the risks posed by the working environment. Must follow any relevant OHS legal requirements.

All works conducted in the Impacted Zone are to be managed in accordance with this EMP.

It is the responsibility of any contractors or sub-contractors conducting work on the site to read and implement (as appropriate) the requirements of this EMP during any works. If, at any time, works are undertaken that have the potential to result in significant harm to the environment, the relevant Environmental Manager or their nominated representative must be notified immediately.

In addition to the above, a copy of this EMP must be provided to, and maintained by, any future strata corporations or property owners that are established following the construction of buildings within the Impacted Zone. This is due to the requirement for a vapour mitigation system to be installed for certain development types if constructed within the Impacted Zone (refer to **Section 4.1** below).

3.2 Induction

All employees (including contractors and sub-contractors) must undergo induction into the requirements of this EMP. The induction should include training on the relevant aspects of working on the site in addition to responsibilities under this EMP. This includes familiarisation with site environmental controls and environmental emergency response procedures. A record of all training should be maintained (as included in **Appendix B**).

3.3 Workplace Health and Safety

All workers (including sub-contractors) engaged in excavation activities at the site are required to be familiar with all relevant New South Wales and Industry Workplace Health and Safety requirements including WHS regulations, codes of practice and relevant Australian standards.

Personnel working at or visiting the Impacted Zone during excavation (construction) activities will be provided with an induction briefing (that informs those personnel about potential environmental and health and safety risks associated with the site works) and be required to sign onto the site risk assessment prior to commencing works.

An Occupational Health and Safety (OH&S) co-ordinator, appointed by the contractor working in the Impacted Zone, will be responsible for establishing and maintaining the Workplace Health and Safety procedures. At all times, the OH&S co-ordinator should:

- Lead by example & promote the site OH&S requirements at every opportunity;
- Insist on correct and safe practices at all times;
- Monitor compliance with safe work procedure;
- Prepare and conduct site safety inductions (that require all personnel working within the Impacted Zone to have read and acknowledged this EMP [refer to **Attachment B** for pro-forma record sheet] to ensure that they are aware of the environmental conditions, controls and appropriate levels of PPE required);
- Provide advice and assistance on OH&S to all employees;
- Participate in regular workplace inspections and ensure that any improvements resulting from such an inspection are initiated within the required time frame;
- Ensure all records as required under the project OH&S Management plan are maintained;
- Participate in safety meetings and other site based safety programs to provide support for consultation and discussion on a regular basis;
- Conduct accident/incident investigations;
- Coordinate rehabilitation for injured employees;
- Review safety reports and inspections; and
- Communicate with the Site Manager and sub-contractor representatives on matters relating to health and safety.

Section 4. Management of Potential Hazards

As discussed in **Section 2**, groundwater within the Impacted Zone is contaminated with PSH and dissolved phase petroleum hydrocarbons.

The following potential hazards, due to the groundwater contamination within the Impacted Zone, have been identified:

- If a future residential or mixed use building with a slab greater than 15 m in diameter and one or both of the following features is constructed within the Impacted Zone:
  - A lift/basement
  - More than 1-2 stories

  then people who live or work on the ground floor of this building may be exposed to unacceptable levels of petroleum hydrocarbon vapours unless vapour mitigation is installed (enRiskS 2015).
- During times when intrusive works may occur in the Impacted Zone, either during development of the site or for the purpose of maintenance of underground services in the future, controls must be implemented to ensure the protection of human health and the environment as odours may be present.

The required risk mitigation measures for the above potential hazards are outlined in **Sections 4.1** and **4.2** below.

All future buildings constructed within the Impacted Zone must comply with the minimum requirements of the Building Code of Australia and relevant Australia Standards. With regard to the management of potential intrusion of vapours, the most critical requirements of the Building Code of Australia are those related to slab thickness and ventilation rates.

4.1 Future Buildings

In regard to the likely development scenarios within the Impacted Zone, **Table 5** outlines which building types require vapour mitigation.

Table 5 Summary of QRA Findings for Likely Development Scenarios

Development Scenario	Governed by Limiting Slab Size?	Vapour Mitigation System Required?
1-2 level residential (i.e. low or medium-density residential), no basement, with residential living areas on the ground floor.	No	No
Multi-storey residential (i.e. high density residential), no basement, with residential living areas on the ground floor.	Yes	Yes – if the building slab size is greater than 15 m in diameter
Multi-storey mixed use, no basement, with car park and/or retail/commercial on the ground	Yes	Yes – if the building slab size is greater than 15 m in diameter

Development Scenario	Governed by Limiting Slab Size?	Vapour Mitigation System Required?
floor and residential living areas on the 1st floor and above.		
Public open space	No	No

A vapour mitigation system is, therefore, required to be installed for any residential or mixed use buildings constructed within the Impacted Zone that will have a slab greater than 15 m in diameter and one or both of the following features:

- A lift/basement ; and
- More than 1-2 stories.

The vapour mitigation system must be designed and installed by a suitably qualified professional.

The QRA (enRiskS 2015) assessed potential intrusion of vapours in a worst case situation for a multi-storey building. The assessment found that the modelled concentrations resulted in risks approximately 10 times the level considered to be acceptable in the ASC NEPM. As a result, a passive vapour mitigation system is considered to be adequate to mitigate vapour intrusion risk as a 10 fold reduction in vapour concentrations is easily achieved by such systems.

The type of passive vapour mitigation system installed will be specific to the development proposed, however, it may include the following elements:

- A passive sub-slab venting system comprising a gravel layer underneath the slabs with slotted pipes embedded in the gravel which are connected to a manifold for collection and support geotextile and engineered sub-base;
- Pipework connecting the manifold of the passive sub-slab venting system to a system outlet point which is commonly located at the roof of the building. The sub-slab air is passively removed in such a system through the use of whirlybirds (or similar) at the outlet point; and / or
- A soil gas vapour barrier (e.g. Liquid Boot or similar).

Once installed, the vapour mitigation system must be tested / validated to ensure it is installed and operating in accordance with the manufacturer's instructions. This may include smoke testing to demonstrate that air removal systems (e.g. whirlybirds) are drawing air effectively from beneath the building slab or that the soil gas vapour barrier (if required) has been installed puncture free.

Following validation of the successful installation of a passive vapour mitigation system, no ongoing monitoring is expected to be required. Documentation of the installation and validation of the system must be provided to Campbelltown City Council to confirm that the vapour mitigation system has been designed, installed and validated in accordance with the manufacturer's instructions. This documentation must also be retained on-file by the responsible party (i.e. owner or strata) for the life of the building.

Following installation of the vapour mitigation system, this EMP should be updated to include the following information:

- The name and contact details of the party(s) who designed, installed and validated the vapour mitigation system;

- Documentation detailing the design, installation and validation of the vapour mitigation system;
- The name and contact details of the party responsible for maintaining, and if required, repairing the vapour mitigation system. It is noted that the vapour mitigation system will need to be retained for the life of the building;
- Details (including frequency) of any routine maintenance required;
- Details of any triggers or alarms included in the vapour mitigation system design, and contingency measures that are required to be adopted if the triggers or alarms are activated. This should include the timeframe within which a response, and any contingency action, is required;
- Procedures for advising any future intrusive or maintenance workers, who may need to access services beneath or in the vicinity of the buildings, that the vapour mitigation system is present so that accidental damage does not occur; and
- Procedures for the review of vapour mitigation system performance, and if required repair, following intrusive works with the potential to damage the system.

The updated EPM should be provided to an Environmental Auditor for review and approval.

4.2 Intrusive Workers

As noted in the QRA (enRiskS 2015), risks to future construction and intrusive maintenance workers within the Impacted Zone are low and acceptable. In the event that excavations are placed above the impacted groundwater, no unacceptable risks have been identified, however petrol type odours may be noticeable (depending on the proximity of works to the contamination).

This EMP provides best practice control measures to ensure staff are informed of the potential presence of odours at the site, where relevant to their work.

4.2.1 Potential Exposure Pathways

Generally speaking, exposure pathways for workers undertaking excavation activities may include the following:

- Incidental ingestion of contaminated soil or groundwater;
- Inhalation of dust;
- Inhalation of vapours from soil or groundwater; and
- Dermal (skin) contact with soil or groundwater.

In this case, exposure via inhalation of dust, inhalation of vapours from soil contamination or direct contact with soils during excavation does not require control measures as soil is not contaminated (to 1.5 m bgl) given the remediation of the site undertaken around 2005.

Groundwater at this site is present at 4 to 8 m bgl so it is unlikely that groundwater will seep into a trench relevant for routine maintenance works on subsurface services even if deep excavations are required. As a result, direct contact (incidental ingestion from splashing and/or skin contact) with groundwater will not occur during such routine works. Potential risks from inhalation of vapours from volatile petroleum hydrocarbon contamination in groundwater were shown to be low in the QRA. However, odours may be noticed by workers in excavations.

The following best practice controls are recommended to minimise the exposure of workers to odours in deep excavations:

- Personnel involved in deep excavation work should be made aware of the chemical and physical hazards associated with the Impacted Zone;
- Access to the area where deep excavations are being undertaken should be restricted to only those personnel who have undergone the appropriate induction training;
- Monitoring of VOCs inside all excavations should be undertaken using a PID and LEL prior to anyone entering the excavation;
    - If the PID reads more than 10 ppm then further investigations should be considered and/or additional ventilation of the excavation should be provided before anyone enters the excavation *(Note: 10 ppm is a low level of VOC vapours which can be reliably measured by commonly available PID meters – i.e. not too close to the detection limit of the meter).*
    - If the LEL reads more than 10 % then further investigations should be considered and/or additional ventilation of the excavation should be provided before anyone enters the excavation (as per Table 2 in (CRC CARE 2013))
- For those who find such odours annoying or offensive, vapour masks (using organic vapour cartridge relevant for petroleum hydrocarbons solvents) may be used (as noted in the QRA no unacceptable health risks are likely from exposure to the vapours).

In addition to the above, all workers should adopt good housekeeping practices during all works in the Impacted Zone including:

- Standard personal protective equipment (PPE) commonly required at construction sites should be used. PPE required for the site during redevelopment should include:
    - Gloves (when required)
    - Eye protection
    - High visibility clothing
    - Clothing with long sleeves and long pants
    - Steel capped boots
    - Hard hat
    - Hearing protection (when required).
- Good hygiene practices should be maintained during works. No specific products are required for removal of specific contaminants.
- Store PPE in a clean place to avoid contamination.
- Ensure all personal protective clothing and equipment is regularly cleaned, maintained and inspected to ensure it remains effective.
- Work clothing should be separated from general laundry.
- Replace gloves and masks regularly, and other equipment as required.

4.3 Unexpected Finds

The available data has not identified contamination in soil in the Impacted Zone however unexpected finds of contamination could occur during construction. Such contamination might be identified by observing odours, discolouration or a change in texture in the soil. Unexpected finds of non-soil materials could also occur during works. This could include the unexpected discovery of hazardous building materials, such as asbestos containing materials, or old drums or other containers that have been buried at the site. Management measures to be implemented in the event of unexpected finds of contaminated soil or non-soil materials are provided below.

It is noted that management measures associated with contaminated groundwater have not been included in the EMP. Due to the depth of groundwater beneath the site (approximately 4-8.5 m bgl), it is not expected that groundwater will be encountered during either redevelopment of the site or future use and management of the site. In addition, groundwater is not likely to be extracted for any purpose in the Impacted Zone. Abstraction of groundwater is unlikely given the poor yield of the groundwater aquifer and the availability of reticulated water in the area. Hence, extraction of groundwater has not been considered further in the EMP.

4.3.1 Unexpected Soil Contamination

If contaminated soil is identified during excavation works, through visual inspection (staining), odour or due to the presence of non-soil materials, work should immediately cease and an appropriately qualified environmental consultant engaged to identify the nature and extent of contamination (via sampling and laboratory analysis) and advise on changes to this EMP to appropriately manage exposure.

Where unexpected finds of soil or groundwater contamination are identified during intrusive works, the following procedures must be followed:

- Stop work and make the area secure with a physical barrier. This includes notifying other workers in the immediate area;
- Notify the Environment Project Manager and / or Site Supervisor or their nominated representative;
- Assume the soil/groundwater is contaminated until notified otherwise, if handling is required prior to work to identify the nature and extent of contamination being completed;
- Record the source location of the materials; and
- Engage a suitably qualified environmental consultant to identify the nature and extent of contamination (via sampling and laboratory analysis) and to advise on changes (if required) to this EMP to appropriately manage exposure.

In addition, for soil:

- Segregate potentially contaminated materials (not previous identified/assessed) separately;
- Stockpile excavated material in a secure location on strong impermeable plastic sheeting.
- Cover the top and sides of the material with securely fitted plastic sheeting; and
- Implement adequate sediment controls to collect runoff and prevent overland stormwater flow from affecting the base of the excavation and/or stockpiled material.

In addition, for asbestos containing materials or potential asbestos containing materials:

- Stop works and contact the Environment Project Manager and / or Site Supervisor or their nominated representative;
- Apply asbestos PPE;
- Cover any suspected asbestos containing soil or material with plastic and barricade;

In general, if asbestos containing materials or potential asbestos containing materials are identified, such materials should be separated from other waste where possible, affected soil should be kept wetted down and any bonded material found must be securely packaged.

The following resources are available for dealing with asbestos containing materials or potential asbestos containing materials

- Information regarding safe handling of asbestos containing materials is available at Workcover NSW (http://www.workcover.nsw.gov.au);
- A blueprint for managing asbestos in NSW has been developed and is available at http://www.workcover.nsw.gov.au/newlegislation2012/asbestos/Pages/asbestosblueprintforNSW.aspx; and
- Information is available at NSW EPA regarding disposal of asbestos containing materials http://www.epa.nsw.gov.au/waste/asbestos/index.htm;

If required, the assistance of a suitably qualified occupational hygienist should be sought.

4.4 Soil Disposal

4.4.1 Classification

Investigation works have shown that soil within the Impacted Zone is not contaminated. The exception may be soils immediately above the saturated zone, which may be impacted with PSH. However, it is noted that the area of PSH in groundwater is small compared to the area of the Impacted Zone. In addition, these soils are located at or below 4 m bgl and are unlikely to be disturbed by construction or maintenance activities, given the likely redevelopment of the site.

In the unlikely event that contaminated, or potentially contaminated soils (e.g. soils with odours or staining) are identified within the Impacted Zone, all soil/materials excavated and required to be removed from the site must be classified in accordance with the *Protection of the Environment Operations Amendment (Scheduled Activities and Waste) Regulation 2008* made under the *POEO Act 1997*, and the Waste Classification Guidelines (NSW EPA, 2014).

The Environmental Project Manager / Site Supervisor shall be consulted on advice regarding waste classification requirements. They may decide to engage a suitably qualified environmental consultant to oversee the classification of the waste. The Environmental Project Manager / Site Supervisor shall ensure waste is transported and disposed at an appropriately licensed receiver.

Classification of any soil stockpiles proposed for off-site disposal will be required when disposal is being organised. This may require the review of soil data available for the site and / or the collection and analysis of additional samples in accordance with the NSW EPA waste classification guidelines at that time. If any building and demolition waste is encountered during excavation works (e.g. bricks, concrete, metal, and timber), this is likely to classify as General Solid Waste (non-putrescible). This material should be stockpiled separately and recycled or reused where possible, or further advice sought prior to off-site disposal to landfill.

Table 5 presents a summary of the guidelines for General Solid Waste (CT1) and Restricted Solid Waste (CT2) for a number of contaminants often encountered at former industrial sites. It is noted that these guidelines are updated regularly. As such, if classification of soil for off-site disposal is required, the source document from NSW EPA should be referenced.

Table 5 Summary of Existing Guidelines for Waste Classification

Key Chemicals	General Solid Waste: CT1 (mg/kg)	Restricted Solid Waste: CT2 (mg/kg)
Arsenic	100	400
Cadmium	20	80
Lead	100	400

Key Chemicals	General Solid Waste: CT1 (mg/kg)	Restricted Solid Waste: CT2 (mg/kg)
Nickel	40	160
Mercury	4	16
Benzo(a)pyrene	0.8	3.2
Total PAHs	200	800
TRH C6-C9	650	2 600
TRH C10-C36	10 000	40 000
Benzene	10	40
Toluene	288	1 152
Ethylbenzene	600	2 400
Xylenes (total	1 000	4000

4.4.2 Transport and Disposal

Waste classified as general solid waste has no special requirements that must be considered when such material is being transported. Waste not classified as general solid waste must be transported by a licensed carrier to a facility approved to accept the waste. Transportation of contaminated material shall be undertaken in accordance with the following procedures:

- Waste tracking shall be undertaken in accordance with NSW EPA requirements (under the requirements of the *POEO Act 1997*); and
- Wastes shall only be removed after the material has been classified and written approval has been received for the disposal at the nominated treatment or disposal site.

The Site Supervisor or a delegated representative shall record each load of contaminated material leaving the site, using the waste tracking system approved by the NSW EPA. As a minimum, the following information must be recorded:

- The transporter's name and address;
- The transporter's NSW EPA licence number where applicable;
- The registration number of the vehicle;
- The type and quantity of waste;
- The name and address of the person or company the waste was delivered to (the consignee); and
- The date the waste was delivered to the consignee.

A copy of the waste depot's weighbridge docket (and corresponding NSW EPA docket – if relevant) for each load delivered shall be retained by the Environmental Project Manager / Site Supervisor. All drivers transporting contaminated soil (should any soil be classified as other than general solid waste) from the site should be given a safety instruction brief, detailing the procedures to be followed should spillage of loads or other incidents occur.

4.5 Backfilling of Excavations

Soil excavated from the site may be backfilled into excavations from which it was sourced at the completion of works provided no unexpected contamination was encountered.

If the importation of soil is required, virgin excavated natural material (VENM) or excavated natural material (ENM) should be sourced and the criteria outlined in the *POEO Act 1997* and *POEO (Waste) Regulation 2014 Resource Recovery Exemption, Part 9, Clause 91, 92.* must be met.

It is suggested that all imported soil is assessed by a suitably qualified environmental consultant to undertake additional soil sampling (if required) and confirm that the material meets the relevant requirements. The environmental consultant / Environmental Project Manager should ensure that:

- Laboratory analysis is undertaken in accordance with the standard test methods outlined in Schedule B3 of the ASC NEPM , where required;
- The practical quantitation limits (PQLs) are below the relevant assessment criteria; and
- The selected laboratories are NATA accredited for the required analyses.

4.6 Dewatering Requirements

Surface water that collects in excavations after rain may need to be pumped out to allow for excavation works to recommence. As soil within the top 1.5 m of the Impacted Zone has been found to be clean, accumulated water is not expected to be contaminated by petroleum hydrocarbons, however, suspended solids content may be elevated (i.e. the water may be muddy).

If extracted groundwater in the Impacted Zone needs to be disposed of for some reason, groundwater should be pumped straight into a vacuum extraction truck or extracted into waste drums, industrial bulk containers (IBCs) or similar and temporarily stored in a bunded area. A suitably qualified environmental consultant or registered waste disposal company should be engaged to oversee the testing and/or disposal of the groundwater.

Stormwater that may collect in an excavation may be able to be discharged overland (i.e. via evaporation/infiltration), or discharged to stormwater subject to regulatory requirements and licences. This water may contain high levels of suspended solids which must be reduced prior to release to stormwater drainage lines. To ensure that de-watering operations do not result in turbid water entering natural waterways, the following management options may be used:

- Collect stormwater on-site and allow suspended solids to settle before disposal in accordance with NSW EPA and/or Sydney Water/local council requirements;
- Treat contaminated water before it is pumped into the stormwater system or a natural waterway to remove excess sediments and ensure water quality meets NSW EPA guidelines (ANZECC Water Quality Guidelines);
- Flocculants can be used to assist in settling suspended solids but some have environmental impacts – check with suppliers about any potential for environmental harm; and
- Monitor the turbidity of the water at least once per hour during pumping.

If the water is found to be contaminated with contaminants other than suspended solids, it must be transported by a licensed carrier to a facility approved to accept the waste. Transportation of contaminated water shall be undertaken in accordance with the following procedures:

- Waste tracking shall be undertaken in accordance with NSW EPA requirements (under the requirements of the *POEO Act 1997*);
- Wastes shall only be removed after the material has been classified and written approval has been received for the disposal at the nominated treatment or disposal site;

The Environmental Project Manager / Site Supervisor or a delegated representative shall record each load of contaminated water leaving the site, using a form approved by the NSW EPA. As a minimum, the following information must be recorded:

- The transporter's name and address;

- The transporter's NSW EPA licence number where applicable;
- The registration number of the vehicle;
- The type and quantity of waste;
- The name and address of the person or company the waste was delivered to (the consignee); and
- The date the waste was delivered to the consignee.

A copy of the waste depot's weighbridge docket (and corresponding NSW EPA docket – if relevant) for each load delivered shall be retained by the Environmental Project Manager / Site Supervisor. All drivers transporting contaminated water from the site should be given a safety instruction brief, detailing the procedures to be followed should spillage of loads or other incidents occur.

Section 5. Emergency Response

Emergency contact information is provided in **Table 6** below.

Where required, the Environmental Project Manager / Site Supervisor must notify regulatory authorities if required in accordance with *POEO Amendment Act 2011*.

Table 6 Emergency contacts

Emergency contact	Phone number
Emergency Services (Police, Ambulance, Fire)	000
NSW EPA	131 555 or 02 9995 5555
Campbelltown City Council	02 4645 4000
Campbelltown Hospital (map below – **Figure 3**)	02 4634 3000

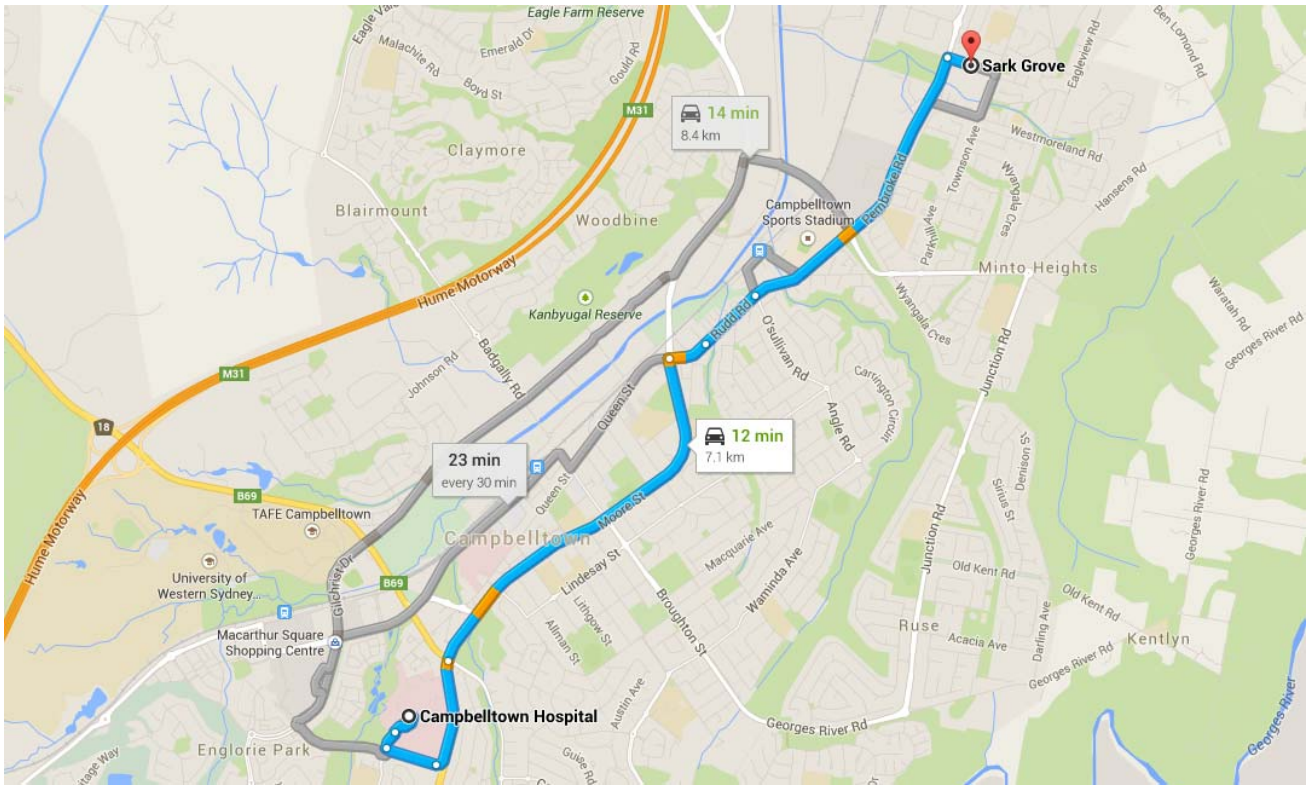

Figure 3 Map showing route to Campbelltown Hospital

Section 6. Monitoring, Reporting and Review

6.1 Monitoring

During all works conducted on the site, it is the responsibility of the Environmental Project Manager / Site Supervisor to determine if any monitoring might be required and what parameters require monitoring as well as to undertake that monitoring to manage the risks and issues outlined in this EMP. Monitoring is also important to ensure that any changes in the environmental condition of the site or work practices are recorded, and that appropriate changes to this EMP are made to account for such changes.

Investigations at the site have documented the level of contamination present sufficiently such that additional chemical analysis is not likely to be required in preparing for intrusive works unless some change in the conditions at the site has occurred. Monitoring for odours, discolouration and other potential indicators of unexpected contamination should be undertaken using the observations of staff involved in the works. Other types of WHS monitoring which can be required for confined spaces/excavations may be required for works at this site depending on the depth of the excavation (e.g. checking for oxygen or hydrogen sulfide levels) regardless of the presence of absence of chemical contamination as noted in the SafeWork Australia Codes of Practice for Excavation Work and Confined Spaces (SafeWork Australia 2013, 2014).

The following monitoring checklist (**Table 7**) may assist in monitoring environmental management activities and controls.

Table 7 Environmental Monitoring Checklist (Example)

Environmental Monitoring Checklist							
Environmental control activity					Follow-up action		
Activity	**Date**	**Responsible person(s)**	**Method to measure effectiveness**	**Sign off**	**Further action required? (Y/N)**	**Date**	**Responsible person(s)**

6.2 Reporting

To support the EMP, workers, including any contractors, are required to keep sufficient records of key activities. Records should be kept as evidence that works have been managed in accordance with this EMP and any legislative requirements. This may include, inter alia (with pro-forma forms included in **Appendix B**):

- Key project personnel;
- Daily site diary recording personnel on site and the activities undertaken;
- Training records for all personnel conducting works;
- Incidents and complaints (Environmental or Safety) and corrective actions; and
- Audits/workplace inspections/other visitors.

6.3 Review

This EMP is a working document that requires review and amendment during the life of the site. Review of the EMP should be undertaken:

- When proposed development plans are available for the site or a specific development scenario is defined;
- When there is a change in the use of the site;
- Following significant environmental incidents e.g. a spill of chemical or waste material; or
- When there is a need to improve performance.

In the first two instances above, the updated EMP should be reviewed and approved by an Environmental Auditor.

The review process should include examination of the environmental controls and procedures in use to make sure they remain effective, and the rationale for making changes to the EMP should be documented. Monitoring and reviewing the EMP by contractors will aid in identifying the need for additional or revised training.

A copy of the original EMP and subsequent versions should be retained on file.

Section 7. References

ASC NEPM, 2013. *National Environment Protection (Assessment of Site Contamination) Measure*

- *Schedule B1, Investigation Levels for Soil and Groundwater*
- *Schedule B4, Guideline on Health Risk Assessment*
- *Schedule B6, The Framework for Risk-Based Assessment of Groundwater Contamination*
- *Schedule B7 and Appendices, Derivation of Health-Based Investigation Levels*

ANZECC/ARMCANZ, 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 2. National Water Quality Management Strategy, ANZECC and ARMCANZ, Commonwealth of Australia, Canberra

Contaminated Land Management Act 1997. Available at http://epa.nsw.gov.au/legislation/legislation.htm

CRC CARE 2013, *Petroleum hydrocarbon vapour intrusion: Australian Guidance*, CRC CARE Technical Report no. 23, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

Department of Urban Affairs and Planning 1998, Managing Land Contamination Planning Guidelines: State Environmental Planning Policy (SEPP) No. 55 – Remediation of Land. Available at http://www.planning.nsw.gov.au/assessingdev/pdf/gu_contam.pdf

E2W, 2011a. Remedial Technology Review for Residual Groundwater Contamination at Minto, NSW. Report Ref: E2W-0153 L001b, prepared by Earth2Water, dated 1 September 2011.

E2W, 2011b. Monitoring of Natural Attenuation and Groundwater Modelling. Sark Grove, Minto NSW. Report Ref: E2W-0153 R001, prepared by Earth2Water, dated 27 September 2011.

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enRiskS, 2011b. Addendum to HHERA – Methane in Soil Gas. Letter Report, dated 12 December 2011.

enRiskS, 2011c. Identification of Impacted Zone Requiring Management – Future Use of Minto Site. Letter Report, dated 24 October 2011. Report dated 24 August 2007.

enRiskS, 2012. Groundwater Remediation and Validation Report for Impacted Zone. Report, dated 11 January 2012.

enRiskS, 2015. Quantitative Risk Assessment – Impacted Zone, Former Integral Depot, Sark Grove, Minto, NSW. Prepared for Endeavour Energy Pty Ltd, 10 April 2015.

Landcom, 2004, Managing Urban Stormwater: Soils and Construction. Available at http://www.environment.nsw.gov.au/stormwater/publications.htm

NSW Department of Environment and Climate Change (DECC) 2009, Guidelines on the duty to report contamination under the Contaminated Land Management Act 1997. Available at http://epa.nsw.gov.au/resources/clm/09438gldutycontclma.pdf

NSW Department of Environment and Conservation (DEC) 2007, Guidelines for the Assessment and Management of Contaminated Groundwater. Available at http://epa.nsw.gov.au/resources/clm/groundwaterguidelines07144.pdf

NSW EPA 2014, Waste Classification Guidelines – Part 1: Classification of Waste

PB, 2008. Groundwater Monitoring Round and MPEAT event, Former Integral Energy Depot, Sark Grove, Minto, NSW, August 2008.

PB, 2010a. Factual Report – Groundwater Monitoring Events (May 2009 to March 2010), Former Integral Energy Depot, Sark Grove, Minto, NSW. Prepared by Parsons Brinkerhoff (PB), July 2010;

PB, 2010b. Summary of waste disposal information and imported VENM for works undertaken at the Former Integral Energy Depot located at Sark Grove, Minto, NSW, July 2010;

PB, 2010c. Validation Report, Former Southern Car Park and Vegetated Corridor Former Integral Energy Depot, Sark Grove, Minto, NSW, July 2010;

PB, 2010d. Validation Report, Former Hardstand Areas and Buildings E, F and G Former Integral Energy Depot, Sark Grove, Minto, NSW, July 2010;

PB, 2010e. Validation Report, Former Creosote Pit and Pole Storage Area Former Integral Energy Depot, Sark Grove, Minto, NSW, July 2010;

PB, 2010f. Validation Report, Former Building H Area Former Integral Energy Depot, Sark Grove, Minto, NSW, July 2010;

PB, 2010g. Validation Report, Former Building C and North West Corner Former Integral Energy Depot, Sark Grove, Minto, NSW, July 2010; and

PB, 2010h. Validation Report, Former Building A and B Area Former Integral Energy Depot, Sark Grove, Minto, NSW, July 2010.

Protection of the Environment Operations Act 1997. Available at http://epa.nsw.gov.au/legislation/legislation.htm

Protection of the Environment Operations (Waste) Regulation 2005 – 2014 Resource Recovery Exemption, Part 9, Clause 91, 92. Available at http://www.epa.nsw.gov.au/resources/waste/ENMRRE14.pdf

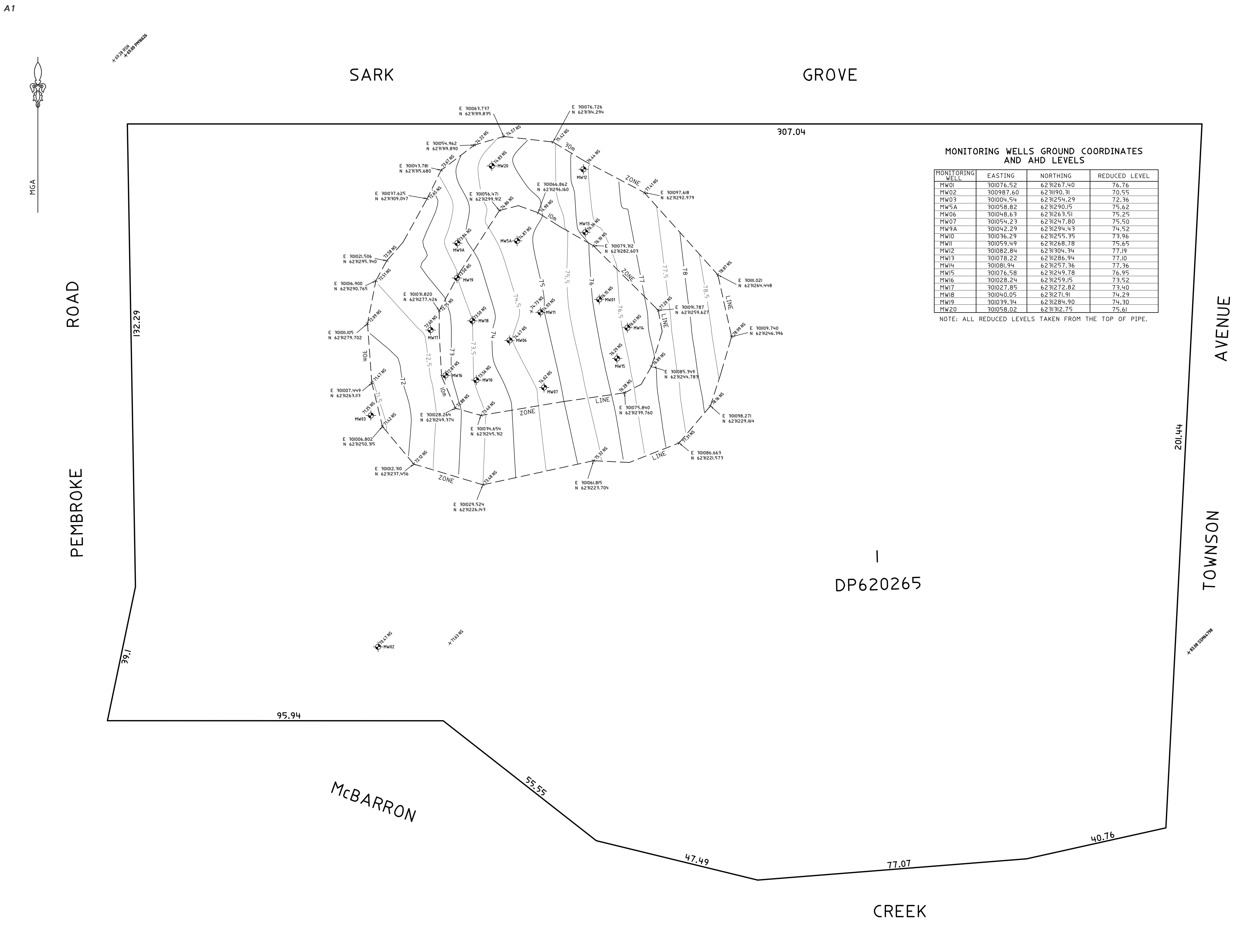
SafeWork Australia, 2013. Excavation Work – Code of Practice. Available at http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/excavation-work

SafeWork Australia, 2014. Confined Spaces – Code of Practice. Available at http://www.safeworkaustralia.gov.au/sites/swa/about/publications/pages/confined-spaces-cop

Waste Avoidance and Resource Recovery Act 2001. Available at http://epa.nsw.gov.au/legislation/legislation.htm

Work Health and Safety Act 2011. Available at http://epa.nsw.gov.au/legislation/legislation.htm

Appendix A Impacted Zone Survey



MONITORING WELLS GROUND COORDINATES AND AHD LEVELS

MONITORING WELL	EASTING	NORTHING	REDUCED LEVEL
MW01	301076.52	6231267.40	76.76
MW02	300987.60	6231190.31	70.55
MW03	301004.54	6231254.29	72.36
MW5A	301058.82	6231290.15	75.62
MW06	301048.63	6231263.51	75.25
MW07	301054.23	6231247.80	75.50
MW9A	301042.29	6231294.43	74.52
MW10	301036.29	6231255.35	73.96
MW11	301059.49	6231268.78	75.65
MW12	301082.84	6231304.34	77.19
MW13	301078.22	6231286.94	77.10
MW14	301081.94	6231257.36	77.36
MW15	301076.58	6231249.78	76.95
MW16	301028.24	6231259.15	73.52
MW17	301027.85	6231272.82	73.40
MW18	301040.05	6231271.91	74.29
MW19	301039.34	6231284.90	74.30
MW20	301058.02	6231312.75	75.61

NOTE: ALL REDUCED LEVELS TAKEN FROM THE TOP OF PIPE.

NOTES

- **PRELIMINARY BOUNDARY DEFINITION ONLY (TITLE DIMENSIONS ONLY) - BOUNDARY DEFINITION IS SUBJECT TO FURTHER SURVEY.**
- **IF CONSTRUCTION ON OR NEAR BOUNDARIES IS REQUIRED IT IS RECOMMENDED THAT THE BOUNDARIES OF THE LAND BE MARKED.**
- THIS PLAN HAS BEEN PREPARED FOR THE EXCLUSIVE USE OF ENVIRONMENTAL RISK SCIENCES PTY LTD.
- RELATIONSHIP OF MONITORING WELLS TO BOUNDARIES IS DIAGRAMMATIC ONLY. WHERE OFFSETS ARE CRITICAL THEY SHOULD BE CONFIRMED WITH THE SURVEYOR.
- SERVICES HAVE NOT BEEN LOCATED. UNDERGROUND SERVICES HAVE NOT BEEN LOCATED. DIAL BEFORE YOU DIG SERVICES (ph 1100) SHOULD BE USED AND A FULL UTILITY INVESTIGATION, INCLUDING A UTILITY LOCATION SURVEY, SHOULD BE UNDERTAKEN BEFORE CARRYING OUT ANY CONSTRUCTION ACTIVITY IN OR NEAR THE SURVEYED AREA.
- CONTOURS SHOWN DEPICT THE TOPOGRAPHY. THEY DO NOT REPRESENT THE EXACT LEVEL AT ANY PARTICULAR POINT. ONLY SPOT LEVELS SHOULD BE USED FOR CALCULATIONS OF QUANTITIES WITH CAUTION.
- CONTOUR INTERVAL - 0.5 metre. - SPOT LEVELS SHOULD BE ADOPTED.
- THE INFORMATION IS ONLY TO BE USED AT A SCALE ACCURACY OF 1:500.
- DO NOT SCALE OFF THIS PLAN / FIGURED DIMENSIONS TO BE TAKEN IN PREFERENCE TO SCALED READINGS.

HORIZONTAL DATUM:
CO-ORDINATE SYSTEM: MGA
MARK ADOPTED: PM.16626
EASTING: 300966.824
NORTHING: 6231372.939
SOURCE: S.C.I.M.S. (26/08/11)

VERTICAL DATUM:
DATUM: AUSTRALIAN HEIGHT DATUM (AHD)
B.M. ADOPTED: PM.16636
R.L. 72.336 (ORDER L2)
SOURCE: S.C.I.M.S. (26/08/11)

1	FIRST ISSUE	1/09/11

CLIENT:

ENVIRONMENTAL RISK SCIENCES PTY LTD
38 SIRIUS STREET
DUNDAS VALLEY NSW 2117

PLAN SHOWING MONITORING WELL LOCATIONS OVER LOT 1 IN D.P.620265 SARK GROVE MINTO NSW 2566

C.M.S. Surveyors Pty Limited
ACN: 096 240 201
PO Box 463 Dee Why NSW 2099
1/32 Campbell Avenue, Dee Why NSW 2099
Telephone: (02) 9971 4802
Facsimile: (02) 9971 4822
E-mail: info@cmssurveyors.com.au

LGA: CAMPBELLTOWN		SHEET 1 OF 1	
SURVEYED: LJ	DRAWN: CJR	CHECKED: MG	APPROVED: DL
SURVEY INSTRUCTION: 8525	SCALE: 1:500	DATE OF SURVEY: 25/08/11	
DRAWING NAME: **8525detail**	CAD FILE: 8525detail 1.dwg	ISSUE: 1	

Appendix B Pro-Forma Reporting Forms

EMP Acknowledgement Record

Operational staff must sign the master copy of this document, indicating they have read and understood it. The employee's signature indicates acceptance and compliance with the requirements of the Environmental Management Plan (EMP). Copies of this document must be made available for their review and readily available at the Site.

Log of Project Personnel

Employee Name	Job Title and Description (activities conducted on project)	Date	Signature

Training Register

Person trained	Date of training	Name of trainer	Training content	Comments

Soil Tracking Form

Date excavated	Soil origin	Stockpile ID	Soil description	Samples collected	Lab analysis	Final soil classification	Off-site Disposal	Final destination	Notes	Logged By

Groundwater Tracking Form

Date extracted	Origin	Description	Samples collected	Lab analysis (Y/N?)	Off-site Disposal (Y/N?)	Final destination	Notes	Logged By

Complaints and Environmental Incidences Register

Date	Time	Complain or Incidence Identified by (name, address and contact number where relevant)	Nature of Complaint or Incident	Response/Corrective Action	Date of Response	Date Complainant Notified of Response	Signature/ Position

Note: should a complaint or incident identify and non-conformance that is not able to be immediately rectified, please initiate and Non-Conformance and Corrective Action Report

Site Inspection Report

Site/Location:		Date:
Reported by:	**(Sign):**	**Time:**
Weather conditions:		
Item:	**Comments (including any immediate corrective actions undertaken)**	
Have all persons on Site received induction and appropriate environmental training?		
Have all works been conducted in accordance with the proposed design requirements, in particular the maintenance of surface barriers/cover?		
Have dust control measures been implemented?		
Are necessary controls and PPE requirements in place?		
Have there been any incidents or complaints?		
Other issues/comments:		

Note: If immediate corrective action could not be undertaken to remedy situation, please initiate Non-Conformance and Corrective Action Report.

Non-Conformance and Corrective Action Report

Date:	
Reporter:	**Name:** **Sign:**
Time:	
Site and Location:	
Problem:	
Cause:	
Report to (Name):	
Corrective Action	
Signed by Project Manager upon Completion:	**Name:** **Sign:**
Feedback Response to Prevent Future Occurrences:	
Date	