



Contamination Management plan

Stage 2 Moorebank Precinct East
400 Moorebank Ave Moorebank NSW

Prepared for: Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd
EP0716_CMP01 v5 17 April 2018



Contamination Management Plan Contamination Management Plan

Moorebank Precinct East Stage 2, 400 Moorebank Avenue, Moorebank NSW

17 April 2018

Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd

Via email: eingram@tacticalgroup.com.au

Ref: EP0716_CMP01 v5

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QUALITY CONTROL

Version	Author	Date	Reviewer	Date	Quality Review	Date
v1.0		15.01.18		15.01.18		15.01.18
V2.0		15.02.18		15.02.18		15.02.18
V3.0		26.02.18		26.02.18		26.02.18
V4.0		01.03.18		01.03.18		01.03.18
V5.0		17.04.18		16.04.18		16.04.18

DOCUMENT CONTROL

Version	Date	Reference	Submitted to
V5.0	17.04.18	EP0716_CMP01_MPE Stage 2_CMP v5	Qube c/o Tactical



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Abbreviations and Terminology		
Abbreviations	Term	Definition
ACM Bonded	Asbestos Containing Materials Bonded	Bonded ACM comprises ACM which is in sound condition, although possibly broken or fragmented, and where the asbestos is bound in a matrix such as cement or resin. This term is restricted to material that cannot pass a 7 mm x 7mm sieve. Equivalent to “non-friable” asbestos in <i>Model Code of Practice: How to Manage and control asbestos in the workplace</i> (Safe Work Australia 2016).
AF	Asbestos Fines	AF includes free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7mm sieve. Equivalent to “friable” asbestos in <i>Model Code of Practice: How to Manage and control asbestos in the workplace</i> (Safe Work Australia 2016).
AFFF	-	Aqueous Film Forming Foam
AHD	-	Australian Height Datum
Ammunition	Ammunition	A device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in connection with defence or offence including demolitions. Certain ammunition can be used for training, ceremonial or other non-operational purposes.
AMP	Asbestos Management Plan	See Section 10 .
AOC	Area of Concern	An area identified as containing potential contamination. Can also be referred to as Quarantined Area.
As	-	Arsenic
BGS	-	Below Ground Surface
BTEX	-	Benzene, Toluene, Ethylbenzene and Xylenes
Butchers Knife	-	Portion of land located to the south of the DNSDC (Figure 2)
Cd	-	Cadmium
CLM	-	Contaminated Land Management
CMP	Contamination Management Plan	This Plan.
CoC	Conditions of Consent	Conditions of Consent SSD 7628
Construction Area	-	Extent of construction works, namely areas to be disturbed during the construction of the Site.
COPC	-	Contaminants of Potential Concern
Cr	-	Chromium
CSM	-	Conceptual Site Model
Cu	-	Copper
DBYD	-	Dial Before You Dig

Abbreviations and Terminology		
Abbreviations	Term	Definition
DNAPL	-	Dense Non-Aqueous Phase Hydrocarbons
DNSDC	-	Defence National Storage and Distribution Centre
DP&E	-	NSW Department of Planning and Environment
DQI	-	Data Quality Indicator
DQO	-	Data Quality Objective
DSI	-	Detailed Site Investigation
DUXOP	Defence Unexploded Ordnance Panel	The panel of contractors and consultants from whom the Department of Defence selects remembers for UXO related tasks.
EIL	-	Ecological Investigation Level
EO	-	Explosive Ordnance
EOW	-	Exploded Ordnance Waste
EPA	-	Environment Protection Authority
ESL	-	Ecological Screening Level
FA	Fibrous Asbestos	FA comprises friable asbestos material and includes severely weather cement sheet, insulation products and woven asbestos material. Defined as asbestos material that is in a degraded condition such that it can be broken or crumbled by hand pressure. Equivalent to “friable” asbestos in <i>How to Manage and control asbestos in the workplace</i> (Safe Work Australia 2016).
Ha	-	Hectares
HCB	-	Hexachlorobenzene
Hg	-	Mercury
HIL	-	Health Investigation Level
HSL	-	Health Screening Level
IMEX	-	Import-Export
IMT	-	Intermodal Terminal
Induction	Site Specific Induction	The <i>Work Health and Safety Act 2011</i> (WHS Act) main objective is to secure the health and safety of workers and workplaces. A site specific induction is necessary for all workers on the Central Precinct to understand the site specific risks.
LGA	-	Local Government Area or Agency
LNAPL	-	Light Non-Aqueous Phase Hydrocarbons

Abbreviations and Terminology		
Abbreviations	Term	Definition
Metallic Debris	Metallic Debris	Debris comprising metal (ferrous) items. May include fragments of former ordnance items.
MIC	-	Moorebank Intermodal Company
MPE Concept Plan Approval	Moorebank Precinct East Concept Plan Approval	Formerly the SIMTA Concept Plan Approval. MPE Concept Plan Approval (SSD_0193) granted by the NSW Department of Planning and Environment on 29 September 2014 for the development of former defence land at Moorebank to be developed in three stages; a rail link connecting the site to the Southern Sydney Freight Line, an intermodal terminal, warehousing and distribution facilities and a freight village.
MPE Project	Moorebank Precinct East Project	Formerly the SIMTA Project. The MPE Intermodal Terminal Facility, including a rail link and warehouse and distribution facilities at Moorebank (eastern side of Moorebank Avenue) as approved by the Concept Plan Approval (MP10_0913) and the MPE Stage 1 Approval (14_6766).
MPE Site	Moorebank Precinct East Site	Formerly the SIMTA Site. Including the former DSND site and the land owned by SIMTA which is subject to the Concept Plan Approval. The MPE Site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
MPE Stage 1	Moorebank Precinct East Stage 1	Stage 1 (14-6766) of the MPE Concept Plan Approval for the development of the MPE Intermodal Terminal Facility, including the rail link at Moorebank. This reference also includes associated conditions of approval and environmental management measures which form part of the documentation for the approval.
MPE Stage 1 Site	Moorebank Precinct East Stage 1 Site	Includes the MPE Stage 1 Site and the Rail Corridor, i.e. the area for which approval (construction and operation) was sought within the MPE Stage 1 Proposal EIS.
MPE Stage 2 Project	Moorebank Precinct East Stage 2 Project	Stage 2 of the MPE Concept Plan Approval including the construction and operation of 300,000m ² of warehousing and distribution facilities on the MPE Site and the Moorebank Avenue upgrade within the Moorebank Precinct.
MPE Stage 2 Site	Moorebank Precinct East Stage 2 Site	The area within the MPE Site which would be disturbed by the MPE Stage 2 Proposal (including the operational area and construction area). The MPE Stage 2 site includes the former DSND site and the land owned by SIMTA which is subject to the MPE Concept Plan Approval. The MPE Site does not include the rail corridor, which relates to the land on which the rail link is to be constructed.
MPW Project	Moorebank Precinct West Project	Formerly the MIC Project. The MPW Intermodal Terminal Facility as approved under the MPW Concept Plan Approval (SSD_5066) and the MPW EPBC Approval (No. 2011/6086).

Abbreviations and Terminology		
Abbreviations	Term	Definition
MPW Site	Moorebank Precinct West Site	Formerly the MIC Site. The site which is the subject of the MPW Concept Plan Approval, MPW EPBC Approval and MPW Planning Proposal. The MPW Site does not include the rail link as referenced in the MPW Concept Plan Approval or MPE Concept Plan Approval.
Ni	-	Nickel
OCP	-	Organochlorine Pesticides
Ordnance	Ordnance	Any item of potential military origin. See Ammunition, Category A and B Ordnance Item and UXO.
PAH	-	Polycyclic Aromatic Hydrocarbons
Pb	-	Lead
PCB	-	Polychlorinated Biphenyls
PFAS	Per- and polyfluoroalkyl substances	Per- and polyfluoroalkyl substances are a diverse group of compounds resistant to heat, water, and oil. These chemicals are persistent, and resist degradation in the environment. They also bioaccumulate, meaning their concentration increases over time in blood and organs.
PFOS, PFOA and PFHxS	Perfluorooctane sulfonate (PFOS), perfluorooctanoic acid (PFOA) and perfluorohexane sulfonate (PFHxS)	Man-made chemicals belonging to the group known as PFAS. See PFAS.
PSH	-	Phase Separated Hydrocarbon
PSI	-	Preliminary Site Investigation
QA/QC	-	Quality Assurance and Quality Control
Quarantined Area	Quarantined Area	Area removed from development activities due to potential contamination. Also see AOC.
QUBE	QUBE Holdings Ltd	Joint owners of the Moorebank Precinct
RAE	-	Royal Australian Engineers
Rail Corridor	-	Area defined as the 'Rail Corridor' within the MPE Concept Plan Approval.
Rail Link	-	The rail link from the South Sydney Freight Line to the MPE IMEX Terminal, including the area on either side to be impacted by the construction works included in MPE Stage 1.
RPD	-	Relative Percentage Difference
Refuelling Area		Former DNSDC Refuelling Area located within Stage 1 MPE (Figure 2)
SAQP	-	Sampling Analysis and Quality Plan
SIMTA	-	Sydney Intermodal Terminal Alliance - a consortium comprising Qube and Aurizon Holdings.

Abbreviations and Terminology		
Abbreviations	Term	Definition
Site	Site	The development area shown on Figure 1 . Also MPE Stage 2 Site.
SME	-	School of Military Engineering
SMP	-	Site Management Plan
SSD	-	State Significant Development
SSFL	-	South Sydney Freight Line
SVOC	-	Semi Volatile Organic Compounds
T&P Area	-	Treatment and Preservation Area
Tactical	Tactical Group	Project Managers of the Moorebank Precinct for Qube
The Moorebank Avenue Site	-	The extent of construction works to facilitate the construction of the Moorebank Avenue upgrade.
The Moorebank Avenue Upgrade	-	Raising of the vertical alignment of Moorebank Avenue for 1.5 kilometres of its length by about two metres, from the northern boundary of the MPE Site to approximately 120 metres south of the MPE Site. The Moorebank Avenue upgrade also includes upgrades to intersections, ancillary works and the construction of an on-site detention basin to the west of Moorebank Avenue within the MPW Site.
The Moorebank Precinct	-	Refers to the whole Moorebank intermodal precinct, i.e. the MPE Site and the MPW Site.
TPH	-	Total Petroleum Hydrocarbons
TRH	-	Total Recoverable Hydrocarbons
UCL	-	Upper Confidence Limit
UST	-	Underground Storage Tank
UXO	Unexploded Ordnance	Explosive ordnance that has been primed, fused, armed or otherwise prepared for action and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material but remains unexploded either by malfunction or design or for any cause. UXO includes items of military ammunition or explosives removed from their original resting place for any reason, including souveniring.
VOC	-	Volatile Organic Compounds
Zn	-	Zinc

1 Introduction

EP Risk Management Pty Ltd (EP Risk) was engaged by Qube (Qube) Property Management Services Pty Ltd c/o Tactical Group Pty Ltd ('Tactical'), to prepare the Contamination Management Plan (CMP) for the Moorebank Precinct East (MPE) Stage 2 development site located at 400 Moorebank Avenue, Moorebank NSW (the Site) **Figure 1 and 2**.

The Site is approximately 67 hectares in area and comprises the following Lots:

- Part Lot 1 DP 1048263 (Former Defence National Storage and Distribution Centre (DNSDC)).
- Part Lot 2 DP 1197707 (Moorebank Avenue).
- Part Lot 1 DP 1197707 (Portion of Moorebank Precinct West (MPW)).
- Part Lot 4 DP 1197707 (Portion of Butchers Knife).

1.1 Background

The MPE Project involves the development of an intermodal terminal (IMT), including a rail link to the Southern Sydney Freight Line (SSFL) within the Rail Corridor, warehouse and distribution facilities with ancillary offices, a freight village (ancillary site and operational services), stormwater, landscaping, servicing, associated works on the eastern side of Moorebank Avenue, Moorebank, NSW.

The development of the Stage 2 portion of the MPE Project involves the construction and operation of warehousing and distribution facilities on the Site, as well as upgrades to approximately 1.4 kilometres of Moorebank Avenue between the northern MPE Site boundary and 120 metres south of the southern MPE Site boundary (Arcadis 2016¹).

Key components of the Site development include:

- Warehousing comprising approximately 300,000m² gross floor area (GFA), additional ancillary offices and the ancillary freight village;
- Establishment of an internal road network, and connection of the Site to the surrounding public road network;
- Ancillary supporting infrastructure within the site, including stormwater and drainage infrastructure, utilities relocation, vegetation clearing, remediation, earthworks, signage and landscaping;
- Subdivision of the Site;
- The associated Moorebank Avenue upgrade; and
- Upgrading existing intersections along Moorebank Avenue.

The following construction activities would be carried out across and surrounding the Site:

- Vegetation clearance;

¹ Moorebank Precinct East – Stage 2 Proposal Contamination Summary Report, JBS&G Australia Pty Ltd c/o Arcadis, December 2016 (Arcadis 2016).

- Remediation works;
- Demolition of existing buildings and infrastructure on the Site;
- Earthworks and levelling of the Site, including within the terminal hardstand;
- Drainage and utilities installation;
- Establishment of hardstand across the Site, including the terminal hardstand;
- Construction of a temporary diversion road to allow for traffic management along the Moorebank Avenue portion of the Site during construction (including temporary signalised intersections adjacent to the existing intersections) (the Moorebank Avenue Diversion Road);
- Construction of warehouses and distribution facilities, ancillary offices and the ancillary freight village; and
- Construction works associated with signage, landscaping, stormwater and drainage works.

The Site is predominately located on the former DNSDC but also includes a section of Moorebank Avenue, a portion of the western boundary of Moorebank Precinct West (MPW) and small portions of the “butchers knife” land located to the south of the DNSDC (**Figure 2**).

A number of previous environmental investigations have been undertaken involving the former DNSDC and associated areas dating back to at least 1980, with more recent investigations and summary documents prepared between 2000 and 2016. A non-statutory Site Audit Statement (SAS) and Site Audit Report (SAR) was completed in 2002, for the Sydney Intermodal Terminal Alliance (SIMTA) site, with the Site Auditor certifying the SIMTA site as suitable for ongoing commercial/industrial use subject to implementation of a Site Management Plan (SMP), which was to include a range of actions relating to further investigation, remediation, groundwater monitoring and management controls. It is not known whether a SMP was prepared or implemented, or whether any recommended actions were undertaken.

Subsequent to the above and at the request of the Department of Defence, the following non-statutory site audits were completed within the following portions of the Site:

- DNSDC (JBS&G 2016a²), excluding the former DNSDC Refuelling Area. The Site Auditor certified the former DNSDC as suitable for commercial / industrial use subject to compliance with the Environmental Management Plan (EMP) prepared for the Site in July 2016 (GHD 2016³) (**Appendix A**) and updated in 2018 (EP Risk 2018a⁴).
- Moorebank Avenue (Aecom 2016a⁵), the Site Auditor certified Moorebank Avenue as suitable for commercial / industrial use subject to compliance with the site management plan (SMP)

² Site Audit Statement and Report 0503-1611 Part Lot 1 in DP 1048263 Former Defence National Storage and Distribution Centre (DNSDC), Moorebank Avenue Moorebank NSW, JBS&G Australia Pty Ltd, 12 October 2016 (JBS&G 2016a).

³ Department of Defence Former DNSDC, Moorebank, NSW Environmental Management Plan, GHD, September 2016 (GHD 2016).

⁴ Environmental Management Plan Moorebank Precinct East, 400 Moorebank Avenue, Moorebank NSW, EP Risk Management Pty Ltd, January 2018 (EP Risk 2018a).

⁵ Site Audit Report and Site Audit Statement Lot 2 DP 1197707, part of Moorebank Avenue, Moorebank, NSW. Report Ref. 60493006, 13 July 2016 (Aecom 2016a).

(Golder 2016a⁶) (**Appendix A**) due to the presence of light non-aqueous phase liquids (LNAPL) in the groundwater beneath a portion of the Southern Section of Moorebank Avenue.

- Butchers Knife (Aecom 2016b⁷), the Site Auditor certified the Butchers Knife was suitable for commercial / industrial use subject to compliance with the site management plan (Golder 2016b⁸) (**Appendix A**) due to contamination remaining on the site.
- Portion of MPW – while this portion of the Site has not been signed off as suitable for a commercial / industrial land use a Remediation Action Plan (RAP) (Golder 2016c⁹) has been developed for the site and reviewed by the Mr James Davis (NSW EPA Contaminated Land Site Auditor) (Enviroview 2016¹⁰). Mr Davis concluded *...the RAP provided meets the requirements of the guidelines and it is my opinion that the site can be made suitable with the implementation of the RAP...* (Enviroview 2016).

The DNSDC refuelling facility (**Figure 2**) is not located within the Site. However, as a portion of the southern part of Moorebank Avenue is located downgradient of the former refuelling area reference will be made to the following reports where necessary:

- *Site Audit Report and Site Audit Statement 0503-1615 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW*. Report Ref. 51732-105413, 13 October 2016 (JBS&G 2016b).
- *DNSDC Moorebank – Refuelling Area Remedial Action Plan*. Report Ref. PRECQPMS- EN-RPT-0007, November 2015 (GHD 2015b).

The most recent SASs (JBS&G 2016a, Aecom 2016a and Aecom 2016b) indicated the Site was suitable for continued commercial/industrial use or could be made suitable (Enviroview 2016 and JBS&G 2016b), subject to the implementation of a EMP/SMP/RAP (GHD 2015b and 2016 and Golder 2016a, 2016b and 2016c). A number of contamination issues, predominately isolated lead, asbestos, ordnance related contamination and hydrocarbon impacted groundwater were identified as requiring management within each of the portions of the Site and are discussed in further details **Section 4.1**.

This CMP has been developed based on the EMP (GHD 2016) (**Appendix A**), whereby the DNSDC conceptual site model and the remaining contamination issues presented within the EMP have been incorporated for management into this plan. As per Section 1.6 of GHD (2016) the EMP required amendment should the Site be redeveloped. The Site is currently the subject of two State Significant Development (SSD) approvals, SSD 6766 MPE Stage 1 (approved) and SSD 7628 MPE Stage 2. The EMP (GHD 2016) was updated and reported in EP Risk (2018a). The GHD (2016) EMP was reviewed and endorsed by the NSW EPA Site Auditor (JBS&G 2016a).

⁶ *Moorebank Avenue Site Management Plan*. Report Ref. 147623070_052-Rev1, 4 July 2016 (Golder 2016a).

⁷ *Site Audit Report and Site Audit Statement - Butchers Knife Part Lot 4 DP 1197707, Moorebank, NSW*. Report Ref 60507697, 12 August 2016 (Aecom 2016b).

⁸ *Contamination Summary Report, Remedial and Site Management Plan– Butchers Knife, Moorebank Intermodal Terminal*. Document No. 147623070-055-R-Rev2, 10 August 2016 (Golder 2016b).

⁹ *Moorebank Intermodal Company Property West Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan*, Golder Associates, 9 August 2016 (Golder 2016c).

¹⁰ *Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan*, Enviroview Pty Ltd, Letter to Tactical Group dated 22 August 2016 from Mr James Davis (Enviroview 2016).

Per- and poly-fluoroalkyl substances (PFAS)

Former DNSDC Site

During the update of the EMP (EP Risk 2018a), it was noted, while GHD (2015a) and JBS&G (2016a) reported the Site posed a low contamination risk for Per- and poly-fluoroalkyl substances (PFAS), Australian guidance has been revised since 2016. Therefore, PFAS has been historically used at the Site (proximal to Building 26) and further assessment is required in accordance with current guidance.

A supplementary PFAS assessment has been recommended for the area containing Building 26 (EP Risk 2018b ¹¹). Depending on the results of this supplementary PFAS assessment a remediation/management plan will be developed.

MPW Site

Based on current investigations within the MPW Site there are two main PFAS source areas. These are located on the eastern portion of the MPW Site and are not within the portion located within the Site.

It is noted there are a number of reference documents, either final or in draft which relate to PFAS within the MPW Site:

- *Literature Review, Criteria for Assessment of PFAS and Risk Assessment Moorebank Intermodal Terminal Development*, EP Risk Management, 3 October 2017 (EP Risk 2017a).
- *Per- and Poly-fluoroalkyl Substances Remediation Action Plan Moorebank Intermodal Terminal Development*, EP Risk Management, 3 November 2017 (EP Risk 2017b).
- In development – *Sampling Analysis and Quality Plan PFAS Soil and Groundwater Characterisation Moorebank Intermodal Terminal Development, Moorebank NSW*, EP Risk Management, TBA 2018.

Overall, PFAS impact within the MPW Site is located predominately within the groundwater and will be managed in accordance to the above reference documents, or subsequent iterations. The proposed development works within the Site located within the MPW Site are for temporary road re-alignment and excavation to depths intersecting groundwater is considered unlikely.

Moorebank Avenue and Butchers Knife

The portions of Moorebank Avenue and the Butchers Knife do not contain areas identified as being potential PFAS sources (Aecom 2016a and 2016b). Therefore, no further PFAS investigations are proposed within these areas of the Site.

Therefore, this CMP does not deal with the management of potential PFAS contamination issues and further revision may be required pending the findings of the supplementary PFAS assessments currently being undertaken proximal to Building 26 and the MPW Site.

¹¹ *Sampling Analysis Quality Plan (SAQP) Building 26 Stage 2 Moorebank Precinct East, 400 Moorebank Avenue, Moorebank NSW*, EP Risk Management Pty Ltd, 25 January 2018 (EP Risk 2018b).

The requirement for a CMP is provided within the conditions of consent for the Site (Development Consent).

1.2 Conditions of Consent SSD 7628

The Development Consent made under *Section 89E of the Environmental Planning and Assessment Act 1979* has listed the conditions of consent (CoC) in **Table 1** in relation to the CMP.

Table 1 – Conditions of Consent (CoC)			
CoC	Requirement	Document Reference	How Addressed
C7	<p>The applicant must ensure that the environmental management plans required under this consent are prepared in accordance with any relevant guidelines, and include:</p> <ul style="list-style-type: none"> a) Baseline data; b) A description of: <ul style="list-style-type: none"> (i) The relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) Any relevant limits or performance measures/criteria; and (iii) The specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any measurement measures; c) A description of the management measures to be implemented to comply with the relevant statutory requirements, limits or performance measures/criteria; d) A program to monitor and report on the: <ul style="list-style-type: none"> (i) Impacts and environmental performance of the development; and (ii) Effectiveness of any management measures (see (c) above); e) A contingency plan to manage any unpredicted impacts and their consequences; f) A program to investigate and implement ways to improve the environmental performance of the development over time; g) A protocol for management and reporting any: <ul style="list-style-type: none"> (i) Incidents and non-compliances; (ii) Complaints; (iii) Non-compliances with statutory requirements; and h) A protocol for periodic review of the plan. 	<ul style="list-style-type: none"> a) Section 3, 4 and 5; b) <ul style="list-style-type: none"> (i) Section 6, 7.2, 7.3, 10, 11.8 and 11.9; (ii) Section 6, 8.2 and 11.5; (iii) Section 8.2 and 11.5; c) Section 7, 8, 9, 10.5, 11.10, 11.11; d) <ul style="list-style-type: none"> (i) Section 8.2, 10.6 and 11.7; and (ii) Section 10.6 and 11.7; e) Section 11; f) Section 12.2; g) <ul style="list-style-type: none"> (i) Section 12.2; (ii) Section 12.2; (iii) Section 12.2; and h) Section 12.1. 	<ul style="list-style-type: none"> a) Includes known site conditions, summarised remaining contamination issues and conceptual site model; b) <ul style="list-style-type: none"> (i) Each section covers any relevant approval and/or license for each type of contamination management activity; (ii) Specifies adopted criteria to be used for assessment and validation; (iii) Specifies sampling and validation plans and the decision questions needing to be answered for each different type of assessment/validation; c) Specifies the details of each management plan as required by GHD (2016) and the Condition of Consent B134 and B135; d) <ul style="list-style-type: none"> (i) Each section describes the sampling analysis and reporting program for each contamination issue requiring management; and (ii) The sampling and validation programs will report on the effectiveness of the any of the management measures; e) Details the Unexpected Finds Procedure in relation to contamination; f) Continual improvement for the CMP is discussed; g) <ul style="list-style-type: none"> (i) Specifies how incidents and non-compliances will be managed; (ii) Specifies how complaints in relation to contamination will be managed; (iii) Specifies how non-compliance to statutory requirements will be managed; and i) Specified how the CMP will be reviewed/updated.

Table 2 – Conditions of Consent (CoC)			
CoC	Requirement	Document Reference	How Addressed
B133	Prior to any demolition on the site, and entry and any subsurface activities within the southern burial pits, an UXO, EO and EOW Site Assessment Survey must be undertaken by a UXO contractor listed on the Defence Panel of suitably qualified UXO consultants and contractors and submitted to the Secretary.	Section 9 Appendix C	G-tek a Defence Panel qualified UXO consultant, were engaged to review historical reports and additional works conducted by them in 2003 within the Southern Burial Pits and concluded “...the requirements of CoC B133 are met and that no additional UXO, EO or EOW Site Assessment Surveys are required within the MPE Site prior to any demolition, entry or subsurface activities.
B134	Prior to early works and fill importation, a Contamination Management Plan must be prepared to the satisfaction of the Secretary and form part of the Construction Environmental Management Plan (CEMP) required under condition C1. The Contamination Management Plan is to be based on the Environmental Management Plan prepared by GHD (2016) and results of the UXO, EO and EOW Site Assessment Survey and must take into account additional risks posed by the proposed works and in particular: <ul style="list-style-type: none"> (a) excavation within the southern burial pits; (b) removal/remediation of underground storage tanks; (c) disturbance of soil containing asbestos material; and (d) demolition of buildings containing asbestos materials. 	This plan. GHD 2016 – Sections 1.1, 4, 4.1 and 5 and Appendix A UXO, EO and EOW – Section 4.2, 9 and Appendix C a) Section 9 and 11 b) Section 8 c) Section 7 and 10 d) Section 10.7	This plan forms a sub-plan to the CEMP. This CMP has been developed based on the EMP (GHD 2016), whereby the DNSDC conceptual site model and the remaining contamination issues presented within the EMP have been incorporated for management into this plan. As per Section 1.6 of GHD (2016) the EMP required amendment should the Site be redeveloped. The Site is currently the subject of two State Significant Development (SSD) approvals, SSD 6766 MPE Stage 1 (approved) and SSD 7628 MPE Stage 2. The EMP (GHD 2016) was updated and reported in EP Risk (2018a). The GHD (2016) EMP was reviewed and endorsed by the NSW EPA Site Auditor (JBS&G 2016a). The CMP has been prepared with reference to CoC B133, see comments above. Additional risks will be managed as follows: <ul style="list-style-type: none"> a) Based on the above assessments and reviews, G-tek (2018a¹² and 2018b¹³) concluded the MPE Site, including the southern burial pits, was designated as a ‘low risk’ UXO site because on past assessment and remediation activities and the lack any UXO finds. The area will be managed as per Section 9 and 11. b) A plan has been provided in the CMP. c) The Asbestos Management Plan (AMP) details how Asbestos impacted soils should be managed. Additionally, Section 7 details how known impacts of Asbestos will be managed. d) A plan has been provided in the AMP.

Table 3 – Conditions of Consent (CoC)			
CoC	Requirement	Document Reference	How Addressed
B135	<p>The Contamination Management Plan must include:</p> <ul style="list-style-type: none"> (a) an UXO, EO and EOW management and remediation plan, prepared by a qualified person(s) listed on the Defence Panel; (b) an Asbestos Management Plan; and (c) Unexpected Finds Procedure. <p>The Contamination Management Plan must be approved by a NSW EPA Accredited Site Auditor prior to submission to the Secretary.</p>	<ul style="list-style-type: none"> a) Section 9 and Appendix C b) Section 10 c) Section 11 <p>Appendix E</p>	<p>All plans provided in the Sections referenced and the CMP have been approved by the NSW EPA Accredited Site Auditor (Appendix E)</p>
B136	<p>Following demolition, a supplementary UXO, EO and EOW Site Assessment Survey is to be undertaken and an updated Contamination Management Plan is to be prepared to the satisfaction of the Secretary to address any additional contamination issues identified. Remediation works must only be carried out by suitably qualified and experienced contractor(s) including a contractor listed on the Defence Panel in the case of UXO, EO and EOW.</p>	<p>Section 9</p>	<p>Following demolition of the existing buildings (Figure 3), a supplementary UXO, EO and EOW Site Assessment Survey is to be undertaken by a qualified contractor listed on the Defence Environment and Heritage Panel (DEHP) as a D2. D2 companies can undertake UXO related materials assessment and management.</p> <p>The Site Assessment Survey will be conducted underneath the buildings in accordance with similar methodologies conducted during previous historical assessments (G-tek 2003) (Appendix C).</p>

¹² G-tek 2018a, CoA B133 – Moorebank Precinct East – Tactical, G-tek Australia Pty Limited, 9 February 2018

¹³ G-tek 2018b, Unexploded Ordnance (UXO) Management Plan for Moorebank Precinct East Stage 2 Development Site, G-tek Australia Pty limited, 15 February 2018.

1.3 Objectives

The objectives of this CMP are to meet the requirements of Conditions of Consent B134 and B135 and provide procedures to manage the following remnant contamination issues during the Site construction activities:

- Excavation within the southern burial pits – lead and asbestos containing materials (ACM);
- Removal/Remediation of Understorey Storage Tanks (UST);
- Disturbance of soil containing asbestos material; and
- Demolition of buildings containing asbestos materials.

As per Condition of Consent B135 the CMP will also include the following management plans:

- An unexploded ordnance (UXO), Exploded Ordnance Waste (EOW) and explosive waste (EO) Management and Remediation Plan prepare by G-tek Australia Pty Ltd (G-tek) a qualified member of the Defence Panel - procedures required for handling and disposing of any identified UXO, EOW or EO during the development;
- Asbestos Management Plan (AMP) - procedures required for handling and disposing of any identified ACM and asbestos impacted soils during the development; and
- Unexpected Finds Procedure (UFP) - provide an appropriate framework for identifying and addressing any discovery of chemical contamination, potentially explosive ordnance or any other form of hazard during development so as to ensure a safe working environment for workers and to avoid unacceptable impact on the natural environment.

Additionally, as per Condition of consent B136, following demolition, a supplementary UXO, EO and EOW Site Assessment Survey is to be undertaken and an updated Contamination Management Plan is to be prepared to the satisfaction of the Secretary to address any additional contamination issues identified. Remediation works must only be carried out by suitably qualified and experienced contractor(s) including a contractor listed on the Defence Panel in the case of UXO, EO and EOW.

The successful implementation of the CMP requires the appropriate briefing and Specific Work Health and Safety (WHS) induction of site workers who may uncover potential chemical contamination (including potential asbestos containing materials) and/or explosive ordnance. It is proposed this briefing will include the review of this CMP and the associated flow chart (**Appendix D**).

This CMP describes reporting procedures and lines of responsibility, including the contact numbers for relevant experts at the commencement of the development works (See **Section 1.5**). These experts should include those with detailed knowledge of the of the Site, and access to, the supporting documents related to the assessment of the Site.

The Site has been audited and declared suitable for the intended use (JBS&G 2016a, Aecom 2016a and Aecom 2016b) or can be made suitable (Golder 2016c and Enviroview 2016) and remnant contamination, if present, is most likely to be discovered during the development earthworks. The approaches included in this CMP are intended for use only during the Site preparation phase of development, during which structures are demolished and disposed of, land levels are altered and redundant infrastructure is removed and new infrastructure is installed and has been generally based

on the DNSDC EMP (GHD 2016) Post-construction management plans, if required, would be administered through the relevant local government authority or the NSW Department of Planning.

1.4 Scope of Work

The scope of work undertaken to achieve the CMP objectives comprised the following:

1. Review of existing documentation; and
2. Preparation of this CMP in general accordance with the requirements of NSW legislation, NSW EPA and Safe Work NSW Codes of Practice.

1.5 Roles and Responsibilities

Provided in the tables below are the terminology and roles and responsibilities relevant to the Site

Table 4 – Responsibilities for CMP Implementation	
Position and Company/Entity	Responsibilities
Client	<p>QUBE c/o of Tactical.</p> <p>The owner of the Site.</p> <p>Responsible for the overall management of the Site and the engagement of the Principal Contractor and Environmental Consultant.</p>
Principal Contractor	<p>TBA</p> <p>-----</p> <p>Means the contractor in primary control of the Site. Responsible for notifying the client, appropriate consultant or contractor in relation to unexpected finds. Also responsible for quarantining AOC with suitable barricades and informing other workers of its location.</p>
Environmental Consultant	<p>TBA</p> <p>-----</p> <p>As defined under the NEPM (NEPC 2013) (Schedule B9) the environmental consultant responsible for the assessment of contaminated sites and preparation of assessment reports should be able to demonstrate relevant qualifications and experience to a level appropriate to the contamination issues relevant to the site under investigation.</p> <p>The environmental consultant is to have a certified practitioner recognised by one of the certifying bodies recognised by the NSW EPA. Any reports prepared should be 'signed off' by the individual certified practitioner.</p> <p>-----</p> <p>Responsible for notifying the Client and Principal Contractor of any unexpected finds. Also responsible for undertaking the assessment, remediation and validation of any AOC in relation to chemical contamination. Additionally, responsible for engaging the Ordnance contractor.</p>
Ordnance Contractor	<p>Persons and/or company appropriately qualified to undertake ordnance searches, clearances and prepare reports. Responsible for undertaking ordnance searches, removal of items and clearances.</p> <p>The ordnance contractor is to be a qualified contractor listed on the Defence Environment and Heritage Panel (DEHP) as a D2 and/or F2.</p>

Licensed Asbestos Assessor	<p>TBA</p> <p>-----</p> <p>Means a person who holds an asbestos assessor licence. Responsible for final clearances after asbestos removal works are undertaken.</p>
Licensed asbestos removalist (Asbestos Removal Contractor)	<p>Means a person conducting a business or undertaking who is licensed under the WHS Regulation to carry out Class A or Class B asbestos removal work. Responsible for the safe removal of asbestos of any AOC in accordance with the relevant legislation and codes of practice.</p>
Asbestos Consultant / Competent Person	<p>A person who has acquired through training or experience the knowledge and skills of relevant asbestos removal industry practice and holds a certification in relation to the specified vocational education and training (VET) course for asbestos assessor work or a tertiary qualification in occupational health and safety, occupational hygiene, science, building, construction or environmental health. For all other purposes, competent person means a person who has acquired through training, qualification or experience, the knowledge and skills to carry out the task.</p>
Remediation Contractor	<p>TBA</p> <p>-----</p> <p>Persons and/or company appropriately qualified to undertake the required remediation works and has the appropriate insurances and licences. Responsible for undertaking remedial works in accordance with any developed remediation action plans or strategies.</p>
Worker	<p>Any worker on the Site, including any contractor or sub-contractor. Responsible for undertaking their tasks in a safe manner and notifying the Principal Contractor if they see any items/conditions which may constitute an unexpected find.</p>

2 Site Identification

The site identification details are presented in **Table 5**.

Table 5 – Site Identification	
Item	Description
Site Address	Stage 2 Moorebank Precinct East, 400 Moorebank Avenue, Moorebank, NSW (see Figure 1 and Figure 2)
Legal Description	Part Lot 1 DP 1048263 (Former Defence National Storage and Distribution Centre (DNSDC)). Part Lot 2 DP 1197707 (Moorebank Avenue). Part Lot 1 DP 1197707 (Portion of Moorebank Precinct West (MPW)). Part Lot 4 DP 1197707 (Portion of Butchers Knife).
Approximate Site Area	67 Hectares
Site Owner	Sydney Intermodal Terminal Alliance (SIMTA), a consortium comprising Qube and Aurizon Holdings.
Municipality	Liverpool City Council
Site Zoning	IN1 General Industry

3 Site Conditions and Surrounding Environment

The Site, is located approximately 27 km south-west of the Sydney Central Business District (CBD) and approximately 26 km west of Port Botany. The Site is situated within the Liverpool Local Government Area (LGA), in Sydney's South West subregion, approximately 2.5 km from the Liverpool City Centre. The Site is located approximately 800 m south of the intersection of Moorebank Avenue and the M5 Motorway. The location of the Site is shown in **Figure 1**. The boundary of the Site is shown in **Figure 2**.

3.1 Current and Proposed Land Use

Currently the Site is predominately vacant pending development approval. The Site is being utilised to store imported fill materials on the central eastern boundary and also contains offices and amenities to support the development works in both Stage 1 and 2 for the MPE. The Moorebank Avenue portion is currently still utilised as a roadway.

As discussed in **Section 1.1** the proposed future use of the Site is for an IMEX Intermodal Facility.

3.2 Site Description and Surrounding Land Use

GHD (2016) reported the Site is mostly located within Part Lot 1, DP 1048263, which formerly contained the DNSDC site and is characterised by:

- Concrete and bituminous concrete access roads providing access to a number of enclosed warehouse/storage structures.
- Existing buildings.
- Open storage/parking areas bordered by various open grassed areas.

The Moorebank Avenue portion (Part Lot 2 DP 1197707) of the Site has historically and is currently a road alignment.

The Butchers Knife portion (Part Lot 4 DP 1197707) is currently vacant vegetated land with dirt vehicle tracks. Historically the area was part of the former DNSDC site.

The MPW portion (Part Lot 1 DP 1197707) was part of the former School of Military Engineering (SME) used for military training purposes.

Existing buildings and features on the Site are shown on **Figure 3**.

The Site lies predominantly to the north and east of the MPE Stage 1 Site and includes the area presented in **Figure 2**. The eastern portion of the Site includes a variety of buildings which have been previously used to store various items, including batteries, electrical equipment and chemicals. The area in the north east corner of the Site is currently being used for the storage of vehicles.

The area immediately east of the Stage 1 MPE Site included the following now demolished buildings:

- Storehouse – B6 including a wastewater UST located on the northern side of the building.
- Palletised stores used to store larger pieces of equipment (i.e. B07, B09).
- Dangerous goods stores (i.e. B25 and B26). These stores are large open warehouses used to store dangerous goods including solvents, fuels, lubricants and compressed gas. The

warehouse floors are concrete lined and bunded. B26 formerly stored AFFF and is the location of the PFAS Investigation Area (**Figure 3**);

- Bulk pallet silos (i.e. B10, B11, B17, B18) reportedly used for sorting and packing materials and equipment; and
- Former storage of radioactive materials – Building 27.

A summary of each of the remaining buildings is presented below

- A portion of B16 that was reported to have been used as a treatment and preservation (T&P) area. This building was noted to have solvent dipping and water rinsing tanks for cleaning equipment, as well as solvent tanks that drained into above ground storage tanks. Two underground oil/water separator or interceptor pits were reported to be observed near the entrance of the T&P area.
- Building 032: Former explosives store.
- Timber post and beam stores (i.e. B33, B34, B35, B39, B40, B44, B45, B46 and B48) used to store miscellaneous items such as radio equipment, timber, steel.
- Building 037: Artisans Workshop Carpenter Facility.
- Building 049: Battery Shop Mechanical - Waste water UST located on the western side of the building.
- Building 053: Storehouse Bulk - Septic UST located on the southern side of the building.
- Building 067: Weapons Store - Waste UST from weapon degreasing pits and firing range sand pits.
- Building 068: Weapons store.
- Building 069: Electrical Repair Facility.
- Building 070: Electronic Instrument Repair and Plant Room.
- Building 071: Amenities.
- Building 072: Electricals Store.
- Building 073: Storehouse (Mechanical).
- Building 074: Amenities.
- Building 075: Mechanical Store.
- Building 079: Testing Shed (Generators) GE - potential UST to the west of B75.
- Building 080: Repair Facility (General Engineering) - Waste oil UST and trade waste UST.
- Building 082: Storehouse - Waste water UST located on the eastern side of building.
- Building 083: Paint Shop.
- Building 084: Flammable Liquids Store.

- Building 088: Wash Point - Vehicle parking area and loading platform.
- Building 91: OH&S Facility.
- Building 92: Offices.
- Building 93: Unknown.
- Southern burial pits – former Hand Grenade Range used for training. G-tek (2018a) reported EOW present and remediated.
- Rail Spur in south of Site - raised rail track located in the middle of the MPE Site in a north-south alignment.
- An open, grassed elevated area east of warehouses B40 and B45 that was once used as a magnetic store yard but now is being used to stockpile imported fill materials for the development. Approved as part of the MPE Stage 1 works but stored within the Stage 2 Site.
- A portion of the northern area reportedly underlain by areas of historical waste disposal (Arcadis 2016) - Board of Survey disposal area used to “burn, bash and bury” waste which was reportedly largely removed for appropriate disposal in the mid-1990s.
- East of B53 and B54 - 21 Supply Battalion disposal area – noted to potentially have been remediated during the construction of the DNSDC. Reported to have been used to “burn, bash and bury” World War II waste material (Arcadis 2016).

The areas of interest as reported in Aecom (2016a) and Golder (2016a) relating to the Moorebank Ave portion (**Figure 3**) of the Site are:

- Investigations of the potential contamination risks associated with the Moorebank Avenue identified LNAPL on the groundwater beneath Moorebank Avenue in the vicinity of the former DNSDC Refuelling Facility.
- Arcadis (2016) reported the part of northern portion of this portion of the Site was reported to have historically been used for Explosive Ordnance Demolition (EOD) and a dog training area. As such, it was considered there was a low possibility of this portion of the Site being impacted by explosives, UXOs and metals.

The area of interest as reported in Aecom (2016b) and Golder (2016b) within the portion of the Butchers Knife located in the Site is an extension of the lead impacts identified adjacent the rail spur (**Figure 3**).

The area of interest as reported in Golder (2016c) adjacent the portion of the MPW Site located in the Site (**Figure 3**) is an area of anthropogenic fill predominately impacted with buried wastes and geotechnically unsuitable fill materials.

It should be noted the remediation and validation activities within the MPW Site are ongoing.

The land surrounding the Site comprises:

- The MPW Site, formerly the School of Military Engineering (SME), on the western side of Moorebank Avenue directly adjacent to the Site.

- The East Hills Rail Corridor to the south of the Site, which is owned and operated by Sydney Trains.
- The Holsworthy Military Reserve, to the south of the East Hills Rail Corridor, which is owned by the Commonwealth; The Boot Land, to the immediate east of the Site between the eastern boundary and the Wattle Grove residential area, which is owned by the Commonwealth.
- The southern Boot Land, to the immediate south of the MPE Site between the southern site boundary and the East Hills Rail Corridor, which is owned by the Commonwealth.
- Glenfield Waste Services, south-west of the Site.

3.3 Topography

As reported by Acardis (2016) the existing topography of the Site is defined by a ridge, which runs along the central portion of the MPE Site, running parallel to Moorebank Avenue. This ridge results in surface water drainage flowing in an easterly direction towards Anzac Creek to the east of the ridge and towards Moorebank Avenue and the Georges River to the west.

The surface drainage regime of the MPE Site is divided into three internal catchment areas and two smaller offsite upstream catchments that drain onto the MPE Site. All surface water runoff within the MPE Site is collected through an existing drainage system comprising a mixture of concrete and open channels and discharged to three drainage outlets. Two outlets (Outlets A and B) discharge eastward into Anzac Creek, while the remainder of flows are collected and discharged into the Georges River via the neighbouring MPW Site from Outlet C.

3.4 Hydrology

The closest significant water body to the Site is the Georges River, located approximately 700 m to the west of the Proposal site. The Georges River flows through to Lake Moore, which is situated approximately 2.5 km north, north east of the Site, and into Chipping Norton Lake, located approximately 5.6 km north east of the Site. The Site is situated near the upstream portion of Georges River, which flows in a general north, then east / south easterly direction towards Botany Bay which is located approximately 20 km south south-east of the Site (GHD 2016).

Other surface water bodies identified in the surrounding area include:

- Anzac Creek, located approximately 250 m to the south and east of the Site. Anzac Creek is eastwest aligned and flows generally north-east to its confluence with the Georges River, approximately 5 km north of the Site. The western extent of Anzac Creek appears to exist in the former Royal Australian Engineers (RAE) Golf Course on the western side of Moorebank Avenue (within the MPW Site), where the creek appears to have been modified into a series of water features (dams/ponds).
- Another series of dams/ponds are visible on the northern portion of the Moorebank Precinct situated to the west of Moorebank Avenue. The visible bodies range in shape, area and distance from the Site as follows:
 - A rough rectangular shaped pond is present with an approximate area of 550 m², situated approximately 300 m to the west of the boundary of the Site.

- A circular body of water is present with a diameter of 60 m, and an approximate area of 3000 m². This pond is situated approximately 100 m to the west of the Site.

3.5 Geology

The Site is reported to be underlain by Tertiary fluvial deposits comprising clayey sand and clay, as well as silty clay with some ironstone Arcadis (2016). Clay is present to depths of at least 10 m to 12 m BGS. Surface cover material overlying the clay includes silty sand topsoil to approximately 0.3 m BGS and clay fill to variable depth between 0.5 m and 1.5 m BGS.

Additionally, Arcadis (2016) reported surface material and fluvial deposits are underlain at depth by shale associated with Ashfield Shale deposits. Registered bores immediately west of the Georges River, associated with the Glenfield Waste Facility, indicate sandy clay and sands to 10 m BGS overlying shale to 20 m BGS overlying sandstone to 30 m BGS. Furthermore, Arcadis (2016) noted shale bedrock was encountered in the eastern portion of the Site, while sandstone bedrock was reported in the southern portion of the Site.

3.6 Hydrogeology

GHD (2016) reported the regional geology consists of Tertiary aged fluvial deposits of clayey quartzose sand clay overlying a thin band of Middle Triassic ages Ashfield Shale of the Wianamatta Group overlying Hawkesbury Sandstone.

Arcadis (2016) reported that groundwater was intercepted at varying depths across the Site, though generally found between 4 m BGS and 5 m BGS. Groundwater was noted within a number of geological units including the fill material, shale and sandy clays. Groundwater is expected to flow in a westerly or north-westerly direction towards the Georges River.

Arcadis (2016) reported deeper groundwater generally exhibited high salinity and therefore has little or no beneficial use. Shallow groundwater was reported having lower salinity, potentially as a result of local recharge via surface infiltration.

4 Previous Environmental Works

A number of investigations and related works have been undertaken at the Site since the 1980s. The following reports related to the works completed since 2000 were made available for Arcadis (2016) to review:

- Egis (2000) Preliminary Site Investigation at the Defence National Supply and Distribution Centre, Moorebank Defence Lands, September 2000.
- Graham Brooks and Associates (2002) Heritage Assessment Defence National Storage Distribution Centre (DNSDC) Moorebank Defence Site, Moorebank, October 2002.
- URS (2002a) Assessment of DNSDC Buildings – Supplement to Egis 2000 Stage 1 Preliminary Site Investigation of Areas A1 to A6, March 2002.
- HLA (2002) Soil and Groundwater Investigation, Precinct H (DNSDC), Moorebank Defence Lands, November 2002.
- URS (2002b) Investigation Review Report DNSDC, Moorebank Defence Lands, 10 December 2002.
- Contamination Management (CM 2002) Summary Site Audit Report and Site Audit Statement, DNSDC Site, Moorebank, December 2002.
- Environmental and Earth Sciences (EES 2002a) Memorandum: Review of Reports Pertinent to Environmental Investigations Conducted at DNSDC, Moorebank, NSW, 12 December 2002.
- EES (2002a) Memorandum: Review of Investigation Review Report DNSDC, Moorebank Defence Lands (URS) and Site Audit Statement WRR118 (Dr William Ryall), 16 December 2002.
- Milsearch (2002) Ordnance Investigation, 2002.
- Douglas Partners (DP 2009) Summary Environmental Conditions, Proposed Intermodal Freight Terminal, DNSDC Site – Moorebank Avenue, Moorebank, December 2009.
- GHD (2015a) DNSDC Moorebank Intrusive Site Investigations, September 2015.
- GHD (2015b) DNSDC Moorebank – Refuelling Area Remedial Action Plan. Report Ref. PRECQPMS- EN-RPT-0007, November 2015. GHD (2016) Former DNSDC, Moorebank NSW Environmental Management Plan, July 2016.
- Golder (2016a) Moorebank Avenue Site Management Plan. Report Ref. 147623070_052-Rev1, 4 July 2016.
- Aecom/Frank Mohen (Aecom 2016a) Site Audit Report and Site Audit Statement Lot 2 DP 1197707, part of Moorebank Avenue, Moorebank, NSW. Report Ref. 60493006, 13 July 2016.
- Golder (2016c) Moorebank Intermodal Company Property West Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan, Golder Associates, 9 August 2016.
- Golder Associates (Golder 2016b). Contamination Summary Report, Remedial and Site Management Plan– Butchers Knife, Moorebank Intermodal Terminal. Document No. 147623070-055-R-Rev2, 10 August 2016.

- Aecom/Frank Mohen (Aecom 2016b) Site Audit Report and Site Audit Statement - Butchers Knife Part Lot 4 DP 1197707, Moorebank, NSW. Report Ref 60507697, 12 August 2016.
- Enviroview (2016) Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan, Enviroview Pty Ltd, Letter to Tactical Group dated 22 August 2016 from Mr James Davis.
- GHD (2016) Department of Defence Former DNSDC Moorebank NSW Environmental Management Plan, GHD Pty Ltd.
- JBS&G (2016a) Site Audit Statement and Report 0503-1611-R Part Lot 1 in DP 1048263 Former Defence National Storage and Distribution Centre (DNSDC) Moorebank Avenue, Moorebank, NSW, 12 October 2016.
- JBS&G/Andrew Lau (JBS&G 2016b) Site Audit Report and Site Audit Statement 0503-1615 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW. Report Ref. 51732-105413, 13 October 2016.

The Site Audit Reports listed above for each of the respective portions of the Site and the RAP for the MPW Site summarise the remaining contamination issues across the whole of these sites. **Section 4.1** below presents a discussion of the remaining contamination issues within the Site based on the historical reports listed above.

The Conceptual Site Model (**Section 5**) summaries the remaining contamination issues on the Site which will be managed under this CMP.

4.1 Remaining Contamination Issues

Former DNSDC

The former DNSDC is located wholly within the Site boundary and excludes the Stage 1 MPE portion (**Figures 2 and 3**).

GHD (2016) identified the following contamination issues required management under the CMP:

- Elevated concentrations of lead in the Rail Spur within the Southern portion of the Site.
- Fragments of ACM were noted on the ground surface and shallow soils at several locations across the Site most notably in the southern portion of the site associated the Southern Burial pits which extend off site to the south and adjacent to the Rail Spur. The potential for widespread presence of ACM on the surface across this portion of the Site cannot be discounted.
- GHD (2016) considered there was a potential risk of UXO or EOW in the southern burial pits in the southern portion of the Site.

Moorebank Avenue

A portion of Moorebank Avenue is located within the Site boundary (**Figures 2 and 3**).

Golder (2016a) identified the potential contamination risks associated with the Moorebank Avenue as LNAPL on the groundwater beneath Moorebank Avenue in the vicinity (west) of the former DNSDC Refuelling facility.

The RAP of the former refuelling facility has been documented in GHD (2015b¹⁴). The former refuelling facility has been the subject of a Site Audit (JBS&G 2016b¹⁵) where it was concluded that the land subject to the audit can be made suitable for commercial/industrial land use subject to the implementation of this RAP.

The presence of the LNAPL necessitated the preparation of a SMP to allow ongoing use of Moorebank Avenue as a publicly accessible road alignment and to facilitate the future development of Moorebank Avenue for commercial/industrial land use until such time the LNAPL and associated dissolved phase groundwater contamination can be remediated (Golder 2016a).

The Golder (2016a) SMP has been prepared to document the management of the identified LNAPL contaminated groundwater located beneath Moorebank Avenue downgradient of the former DNSDC refuelling facility, referred to as the *exclusion zone* (**Figure 3**) and has been prepared assuming ongoing use as a publicly accessible road alignment and its future development.

¹⁴ DNSDC Moorebank – Refuelling Area Remedial Action Plan, GHD, November 2015 (GHD 2015b).

¹⁵ Site Audit Report and Statement 0503-1615 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW, JBS&G Australia Pty Ltd, 13 October 2016 (JBS&G 2016b).

Therefore, based on the above, under this CMP the *exclusion zone* is to be managed in accordance with the Golder (2016a) SMP (**Appendix A**).

Butchers Knife

Two portions of the Butchers Knife are located within the Site (**Figure 2**).

Aecom (2016b) reported a review of previous investigations by Golder (2016b) identified a potential for future Site users to be exposed to soils impacted with lead and asbestos and to potentially negatively influence the migration of petroleum hydrocarbon-impacted groundwater identified to the north of the Site (former DNSDC refuelling facility) through uncontrolled excavation and/or groundwater extraction.

Given the former refuelling facility is not located within the Site and is being remediated/managed in accordance with GHD (2015b) and the proposed development within the Butchers Knife portion of the Site will not include uncontrolled excavation and/or groundwater extraction, the remaining contaminants of concern which require management during construction, in accordance with this CMP, are associated with the soils and comprise lead, asbestos and unexpected finds of UXO, EOW and EO from burial/waste sites.

- Lead in the vicinity of the Rail Spur (**Figure 3**) (TP062);
- Unexpected finds of bonded asbestos within surface and/or fill materials; and
- Unexpected finds of UXO, EOW and EO within surface and/or fill materials.

MPW Site

A portion of the MPW site is located within the Site (**Figure 2 and 3**).

Overall, the MPW Site has a number of site contamination issues being managed under a RAP (Golder 2016c); one anthropogenic fill area is located proximal to the Site.

As mentioned in **Section 1.1** any legacy PFAS in groundwater issues are being managed separately.

Furthermore, it is noted groundwater impacts from the former DNSDC Refuelling facility are located within this portion of the MPW Site as the *exclusion zone* is located upgradient (Golder 2016a) (**Figure 3**). As discussed above the remediation of the former refuelling facility is ongoing under the RAP (GHD 2015b). Even though this area of the Site is not located within the *exclusion zone* reference to the SMP (**Appendix A**) should be undertaken during works within this area.

It is noted the proposed development works within this portion of the MPW Site are for temporary road re-alignment and excavation to depths intersecting groundwater (>8 m below ground surface) is unlikely.

All remedial works being conducted within the MPW Site in accordance with Golder (2016c) will be reported within a validation report. This report will be reviewed by the Site Auditor, Mr James Davis (Enviroview).

Known contamination within this portion of the Site will be managed in accordance with the RAP (Golder 2016c) (**Appendix B**).

Any unexpected finds within the portion of the MPW Site located in the Site will be managed in accordance with this CMP.

Summary

Overall, based on the review of the recent Site Audits (JBS&G 2016a, JBS&G 2016b, Aecom 2016a and Aecom 2016b) the following known contamination issues remain with the Site and require management:

- Lead at TP062 0.7-1.9 m BGS, located within the Site, east of B26 along the rail spur.
- ACM in shallow fill at TP062, TP056 and BH107 (within the Site) and extending off-site to the south.
- Potential risk of UXO or EOW relating to the southern burial pits in the southern portion of the Site.
- LNAPL on top of groundwater within the *exclusion zone* located underneath Moorebank Ave.
- LNAPL on top of groundwater within the MPW portion of the Site to the west of the *exclusion zone*.

JBS&G (2016a) noted relatively limited sampling had been conducted beneath the remaining buildings, but the soil data from the audited area as a whole did not indicate any additional contamination issues were likely to be present. Should existing building slabs / pavements be removed, then the requirements in the CMP relating to the management of asbestos / lead / UXO / EOW, or any other forms of contamination as directed by the unexpected finds protocol, should be adhered to.

4.2 Southern Burial Pits - UXO

As reported in G-tek (2018a) (**Appendix C**) the Milsearch (2002) report indicated scattered inert remnants from functioned 36M hand grenades were present within the southern burial pits. As a result of the Milsearch (2002) report, Defence contracted G-tek (2003a¹⁶ and 2003b¹⁷) to conduct remediation of the south-east portion of the DNSDC to remove any potential material the size of a 36M hand grenade. This remediation was conducted through electromagnetic digital imaging of the Site, data processing and interpretation and intrusive investigation of interpreted anomalies. G-tek (2018a) reported the Southern burial pits were remediated for potential UXO, EOW and EO in 2003 and no additional UXO, EO or EOW Site Assessment Surveys are required within the southern burial pits prior to any demolition, entry or subsurface activities within the area.

Subsequent G-tek (2003 and 2018a) investigations revealed a training Hand Grenade Range was established south of the former DNSDC during World War Two (WWII). It would appear this area was the source of the EOW contaminated soil rather than Anzac Rifle Range. The former Hand Grenade Range area has also been remediated for UXO by Defence.

Based on the above assessments and reviews G-tek (2018a and 2018b) concluded the MPE Site, including the southern burial pits, were designated as a 'low risk' UXO sites because of past assessment and remediation activities and a lack any UXO finds evidence.

With the risk categorisation as 'low', intrusive works and redevelopment can take place with the following controls implemented:

- UXO awareness induction to be provided to all on-site personnel.
- Appropriate 'Unexpected Finds Protocol' to be implemented (**Appendix D**).
- UXO potential noted in any intrusive works contractors Safe Work Method Statements (SWMS)/Job Safety Analysis (JSA) or similar safety document.
- An UXO contractor member of the Department of Defence Environment and Heritage Panel 2014 – 19 (DEHP) will be appointed to the project team to provide support and callout response as required to potential UXO "finds".

¹⁶ Post Activity Report Hazard Reduction Precinct H, Moorebank Defence Land Moorebank NSW, G-tek Australia Pty Ltd, October 2003 (G-tek 2003a).

¹⁷ Post Activity Report Hazard Reduction Precinct I, Moorebank Defence Land Moorebank NSW, G-tek Australia Pty Ltd, October 2003 (G-tek 2003b).

5 Conceptual Site Model

The information in this section together with the figures included in this report aid in presenting a CSM for the Site, based on a review of relevant background historical site information sourced from GHD (2016) and Golder (2016a and 2016b).

The National Environment Protection (Assessment of Site Contamination) Measure, NEPC, 1999 (as amended 2013, NEPC 2013) identifies a CSM as a representation of site related information regarding contamination sources, receptors, and exposure pathways between those sources and receptors. The development of a CSM is an essential part of all site assessments and remediation activities.

NEPC (2013) identified the essential elements of a CSM as including:

- Known and potential sources of contamination and contaminants of concern including the mechanism(s) of contamination.
- Potentially affected media (soil, sediment, groundwater, surface water, indoor and ambient air);.
- Human and ecological receptors.
- Potential and complete exposure pathways.
- Any potential preferential pathways for vapour migration (if potential for vapours identified).

5.1 Sources and Contaminants of Concern

Following a review of the findings of intrusive investigations and in which AOCs were investigated and assessed, the remaining AOCs and COPCs have been identified in **Table 4** and presented in **Figure 3**.

Table 6 – Areas of Identified Environmental Concern and Associated Contaminants of Concern	
AOC	Contaminants of Potential Concern (COPC)
General site areas where filling may have occurred. Under building slabs	As per GHD (2016) (Appendix A) Unexpected Finds TPH PAHs OCPs/OPPs PCBs Asbestos Metals

Table 6 – Areas of Identified Environmental Concern and Associated Contaminants of Concern	
AOC	Contaminants of Potential Concern (COPC)
TP062 – 0.7 to 1.9 m below ground surface (6 m x 20 m and 2 m deep) – Figure 3	As per GHD (2016) (Appendix A) Lead Bonded ACM
TP056 - approx 0.5 m (5 m x 5 m) – Figure 3 BH107 - Building 32 (surface) (5 m x 5 m) – Figure 3	As per GHD (2016) (Appendix A) Bonded ACM
Southern burial pits	As per GHD (2016) (Appendix A) Unexpected finds TPH PAHs OCPs/OPPs PCBs Asbestos Metals
MPW and Moorebank Avenue portion of Site – former refuelling Facility	As per Golder 2016a and 2016b (Appendix A) Unexpected Finds LNAPL TPH PAHs VOCs Phenols Asbestos Metals
USTs (various locations across the Site) – Figure 3 and Section 3.2	As per GHD (2016) (Appendix A) TPH PAHs VOCs Phenols Asbestos Metals
PFAS Investigation Area (Vicinity of former B26)	PFAS – refer to SAQP (EP Risk 2018b)

It is noted the Moorebank Avenue portion of the Site (**Figure 3**) was formed as a roadway prior to the development of the MPE Site. As such, it is unlikely the Moorebank Avenue portion of the Site was subject to significant contaminating activities, with the exception of the hydrocarbon impacted groundwater migrating from the former refuelling facility south west of the Site. The contamination reported in this area should be managed in accordance with Golder (2016a) (**Appendix A**).

5.2 Potentially Contaminated Media

Potentially contaminated media present at the site may include:

- Fill material, including buried wastes;
- Surface soil (potential dust);
- Natural soils;
- Groundwater; and
- Stormwater/surface water.

5.3 Pathways

Potential pathways by which contamination could migrate towards an identified off-site receptor or present a potential exposure pathway to commercial/industrial site workers include:

- Direct contact.
- Inhalation of particulates.
- Solubilisation into groundwater and groundwater, potential discharge into Georges River.

5.4 Potential Receptors

The Site is currently undergoing construction in the Stage 1 MPE and approximately 6-12 buildings are tenanted, pending the approval of the Stage 2 commercial / industrial development. The potential receptors for contamination during development are considered to include:

- Construction and maintenance workers.
- Commercial workers on the site.
- Downstream ecological receptors – Georges River.

5.5 CSM Summary

Previous investigations conducted within the Site have not identified widespread residual contamination and as such, the risk posed by contamination on the Site is considered to be low. However, this finding does not preclude the possibility of encountering unexpected and incidental contamination during the development of the Site.

6 Adopted Assessment Criteria

6.1 Soil Criteria

For the purposes of assessing the results of analytical testing of soil at the Site, the following guidelines will be considered:

- NSW DEC (2017) Guidelines for the NSW Auditor Scheme (Third Edition).
- National Environment Protection Council (NEPC) 2013, National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), Canberra (ASC NEPM, 2013).
- Friebe, E & Nadebaum, P 2011, Health Screening Levels for Petroleum Hydrocarbons in soil and Groundwater. Part 1: Technical development document, CRC CARE Technical Report no. 10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia.

In accordance with the decision-making process for assessing urban redevelopment sites (Appendix A, NSW DEC, 2017), soil concentrations, where required, will be compared against the following soil investigation levels (SILs):

- **Health-based Criteria for the proposed land use:** ASC NEPM (2013) Health-based Investigation levels ('HILs') for commercial/industrial land uses, the Health Screening Levels ('HSLs') for commercial/industrial land uses and the CRC Care (2011) Soil Health Screening Levels for Direct Contact and Intrusive Maintenance Worker ('HSLs').
- **Environmental Criteria:** ASC NEPM (2013) Ecological Screening Levels ('ESLs') and Ecological Investigation Levels ('EILs') for commercial/industrial.
- **Management Limits:** ASC NEPM (2013) Management Limits for commercial/industrial land use ('Management Limits').
- **Aesthetics:** The consultant should also consider the need for remediation based on the 'aesthetic' contamination as outlined in Schedule B (1) of the ASC NEPM (2013) that states that *'there are no numeric Aesthetic Guidelines however site assessment requires balanced consideration of the quality, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity'*. Where required, soil odour and discolouration may need to be assessed.

6.2 Ground and Surface Water Criteria

Where required, for the purposes of assessing any results of analytical testing of surface water and/or groundwater at the Site, the following guidelines will be considered:

- NSW DEC (2017) Guidelines for the NSW Site Auditor Scheme (Third Edition);
- Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000), National Water Quality Management Strategy, Australian Water Quality Guidelines for the Protection of Aquatic Ecosystems (ANZECC/ARMCANZ, 2000);

- National Environment Protection Council (NEPC) 2013, National Environment Protection (Assessment of Site Contamination) Measure 1999 (April 2013), Canberra (ASC NEPM, 2013);
- Australian Drinking Water Guidelines, National Health and Medical Research Council (NHMRC 2016); and
- Contaminated Sites: Guidelines for the Assessment and Management of Groundwater Contamination, NSW DEC, March 2007 (DEC 2007).

Where required, the NEPM (2013) Groundwater Investigation Levels (GILs) for freshwater aquatic ecosystems would be adopted as one component of the surface water and/or groundwater investigation criteria for the Site. It is noted that the NEPM GILs apply to typical slightly to moderately disturbed systems and have been adopted from the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000), National Water Quality Management Strategy, Australian Water Quality Guidelines for the Protection of Aquatic Ecosystems (ANZECC/ARMCANZ, 2000).

Given the urban nature of the area where the Site is located, and the presence of a reticulated water supply, it is unlikely that surface water and/or groundwater in the area would be extracted for drinking water purposes. However, the NSW EPA (2015) Duty to Report Guidelines reference NEPC (2013) criteria, including NEPM (2013) Drinking Water criteria. Therefore, the any results would also be compared to the NEPM (2013) Drinking Water criteria.

Where required, to evaluate the potential risk posed from vapour intrusion (VI) from groundwater, analytical results would need to be compared to the NEPM (2013) HSLs for VI from groundwater. The NEPM HSLs have generally adopted the CRC Care HSLs for evaluation of VI risk posed from groundwater with some minor deviations. Based on the intended ongoing land use of the site being commercial/industrial, the analytical results will be compared to the clay HSL D criteria for VI.

The NEPM groundwater HSLs have been drafted as a screening tool to determine whether further investigation is necessary. This means should the identified concentrations be below the adopted HSLs then no further investigation is required. However, should the identified concentrations be above the HSLs it is noted this is a trigger value requiring further detailed assessment.

Where no criterion is available, the background levels (if known) or the laboratory limit of reporting can be adopted as the water criteria.

7 Remediation and Validation of Known Areas of Contamination

Prior to development works proceeding within the vicinity of the southern burial pits, Building 32 and the Rail Spur the following management and validation activities should be undertaken.

7.1 Areas of Concern

Excluding areas of ongoing PFAS investigation, three AOC remain within the Site which require excavation, waste disposal and validation (**Figure 3**).

- Around TP062 - lead and asbestos to approximately 2.0 m BGS.
- Around TP056 - asbestos to approximately 0.8 m BGS.
- Around BH107 – asbestos - surface (approximately 0.1 m BGS).

7.2 Management Strategy

Objective

The objective of these management activities will be to ensure the Site is suitable for the proposed land use.

Regulatory Requirements

Environment Planning and Assessment Act 1979 / SEPP55

The nature of management works is relatively straightforward, and it is considered most appropriate that development applications for remediation works are included with development application documentation for the associated earthworks as ancillary to other development.

Protection of the Environment Operations Act 1997 (POEO Act)

The proposed management/validation activities are not required to be licensed under the Protection of the *Environment Operation Act* 1997. None of the individual work stages are found to be greater than 3 hectares in area nor is there greater than 30,000 m³ of soils to be remediated, and hence do not trigger the licensing requirements.

Water Management Act 2000

A dewatering and re-injection approval is unlikely to be required from the NSW Office of Water (NOW) for any proposed management works. If dewatering is required as part of the works approval will need to be obtained prior to undertaking any works.

Protection of the Environment Operations (Waste) Regulation 2014

The Regulation provides requirements relating to non-licensed waste activities and waste transporting. The proposed works on the Site are unlikely to be required to be licensed.

Part 7 Section 78 of the Regulation stipulates special transportation, re-use or recycling requirements relating to asbestos waste and must be complied with regardless whether the activity is licensed.

Part 7 Section 79 of the Regulation stipulates reporting on transportation of asbestos waste solely in NSW and applies to the transportation of asbestos waste as defined in Schedule 1 Part 3 of the POEO Act.

Additionally, Section 79 stipulates the transporter of a load of asbestos waste must ensure that the occupier of any premises to which the transporter causes the load to be delivered is given the following information (in the prescribed form and manner) no later than on delivery:

- The unique consignment code issued by the NSW EPA in relation to that load.
- Any other information specified in the Asbestos and Waste Tyres Guidelines issued by the NSW EPA.

Section 80 of the Regulation relates to the disposal of asbestos waste and indicates the following:

- A person disposing of asbestos waste off the site at which it is generated must do so at a landfill site that can lawfully receive the waste.
- When a person delivers asbestos waste to a landfill site, the person must inform the occupier of the landfill site that the waste contains asbestos.
- When a person unloads or disposes of asbestos waste at a landfill site, the person must prevent:
 - any dust being generated from the waste; and
 - any dust in the waste from being stirred up.

Moreover, Section 81 of the Regulation stipulates a person must not cause or permit asbestos waste in any form to be re-used or recycled.

Provision is provided in the Regulation and recent EPA (2014) guidelines for the NSW EPA to approve the immobilisation of contaminants in waste (if required with unexpected finds).

Waste Classification Guidelines (EPA 2014)

All wastes generated and proposed to be disposed off-site shall be assessed, classified and managed in accordance with this guideline. Where wastes require immobilisation prior to off-site disposal (to reduce waste classifications) an immobilisation approval shall be sought in accordance with Part 2 of this guideline. Immobilisations are only anticipated to be required with unexpected finds. Additionally, materials may be characterised under one the general resource recovery exemptions made under the Protection of the Environment Operations (Waste) Regulation 2014.

Asbestos Removal Regulations and Code of Practice

The removal and disposal of asbestos will be managed in accordance with the Work Health and Safety Act (2011) and Work Health and Safety Regulation (2017).

Excavation and removal of friable asbestos contaminated soils are required to be conducted by a Class A licensed contractor. Excavation, onsite remediation and offsite removal of bonded ACM contaminated soils are required to be conducted by at least a Class B licensed contractor.

Before starting any asbestos removal works, the appointed contractor is required to obtain a site-specific permit approving the asbestos removal works from Safework NSW. A permit will not be granted without a current licence and the permit application must be made at least seven days before the work is due to commence.

Extent of Remediation and Management Required

See **Section 7.1**.

The extent of remediation works is limited to the remediation of identified contamination in soils within three areas only. At the time of preparation of the CMP, asbestos and lead were the only contaminants of concern reported in JBS&G (2016a) and GHD (2015a).

Preferred Management Strategy

The preferred management strategy for the areas of known contamination is as follows:

- Excavation and offsite disposal of any identified lead and/or asbestos contaminated materials.

7.3 Management Plan

Approvals Licenses and notifications

Excavation, remediation and offsite removal of bonded ACM contaminated soils are required to be conducted by a contractor holding at least a Class B licence. If fibrous asbestos is detected a Class A license may be required. However, at this stage only bonded asbestos has been identified.

Before starting the works, the appointed contractor is required to obtain a site-specific permit approving the asbestos works from Safework NSW. A permit will not be granted without a current licence and the permit application must be made at least seven days before the work is due to commence.

Site Establishment

All safety and environmental controls are to be implemented as the first stage of remediation works. These controls will include, but not be limited to:

- Locate and isolate all required utilities in the proximity of the works.
- Assess need for traffic controls.
- Work area security fencing.
- Site signage and contact numbers.
- Stabilised site entry gate.

- Sediment fencing.
- Stormwater runoff sediment controls.

All environmental controls are specified the Construction Environmental Management Plan (CEMP).

Management Works

The remediation and validation works will be supervised by an appropriately qualified and experienced environmental consultant and, where required, undertaken by an appropriately licensed remediation contractor.

Air Monitoring

Where remedial works are required for the management of asbestos impacted soils, perimeter air monitoring will be conducted on each of the site boundaries. Additional downwind monitoring locations will be included in the air monitoring program as required.

Air monitoring will be conducted in accordance with **Section 10**.

Lead and Asbestos Contaminated Soils

Soils within TP062, TP056 and BH107 will be managed as follows:

- Excavation of the contaminated material to the extent indicated in **Section 7.1**.
- The impacted area will be excavated based on any visual observations of contamination (odours and staining and/or any other signs of contamination). Materials containing the visual signs of contamination will be separated in an attempt to minimise the volume of any heavily impacted materials requiring offsite disposal.
- Disposal of the material to an appropriately licensed waste facility:
 - Prior to off-site disposal excavated contaminated materials may be stockpiled within a stockpiling area/s and managed in accordance with **Sections 11.8 and 11.9**; or
 - excavated contaminated materials may be loaded directly onto trucks and disposed at a licensed waste facility in accordance with requirements detailed in **Section 11.8**.

Validation

Excavations are to be validated as per **Sections 11.2 to 11.7**. Should validation fail the failed wall/s or base of the excavation will be excavated further in the direction of the failure and the validation process repeated until validation is achieved.

Following validation of the excavation as outlined in **Sections 11.2 to 11.7**, either backfill the excavation with clean fill sourced from elsewhere on the development site or proceed with development works taking note of the remaining requirements within the CMP for unexpected finds.

Site Dis-establishment

On completion of the remediation works all plant/equipment and safety/environmental controls shall be removed from the Site.

8 Removal and Remediation of Underground Storage Tanks

There are a number of USTs remaining within the Site see **Figure 3**. The following program should be implemented to ensure correct removal and validation of the infrastructure has occurred.

8.1 Remedial Actions

Where USTs or other underground waste tanks are identified the following remediation works shall be undertaken:

- A licensed contractor is required to remove and dispose of any residual liquid contents of the tank for off-site disposal to a licensed liquid waste facility lawfully able to accept the waste.
- Removal of the tank and associated infrastructure (dispensers, feed lines and remote fill points) for appropriate off-site destruction. The contractor must keep destruction documentation for validation purposes.
- Provision of all disposal documentation.
- Excavation and stockpiling of any surrounding impacted soils, managed in accordance within **Section 11.9**.
- Prior to off-site disposal the environmental consultant shall undertake sampling for waste classification purposes in accordance with *Waste Classification Guidelines Part 1: Classifying Waste* EPA 2014a and **Section 11.8**.
- Validation of the tank pit and associated infrastructure excavations and as per the sampling and analytical protocols provided in EPA 2014b¹⁸ and **Section 8.2**.
- The environmental consultant shall make an assessment based on the condition of the tank, nature and extent of any soil impacts to determine the need for groundwater validation via the installation and sampling of groundwater monitoring wells. Groundwater wells will be required if:
 - On removal it appears to contain holes; and/or
 - On removal a sheen is observed on seepage water; and/or.
 - Natural soil samples in the base and/or walls of the tank pit are impacted above the adopted criteria (**Section 6**).

¹⁸ *Technical Note: Investigation of Service Station Site*, NSW Environment Protection Authority, April 2014 (EPA 2014b)

8.2 Validation Sampling and Analysis Plan

State the Problem

Validation required of a former UST and associated infrastructure.

Identify the Decision

To assess whether the remediation works undertaken were sufficient to remediate any impacted soil for the intended land use, decisions to be address as per **Section 11.2**.

Identify Inputs into the Decision

The inputs required to make the decision include the following:

- Site inspection observations.
- Available geological and hydrogeological information.
- Visual observations of staining as well as field screening of soils with a photoionisation detector ('PID').
- Concentrations of the COPC from validation soil samples assessed against the adopted human health and environmental criteria.

Define the Boundaries of the Study

The immediate vicinity of any known or unknown (unexpected) USTs.

Develop a Decision Rule to Identify the Decision

The decision rules to identified the decision as per **Section 11.5**.

The assessment criteria for the contaminants of concern are presented in **Section 6**.

Specify Acceptable Limits of Decision Errors

Limits of decision errors as per **Section 11.6**.

Optimise the Design for Obtaining Data

Minimum sampling and analysis requirements as per EPA 2014b and the table below.

Table 7 – Minimum Recommended Soil Sampling		
Area of concern (location)	Indicative no. of samples/locations	Action
1. Underground storage tank (UST)	Minimum two samples per tank with samples taken from each tank wall and floor	Collect samples if tank is to remain in place or during excavation and tank removal. Samples to be taken at or below the base of the tanks.
2. UST pit natural soils and backfill sands	Two samples (though may not be necessary if backfill sands are found to be unaffected)	Samples between 0–200 mm into surrounding soil. Recommended to be at or below the base of the tank.
3. UST pit water	One sample	Sample if there is water present and backfill sands or natural soils appear contaminated.
4. Dispensers	One sample per dispenser backfill and one per natural soil (if needed)	Sample area adjacent to line and dispenser junction, taking representative sample of backfill during excavation and removal of the dispenser. If contamination apparent, sample 0–200 mm into natural soils.
5. Fuel feed lines to dispensers	One sample every 5 m of line	Take representative sample of backfill sands and, if it appears contaminated, sample 0–200 mm into natural soils. Additional attention should be given to changes of line direction and the depth of burial of the line.
6. Remote fill points	One sample per fill point	Representative sample from backfill sands and, if it appears contaminated, sample 0–200 mm into natural soils.
7. Above-ground fuel storage (drum/tank)	One sample per 25 m ²	Collect samples in areas of spills, otherwise collect samples below storage area at depth intervals of 0–200 mm and 200–500 mm.
8. Below-ground waste oil/wastewater tank	Two samples per tank	Collect samples if tank is to remain in place or collect samples during excavation and tank removal.
9. Spent battery storage	One sample per 25 m ²	Take representative auger samples in the 0–200 mm layer.
10. Waste disposal areas (including wastewater disposal on site)	One sample per 25 m ²	Collect samples at the site of contamination or within the disposal area in the 0–200 mm layer.
11. Fill materials of unknown origin	Adopt sampling density in accordance with Section 6 and 7 of Schedule B2 of the ASC NEPM	Collect representative auger/ borehole samples from surface to natural ground level.
12. Workshop (current or historical – may include smash repair activities, i.e. blasting grits)	Dependent on CSM and site observations	Collect samples at the site of contamination at depth intervals of 0–200 mm and 200–500 mm. Where pits or hoists are present, sampling should extend below the base of the structure.
13. Carwash	Dependent on CSM and site observations	Take representative samples in the 0–200 mm layer.

A systematic based sampling pattern should be collected for the validation works. A suite of COPC should be selected based on the historical use of the UST to provide characterisation of the status of

soil, surface water and groundwater contamination (if any). The adopted sampling approach should be consistent with NEPM (2013) and AS4482.1 (2005).

General soil and groundwater sampling methodology as per **Section 11.7**.

9 UXO, EO and EOW Management and Remediation Plan

As provided in G-tek (2018a¹⁹) G-tek Australia Pty Limited (G-tek) has reviewed previous reports and activities relating to intrusive works within the Moorebank Precinct East (MPE) with particular emphasis on the potential for remnant unexploded ordnance (UXO), explosive ordnance (EO) and explosive ordnance waste (EOW) within the overall Site and the area referred to as the “southern burial pits” (**Figure 3**). G-tek (2018a) concluded as a result of this review the overall MPE Site was found to be free of UXO risk.

Based on the Milsearch findings and the G-tek (2003) works, it was considered the requirements of CoC B133 were met and that no additional UXO, EO or EOW Site Assessment Surveys are required within the MPE Site prior to any demolition, entry or subsurface activities.

The UXO, EO and EOW Management and Remediation Plan is provided in **Appendix C** (G-tek 2018b²⁰).

Additionally, as per Condition of consent B136, following demolition of the existing buildings (**Figure 3**), a supplementary UXO, EO and EOW Site Assessment Survey is to be undertaken by a qualified contractor listed on the Defence Environment and Heritage Panel (DEHP) as a D2. D2 companies can undertake UXO related materials assessment and management.

The Site Assessment Survey will be conducted underneath the buildings in accordance with similar methodologies conducted during previous historical assessments (G-tek 2003) (**Appendix C**).

Should any contamination issues be identified the CMP will be updated to the satisfaction of the Secretary. Where remediation works are required they will only be carried out by a suitably qualified and experienced contractor(s) contractor listed on the Defence Environment and Heritage Panel (DEHP) as a F2. F2 companies can undertake UXO remediation works.

¹⁹ CoA B133 – Moorebank Precinct East – Tactical, G-tek Australia Pty Limited, 9 February 2018 (Gtek 2018a).

²⁰ *Unexploded Ordnance (UXO) Management Plan for Moorebank Precinct East Stage 2 Development Site*, G-tek Australia Pty limited, 15 February 2018 (G-tek 2018b).

10 Asbestos Management Plan (AMP)

An Asbestos Management Plan (AMP) is required to ensure if asbestos containing materials (ACM) or asbestos impacted soils are encountered at the Site during the redevelopment, it is appropriately managed to ensure protection of human health of site workers, future site workers and the neighbouring community. This AMP also outlines the requirements for managing any potentially asbestos impacted fill materials. Additionally, this plan will apply to currently known areas of bonded ACM impacts see **Figure 3**.

10.1 Summary of Contaminant Type

Friable asbestos is defined by Safe Work Australia in the Code of Practice – How to Safely Remove Asbestos (2016) as being “...material that is in a powder form or that can be crumbled, pulverised or reduced to a powder by hand pressure when dry, and contains asbestos”. This includes asbestos fibre impacted soils (fibrous asbestos, FA or asbestos fines, AF) and asbestos fines as identified by laboratory analysis.

Non-friable asbestos material is defined by Safe Work Australia (2016) as being “...material containing asbestos that is not friable asbestos, including material containing asbestos fibres reinforced with a bonding compound.” This includes bonded asbestos fragments found in soils, subject to laboratory analysis for respirable fibres.

Mechanical disturbance of the fragments may result in the release of fibres and therefore, such activities should be managed to prevent any fibres becoming airborne. The primary issue associated with the asbestos contamination is inhalation of respirable fibres if the materials were to be disturbed and abraded. A secondary issue with asbestos contamination is disposal of excess spoil that may be impacted with asbestos.

10.2 Objectives

The purpose of this AMP is to outline the required procedures for handling and disposing of any identified ACM and asbestos impacted soils during the development (bulk earthworks) at the Site, to outline the measures required to protect the health and safety of workers who may encounter asbestos containing materials or asbestos impacted soils whilst completing the planned works and to prevent any adverse health effects on any future workers or neighbouring community in accordance with relevant National Codes of Practice and Work Health and Safety Legislation.

Specifically, the objectives are to:

- Outline, monitor and enforce safe working condition for all workers.
- Outline, monitor and enforce safe environmental conditions for all persons outside of the AOC.
- Outline, monitor and enforce procedures to manage works within asbestos impacted soils identified in the Site during works.
- Outline measures for the safe onsite storage and, if required, off-site disposal of asbestos materials in accordance with all relevant legal and statutory requirements.

- Outline ongoing management requirements of the Site to ensure the risk posed by any potential asbestos contamination is properly managed.

10.3 AMP Responsibilities during Redevelopment Works

Appointment of Principal Contractor

In accordance with the provisions of the Work Health and Safety Regulation 2017 prepared under the Work Health and Safety Act 2011 QUBE c/o Tactical has been appointed as the “person conducting a business or undertaking” (PCBU).

Responsibilities of the Principal Contractor

Responsibilities of the Principal Contractor include, but are not limited to the following. The Principal Contractor must:

- Be responsible for the proposed project work at all times until the work is completed.
- Ensure that all persons involved with proposed project work have undertaken occupational health and safety training if ACM is identified.
- Keep records of induction training for workers and any specific training.
- Ensure that any subcontractors provide safe work method statements for the activities for which they are engaged.
- Monitor any subcontractors to ensure that they are complying with the safe work method statements.
- Maintain a hazardous substances register for all hazardous substances used or present on the Site.

The Principal Contractor is responsible for co-ordinating health and safety activities for the project. Other responsibilities of the Principal Contractor include:

- Compliance with occupational health and safety and environmental legislation, regulations, standards, codes and the Central Precinct specific rules relating to safety contained in this AMP.
- Ensuring that sufficient funds are available to procure the necessary health and safety equipment such as personal protective equipment (PPE).
- Managing accident and emergency procedures.
- Managing workplace injury management and rehabilitation.

The Principal Contractor has the authority to provide for the auditing of compliance with the provisions of this AMP, suspension or modification of work practices, and administration of disciplinary actions for individuals whose conduct does not meet the requirements set forth herein.

Asbestos Consultant or Competent Person

An Asbestos Consultant or Competent person, shall be engaged by the Principal Contractor or Remediation Contractor to assess any suspected asbestos containing materials when encountered during the redevelopment of the Site and prepare a management/remediation plan, if necessary.

The asbestos consultant or competent person shall also complete airborne asbestos monitoring and dust monitoring during any asbestos works. Where required, air monitoring will be conducted in accordance with **Section 10.6**.

The Asbestos Consultant shall:

- Provide a remediation or management strategy prior to works commencing.
- Provide on-site supervision of all potential asbestos works.
- Licensed Asbestos Assessor (LAA) to complete static asbestos air monitoring during any potential asbestos works and display daily results for the information of workers.
- Provide on-site advice, if required, in relation to suspected asbestos containing materials and the management of asbestos issues associated with the works.
- Be available, if required, for consultation with regards to the conditions and requirements of this AMP.

Should asbestos be encountered during the planned excavation works, additional clearance inspections and clearance asbestos air monitoring may be required to confirm the suitability of the AOC prior to works recommencing.

Class A/ B Licensed Asbestos Removal Contractor

A Class A (friable) or Class B (non-friable) licensed asbestos removal contractor shall be engaged if ACM is identified. The asbestos removal contractor will remove ACM or asbestos impacted soils from the AOC and dispose of them to a suitably licensed waste facility lawfully able to accept the waste. The licensed asbestos removal contractor will be the primary person responsible and in charge for works on site involving ACM or asbestos impacted soils.

Their responsibilities include:

- Complete a site walkover and 'emu-pick' to remove any observed ACM on the ground surface prior to any topsoil stripping works commencing.
- Completion of required Safework NSW permits (friable asbestos removal) or notifications (non-friable asbestos removal).
- Prepare a site-specific Asbestos Removal Control Plan (ARCP) prior to commencement of any asbestos removal works.
- Ensuring compliance with relevant legislation and the conditions of this AMP.

- Removal and disposal of asbestos containing materials or asbestos impacted soils from the site in accordance with relevant legislation. Or remediate bonded ACM impacted soils via an approved method (e.g. walking and picking or tilling etc).
- Ensure appropriate environmental and safety controls outlined in this AMP are maintained for the duration of the works.
- Assisting all site sub-contractors where required in complying with relevant legislation and the procedures outlined in this AMP.
- Completion of a final site walkover and removal of all visible asbestos containing material from the ground surface across the site.

10.4 Health and Safety Management

Safe Work Method Statements

Safe work method statements must be prepared by the Principal Contractor or by subcontractors completing significant intrusive works and also covering other aspects of the proposed project works not related to significant intrusive works, are to be prepared and approved by the Principal Contractor prior to those activities commencing.

Safe Work Method Statements must:

- Describe how work is to be carried out.
- Identify the safety risks.
- Describe the control measures that must be applied to the work.
- Describe the equipment used in the work.
- Describe any standards or codes applicable to the work.
- Training and qualifications required of persons undertaking the work.

Safe work method statements for all workers must be reviewed and approved by the Principal Contractor.

Site Access Control

The Principal Contractor shall ensure if works are to occur in an area in which ACM has been identified the construction area is securely fenced and access is controlled. Entrance to the asbestos area will be via a dedicated entry point which will contain the following features in addition to site security measures as required for a construction site as per relevant health and safety provisions:

- Readily identifiable and delineated site access / egress point. Where possible this location shall be visibly identifiable by site fencing / barricading.
- Decontamination unit for all workers to remove PPE and dispose of contaminated articles and will also include a hand wash and boot wash facility. The decontamination unit will be located in close proximity of the designated site access / egress point.

- Signage including “No Entry Without Required PPE” and a contact number for members of the public to direct any queries / complaints.
- Emergency contact details.

The overall construction site boundary will be secured by fencing. It is anticipated if areas of ACM are identified then localised active construction site access points maybe delineated within the overall site boundaries. Access to the construction site will be controlled and permitted by the Principal Contractor only after persons entering the area have been advised of the potential contamination hazards. This shall at least include notification of the potential presence of asbestos containing materials and asbestos impacted soils.

If ACM is identified then any authorised person accessing the site should do so in accordance with health and safety requirements as indicated in this AMP. The implementation of the health, safety and environmental requirements should be administered by the Principal Contractor.

Site access will not be allowed until the workers have been inducted, have signed in, and if entering the asbestos area must have donned the required PPE (below). Upon exiting the area, personnel must remove and dispose of/clean the PPE in the provided decontamination area.

Asbestos removal boundaries (if required) shall be determined by the Principal Contractor in consultation with the asbestos consultant and will vary according to the location and size of the required daily activities. Any asbestos removal boundaries will be designed to allow other site works not involving significant intrusive works to continue without being required to adhere to this AMP.

It may be found that the asbestos removal boundaries require to be assigned to the Site boundaries, in which case all site workers must adhere to the requirements of this AMP.

Training and Certification

The Principal Contractor must not allow any person to carry out project works unless he/she are satisfied that the person has undergone OHS induction training.

The OHS induction training required by the Regulation is as follows:

- General occupational health and safety training for construction work;
- work activity based health and safety training (job specific training); and
- site-specific health and safety induction training.

For each person carrying out project works, for a period of three years, the Principal Contractor must keep a record of the following:

- A copy of relevant statements of OHS induction training, or a statement indicating the Principal Contractor is satisfied that the relevant OHS induction training has been undertaken; and
- a brief description of the site-specific training undertaken by the person.

Site Safety Induction

If ACM is identified it is the responsibility of the Principal Contractor to ensure all persons carrying out construction work on site are given site-specific occupational health and safety training. The induction shall be undertaken by the Principal Contractor. The induction shall be undertaken as per a standard presentation which will address the following topics as per the requirements of this AMP:

- Identification of any site specific hazards and risk control measures in relation to the asbestos impacted nature of the site.
- Regulatory requirements or codes of practice relevant to identified site specific hazards as restricted to asbestos impact.
- Directions on what to do if suspected asbestos containing materials or asbestos impacted soils are encountered.
- Site orientation at least including location of asbestos decontamination areas at site access / egress points.
- Site specific safety rules in relation to asbestos.

The Principal Contractor is responsible for establishing site specific safety rules. The rules must be displayed in an easily observable location (nominally in the site office) so as to ensure all site workers, have ready access.

At the completion of the induction presentation, each worker shall be required to acknowledge that they have understood the requirements for the site works and health, safety and environmental obligations by completion of a site induction form.

Personal Protective Equipment (PPE) Requirements

Prior to any asbestos containing materials or asbestos impacted soils being encountered, no additional PPE is required above the standard construction site PPE outlined by the Principal Contractor for the site. Should suspected ACM be identified then the supervising asbestos consultant should be contacted, the following additional items of PPE are required in addition to the standard construction site PPE outlined by the Principal Contractor for the Site, and applies for any ground workers within the asbestos work area, as defined by the supervising asbestos consultant:

- Disposable 'type 5, category 3 (EN ISO 13982–1) rated or better' coverall suits must be worn.
- Disposable gloves – non disposable gloves must be cleaned within the decontamination unit in accordance with Safe Work Australia (2011).
- P2 class respirator or higher – non disposable respirators must be cleaned in the decontamination unit in accordance with Safe Work Australia (2016).
- Laceless steel capped rubber soled work shoes or gumboots.

Plant operators must close cabin doors and windows and set air conditioning to re-circulate when operating within the asbestos work area.

Management of Subcontractors

If ACM is identified then workers on-site will be required to adopt the provisions of this AMP and will be advised of potential safety and environmental issues on site during site-specific induction training. This induction will include the occupational health and safety responsibilities, requirements and controls for all workers on site. All workers activities involved in asbestos works will be monitored by the Principal Contractor, the licensed Asbestos Removal Contractor and the Asbestos Consultant to ensure compliance with the requirements of this AMP.

Workers whose work will be performed on-site, or who otherwise could be exposed to health and safety hazards, will be advised of known hazards through distribution of site information contained in this AMP.

They shall be solely responsible for the health and safety of their employees and shall comply with all applicable laws and regulations. All workers are responsible for:

- Providing their own personal protective equipment as required by the Principal.
- Conditions set out in this AMP.
- Training their employees in accordance with applicable laws.
- Providing medical surveillance and obtaining medical approvals for their employees, as appropriate.
- Ensuring their employees are advised of and meet the minimum requirements of this AMP and any other additional measures required by their site activities.
- Designating their own site safety officer.

Workers must sign an acceptance form prior to commencing work on site. Workers may only modify, and then only to improve, the conditions specified in this AMP with approval from the Principal Contractor, or his nominee.

10.5 Environmental Management

Asbestos Works

In the event significant asbestos contamination is identified and intrusive works are to be carried out in the asbestos work area then the following management measures will apply.

Prior to any intrusive work commencing:

- Review of the information available for the site.
- Approval for the works must be sought from the Principal Contractor or their representative who will assess whether the works are necessary or if there is an alternative that will not result in exposure of ACM impacted soils. The Principal Contractor must review the job specific risk assessment (JSRA) and safe work method statements (SWMS) and ensure that workers who will undertake the works are inducted into the AMP.

- The asbestos consultant must complete supervision of the significant intrusive works and complete regular inspections for the presence of visible asbestos. Static airborne asbestos monitoring must also be completed by the asbestos consultant for the duration of significant intrusive works.
- The works area must be isolated from casual entry using temporary barriers and only personnel inducted in the requirements of the AMP will be permitted to enter the works area.
- Sufficient room must be provided within the works area to allow stockpiling of spoil from excavations, if required, in accordance with **Section 11.9**.
- A water supply must be provided to the works area for the purpose of maintaining exposed asbestos impacted fill or soil in the excavations and stockpiles in a moist state.
- Personnel entering the works area must wear appropriate PPE in accordance with the section above.
- Stockpiles of excavated spoil must be managed in accordance with **Section 11.9**.
- Air monitoring requirements must be met as outlined in **Section 10.6**.

Should visible asbestos be identified by the asbestos consultant or airborne asbestos monitoring results identify airborne asbestos fibres in the vicinity of the works area, specific requirements for working with asbestos containing materials or asbestos impacted materials shall be enforced as outlined in below.

Specific Requirements for Working with Asbestos Impacted Material

Asbestos may be present in non-friable or friable form. In the event that either friable or nonfriable asbestos is encountered, as determined by the Asbestos Consultant, the following procedures shall be implemented for the remaining significant earthworks to ensure workers safety and to mitigate any potential off site migration of contamination.

Friable and Non-Friable Asbestos

Prior to Excavation:

- Workers and visitors to the asbestos work area will be made aware of the encountered soil contamination and only authorised people shall enter the asbestos work area, which must contain a perimeter barrier separate to the site boundaries to restrict entry. Where the asbestos work area boundary is also the site perimeter boundary, an exclusion zone of at least 5 m shall be erected beyond the site perimeter boundary (if practical/possible) to restrict access to the asbestos work area.
- Asbestos removal caution signs shall be placed on the perimeter barrier (or exclusion zone barrier, whichever is furthest from the asbestos removal work area), as per AS1319.

During Excavation/Transport/Disposal

- A WorkCover permit for friable asbestos removal works or WorkCover notification for non-friable asbestos removal works shall be sought by the licensed asbestos removal contractor.

Friable asbestos removal permits must be submitted at least 7 days prior to any friable asbestos being disposed off-site.

- All wastes will be classified, managed and disposed in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (EPA 2014).
- Personnel within the excavation work area shall wear a Disposable 'type 5, category 3 (EN ISO 13982–1) rated or better' coverall suit, respirator (e.g. half faced P2 respirator), disposable gloves and laceless steel capped rubber soled work shoes or gumboots at all times when within the asbestos work area and until clearance certification is provided by the asbestos consultant.
- Any obvious pieces of asbestos containing materials shall be picked up and placed into a labelled asbestos waste bag and set aside in a designated waste storage area for off-site disposal.
- The excavation shall be kept damp by water spraying at all times during excavation to reduce the possibility of dust generation.
- Personal protective equipment used during the works, such as disposable coverall suits and half faced respirators, shall be disposed of as asbestos waste.
- Airborne asbestos monitoring shall be conducted for the duration of the excavation works in accordance with **Section 10.6**.
- Any stockpiled excavated material shall be kept moist and covered if left for more than 24 hours in accordance with the Dust Management section below.
- Appropriate leak proof transport vehicles must be used to transport materials offsite.
- Transport vehicle shall be covered prior to leaving Site and any material removed from wheels to prevent tracking outside the Site.
- Any areas required imported materials for backfill must only be completed in accordance with **Section 11.9**.

Post Excavation

- Any excavation floor and walls shall be inspected by the Asbestos Consultant who is trained and experienced in the identification of asbestos. Any visible ACM shall be removed by the licensed Asbestos Removal Contractor.
- Where friable asbestos has been encountered, validation samples shall be collected from the excavation walls and base and analysed at a NATA Accredited testing laboratory for the presence of asbestos. Clearance airborne asbestos monitoring shall also be conducted by a Licensed Asbestos Assessor following the completion of the excavation and reinstatement works to be included in clearance certification. Clearance monitoring is not required if only non-friable asbestos is encountered.
- Upon receipt of both visual and laboratory data (where required) confirming the absence of asbestos, the asbestos work area shall be deemed suitable for reoccupation and a clearance letter shall be provided by the Asbestos Consultant.

Disposal and Storage of Asbestos Containing Materials

Where asbestos fragments or other forms of asbestos are identified either during redevelopment works or on the ground surface, these materials should be removed under the supervision of a licensed Asbestos Removal Contractor and in accordance with Safe Work Australia (2016).

The asbestos materials should be placed into heavy-duty 200µm (minimum thickness) polythene bags that are no more than 1200 mm long and 900mm wide. The bags should be labelled as asbestos waste, sealed and placed in a designated waste area for off-site disposal.

Stockpiles should be managed in accordance with **Section 11.9**.

Dust Management

Dust levels shall be managed by ensuring:

- All stockpiles will be either periodically wetted down or covered to control dusts.
- Water sprays will be used on the excavation areas, stockpiles and haulage pathways;
- Any haulage vehicles shall be covered and leave via the designated (stabilised) site access;
- All haulage vehicles and plant and equipment shall be washed down whenever they leave the Asbestos in Soil (ASBINS) work area.
- All access roads are sufficiently maintained to ensure no visible dust at the site boundary.
- Dust suppressors will be fitted to equipment as required.

If dust is visible at the boundary of the work area, then additional dust control measures shall be employed, which may include:

- Temporarily suspending activities until winds speeds reduce; and/or
- additional use of water sprays.

Waste Management

There shall be no wastes brought onto the Site for storage, treatment, processing, reprocessing or disposal unless permitted by a licence issued under the POEO Act.

All wastes will be classified, managed and disposed in accordance with the Waste Classification Guidelines: Part 1 Classifying Waste (EPA 2014).

All wastes disposed off-site will be controlled as per the EPA's requirements for waste tracking and acceptance using the WasteLocate online tracking system. Under clauses 76 and 79 of the *Protection of the Environment Operations (waste) Regulation 2014* transporters must use WasteLocate when:

- consigning, transporting or accepting more than 100 kilograms of asbestos waste, or more than 10 square metres of waste asbestos sheeting, in any single load.

10.6 Monitoring Program

In the event that significant asbestos is found a monitoring program may be needed to ensure that the control measures being implemented at the Site are effective, the following monitoring procedures will be implemented:

- Daily static airborne asbestos fibre monitoring at work area boundaries during significant asbestos works; and
- clearance monitoring (if friable asbestos is encountered only).
- Site Inspections.

Daily Static Airborne Asbestos Fibre Monitoring

During excavation works or any other works that may disturb significant asbestos in soil at the Site, airborne asbestos fibre monitoring may be undertaken by a licensed Asbestos Assessor using calibrated portable air sampling pumps. Monitoring will be conducted at 4 locations around the work area boundaries each day over the work period and targeting any neighbouring sensitive receptors and with consideration to the daily location of works.

At the end of each monitoring period the pump and attached filter will be collected and analysed at a NATA-accredited laboratory in accordance with NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition (NOHSC:3003 [2005]).

The results of air monitoring will be available on a 24-hour turnaround time basis. Daily air monitoring reports shall be displayed in a common area outside of the asbestos work area (e.g. site office or lunch shed) or be able to be produced upon request.

The following action levels will be applied upon receipt of daily results, as outlined in the Safe Work Australia (2016):

- Reading of less than 0.01 fibres/mL – control measures in place are working effectively, site works to continue.
- Reading between 0.01 and 0.02 fibres / mL – a review of control measures shall be completed in the work area.
- Reading greater than 0.02 fibres / mL – works shall cease until the cause of contamination is identified and rectified.

It is noted that these action levels adopted are more conservative than the exposure standard for airborne asbestos (0.1 fibres/mL (TWA)) as outlined in the Adopted National Exposure Standards for Workplace Exposure Standards for Airborne Contaminants (Safe work Australia 2013) for an 8 hour shift.

Clearance Monitoring

In the event that friable asbestos is encountered during the excavation works, clearance airborne asbestos monitoring shall be required following the friable asbestos removal. Following the completion of all earthworks, backfill of the excavated area, clearance air monitoring will take place in the vicinity of the work area to ensure that there is no residual contamination remaining at the Site. Clearance air monitoring will be achieved by recording airborne asbestos concentration levels in all sampling locations below 0.01 fibres / mL.

Site Inspections

Following the completion of any asbestos removal works, a final site walkover will be completed by the Asbestos Consultant to inspect the site ground surface for the presence of ACM. Any ACM observed will be removed and placed in asbestos waste bags in accordance with Safe Work Australia (2016). Once a successful inspection has been completed and both the licensed Asbestos Removal Contractor and the Asbestos Consultant are satisfied there is no visible residual asbestos impacts on the ground surface, the area shall be deemed suitable for re-occupation and a clearance report issued by the Asbestos Consultant.

10.7 Demolition of Buildings Containing Asbestos

Prior to any proposed demolition within buildings, a destructive asbestos survey and management plan should be conducted by a competent person and / or asbestos hygienist to determine whether potential hazardous substances are located in areas that have not been assessed or were inaccessible during any previous survey.

The destructive asbestos survey must be conducted in accordance with Part 8.6 of the NSW *Work Health and Safety Regulation, 2017*, Section 1.2 of the NSW *Code of Practice: How to Manage and Control Asbestos in the Workplace, 2016*, *Code of Practice: Demolition Work, 2016* and other industry related standards and guidance notes.

It should be noted the asbestos building materials report for the Site should **not** be used for the purposes of demolition works unless accompanied by an appropriate and site-specific scope of works.

If any asbestos materials have been identified in the demolition works area and are likely to be disturbed by the works, then these materials will be required to be removed by an appropriately licensed Asbestos Removal Contractor prior to the commencement of the proposed works according to an Asbestos control plan prepared in accordance with the NSW *Code of Practice: How to Safely Remove Asbestos 2016*.

11 Unexpected Finds Protocol

The Site has previously been the subject of number of environmental investigations. Detailed site history is provided in the GHD (2014), Arcadis (2016) and Golder (2016a and 2016b). However, given the size of the Site, there is potential for the presence of unexpected finds of contamination during bulk excavation. The unexpected Finds Protocol (UFP) is summarised in **Appendix D** and is detailed in the following sections.

The objective of the UFP is to provide clear guidance on the safe and appropriate actions in the event of encountering potential chemical or ordnance contamination during development works.

Where such material is uncovered the UFP prescribes the quarantining of the relevant area of concern, allowing other works to proceed unhindered, while the area of concern is assessed and, if necessary, remediated and validated.

The AOC may be identified by the Principal Contractor, Environmental Consultant or a site worker. The AOC will be quarantined by the Principal Contractor by means of some appropriate barrier to prevent access to the area. The quarantined area/s will be communicated with workers during the daily tool box talks.

Two classes of potential contamination: chemical (including potential asbestos containing materials), presented in the following sections and ordnance, discussed in **Section 9 and Appendix C**.

11.1 State the Problem

It is acknowledged previous investigations of the Site have been undertaken to assess COPC. However, ground conditions between sampling points may vary, and further hazards may arise from unexpected sources and/or in unexpected locations during redevelopment. The nature of any residual hazards which may be present at the Site are generally detectable through visual or olfactory means, for example:

- Potentially asbestos containing sheeting, fragments or insulation materials (visible).
- Discoloured / odorous soils (visible and odorous).
- Drums / bottles / containers of chemicals (visible).
- Construction / demolition waste (visible).
- Ash and/or slag contaminated soils / fill materials (visible).
- Petroleum contaminated soils (staining / odorous / discolouration visible).
- Volatile organic compound contaminated soils (odorous).
- Asphalt contaminated fill (visual).
- Uncovering in-ground infrastructure (e.g. underground storage tanks, USTs).

As a precautionary measure to ensure the protection of the workforce and surrounding community, should any of the abovementioned substances be identified (or any other unexpected potentially hazardous substance), the procedure summarised in **Appendix D** and detailed in the following sections is to be followed.

An enlarged version of the unexpected finds protocol, suitable for use at the Site, should be posted in the site Office and referred to during the Site Specific Induction by the Principal Contractor.

If the Principal Contractor considers material to be potential chemical contamination the area will be quarantined and a suitably qualified Environmental Consultant will be contacted. The Environmental Consultant will be responsible for assessing the findings, taking samples to characterise and delineate the extent of the potential contamination and defining appropriate remedial actions, if required, in accordance with **Section 11.1 to 11.7**.

Suspected asbestos containing materials should be assessed in accordance with **Section 11.1 to 11.7** and managed in accordance with relevant WorkCover requirements and the asbestos management plan (AMP) detailed in **Section 10**.

Where contamination is identified within any AOC an Investigation Report and Remediation Action Plan will be prepared by the Environmental Consultant detailing how the impacts will be managed, validated and reported.

If the area is determined by the Environmental Consultant to not be contaminated or the analyses meet the relevant site criteria (**Section 6**), the Environmental Consultant should notify the Principal Contractor that the quarantine restrictions on the area can be lifted and the works in that area may resume. The Environmental Consultant will prepare a report on the investigation and the conclusions drawn.

11.2 Identify the Decision

Based on the decision making process for assessing urban redevelopment sites detailed in DEC (2017), modified to meet the specific project objectives, the following decisions must be made during any unexpected find assessment:

- Are there any unacceptable risks to likely future onsite receptors from impacted soils during development?
- Are there any issues relating to local area background soil concentrations that exceed the appropriate soil criteria?
- Are there any impacts of chemical mixtures?
- Are there any aesthetic concerns in fill soils present at the Site?
- Is there any evidence of, or potential for, migration of contaminants off-site?
- Is the site specific risk assessment required to be updated?
- Is a site management strategy required?

11.3 Identify Inputs to the Decision

Inputs to the decisions are:

- Environmental data as collected by sampling and analysis and site observations made during this investigation.

- Assessment criteria to be achieved on the site as based on the intended landuse and project objectives, as defined by assessment criteria nominated in **Section 6**.
- Final site surface survey.
- Confirmation that data generated by sampling and analysis are of an acceptable quality to allow reliable comparison to assessment criteria as undertaken by assessment of quality assurance / quality control (QA/QC) as per the data quality indicators (DQIs) established in **Section 11.6**.

11.4 Define the Study Boundaries

Each AOC identified and investigated and where required, remediated, will be surveyed to provide accurate boundaries. The vertical extent of any investigation will be 0.3 m into natural soils. Data will be representative of the timing and duration of each investigation.

11.5 Develop a Decision Rule

Laboratory analytical data will be assessed against NSW EPA endorsed criteria as identified in **Section 6**. The decision rules adopted to answer the decisions identified in **Section 11.2** are summarised in **Table 8**.

Table 8 – Summary of Decision Rules	
Site	Area and Aspect
1. Are there any unacceptable risks to likely future onsite receptors from impacted soils during development?	The nature and extent of soil impacts will be assessed, and soil analytical data will be compared against EPA endorsed criteria (health and ecological). Statistical analyses of the data in accordance with relevant guidance documents will be undertaken, if appropriate, to facilitate the decisions. The following statistical criteria will be adopted with respect to soils: Either: the reported concentrations are all below the site criteria; Or: the average site concentration for each analyte must be below the adopted site criterion; no single analyte concentration exceeds 250% of the adopted site criterion; and the standard deviation of the results must be less than 50% of the site criteria. And: the 95% upper confidence limit (UCL) of the average concentration for each analyte must be below the adopted site criterion. If the statistical criteria stated above are satisfied, and an assessment of risk indicates no unacceptable risks, the decision is No. Otherwise, the decision is Yes.
2. Are there any issues relating to the local area background soil concentrations that exceed relevant investigation criteria?	If the 95% UCL of natural soils exceeded calculated background concentrations (NEPC 2013), the decision is Yes. Otherwise the decision is No.
3. Are there any chemical mixtures	Are there more than one group of contaminants present which increase the risk of harm? If there is, the decision is Yes. Otherwise, the decision is No.
4. Are there any aesthetics issues in fill soils at the site?	If there are any unacceptable odours, anthropogenic materials or staining the answer to the decision is Yes. Otherwise, the answer to the decision is No.
5. Is there any evidence of, or potential for, migration of contaminants off-site?	Are contaminants present within natural soils at concentrations exceeding EPA endorsed criteria? If yes, the answer to the decision is Yes. Otherwise, the answer to the decision is No. And

Table 8 – Summary of Decision Rules	
Site	Area and Aspect
	If groundwater analytical results exceed the NEPC 2013 criteria and the downgradient groundwater impacted, the decision is yes. Otherwise, the decision is No.
6. Is a site specific risk assessment required?	If the 95%UCLs of the COPC are detected above the adopted Site criteria, a Site Specific Risk Assessment may be required.
7. Is a site management strategy required?	Is the answer to any of the above decisions Yes? If yes, a site management strategy will be required to be developed. If no, a site management strategy is not required.

11.6 Specify Limits of Decision Error

This step is to establish the decision maker's tolerable limits on decision errors, which are used to establish performance goals for limiting uncertainty in the data. Data generated during this project must be appropriate to allow decisions to be made with confidence.

Specific limits for this project have been adopted in accordance with the appropriate guidance from the NSW EPA, NEPC (2013) and appropriate indicators of data quality (DQIs used to assess QA/QC).

To assess the usability of the data prior to making decisions, the data will be assessed against predetermined DQIs for completeness, comparability, representativeness, precision and accuracy. The acceptable limit on decision error is 95% compliance with DQIs.

The pre-determined DQIs established for the project are discussed below in relation to precision, accuracy, representativeness, comparability and completeness (PARCC parameters), and are shown in **Table 7**.

- Precision - measures the reproducibility of measurements under a given set of conditions. The precision of the laboratory data and sampling techniques is assessed by calculating the Relative Percent Difference (RPD) of duplicate samples.
- Accuracy - measures the bias in a measurement system. The accuracy of the laboratory data that are generated during this study is a measure of the closeness of the analytical results obtained by a method to the 'true' value. Accuracy is assessed by reference to the analytical results of laboratory control samples, laboratory spikes and analyses against reference standards.
- Representativeness –expresses the degree which sample data accurately and precisely represent a characteristic of a population or an environmental condition. Representativeness is achieved by collecting samples on a representative basis across the site, and by using an adequate number of sample locations to characterise the site to the required accuracy.
- Comparability - expresses the confidence with which one data set can be compared with another. This is achieved through maintaining a level of consistency in techniques used to collect samples; ensuring analysing laboratories use consistent analysis techniques and reporting methods.

- Completeness – is defined as the percentage of measurements made which are judged to be valid measurements. The completeness goal is set at there being sufficient valid data generated during the study.

If any of the DQIs are not met, further assessment will be necessary to determine whether the non-conformance will significantly affect the usefulness of the data. Corrective actions may include requesting further information from samplers and/or analytical laboratories, downgrading of the quality of the data or alternatively, re-collection of the data.

Table 9 – DQO, Requirements and Indicators		
DQO	Requirement	DQI
Precision		
Standard operating procedures appropriate and complied with	The sampling methods comply with industry standards and guidelines	Meet requirement
Intra-laboratory duplicates	1 per 20 samples	RPDs < 50%
Inter-laboratory duplicates	1 per 20 samples	RPDs < 50%
Laboratory duplicates	Minimum of 1 per batch per analyte	RPDs < 50%
Accuracy		
Laboratory matrix spikes	1 per batch per volatile/semi-volatile analyte	Recoveries 50% to 150%
Laboratory surrogate spikes	1 per volatile/semi-volatile analyte sample (as appropriate)	Recoveries 70% to 130%
Laboratory control/method blank samples	At least 1 per batch per analyte tested for	Result < laboratory reporting limit
Trip blanks	1 per lab batch for volatile analytes	Result < laboratory reporting limit
Trip spikes	1 per lab batch for volatile analytes	Recoveries 60-100%
Representativeness		
Sampling methodology - preservation	Appropriate for the sample type and analytes	Meet requirement
Samples extracted and analysed within holding times	Specific to each analyte	Meet requirement
Field equipment calibration	All field equipment calibrated and calibration records provided.	Meet requirement
Comparability		
Sampling approach	Consistent for each sample	Meet requirement
Analysis methodology	Consistent methodology for each sample	Meet requirement
Handling conditions and sampler	Consistent for each sample	Meet requirement
Field observations and analytical	Field observations to support analytical results	Meet requirement
Consistent laboratory reporting limit	Consistent between primary and secondary laboratories	Meet requirement

Table 9 – DQO, Requirements and Indicators		
DQO	Requirement	DQI
Completeness		
Sampling staff	Consistent sampling staff used.	Meet requirement
Laboratory accreditation	NATA Accredited laboratory for methods used	Meet requirement
Accredited methods	NATA accredited methods used appropriate for each analyte.	Meet requirement
ASC NEPM (2013) lab methods	Lab methods consistent with the ASC NEPM (2013).	Meet requirement
Laboratory reporting limit	Laboratory reporting limit consistent and appropriate	Meet requirement
Consistent weather / field conditions	Consistent	Meet requirement
Chain of custody documentation	Appropriately completed	Meet requirement
Field sampling documentation	Appropriately completed	Meet requirement

11.7 Optimise the Design for Obtaining Data

Various strategies for developing a statistically based sampling plan are identified in EPA (1995), including judgemental, random, systematic and stratified sampling patterns. Random sampling is not appropriate. Based on the history of the site a systematic sampling program is considered the most appropriate for any unexpected finds. Sampling locations will initially be placed systematically across the AOC.

Soil Sampling Methodology

Each sample collected as part of the assessment will be examined for signs of contamination and screened with a calibrated PID to identify the presence of VOCs, which might indicate contamination.

Soil samples will be collected directly from the excavator bucket and/or walls of the excavation surface using a dedicated pair of nitrile gloves for each sample to prevent cross contamination.

Testpitting will be undertaken by the Environmental Consultant, with the use of an excavator or backhoe, on a 10 m grid (*in situ* materials and stockpile footprints) or 1 sample per 25 m³ if potential impacts are identified within a stockpile. Testpits will be extended through fill material or the stockpile to a maximum depth of 0.3 m into natural, whichever is the shallower.

Soil samples will be collected at 0-0.15 m, 0.3 m, 0.5 m and every 0.5 m interval to a maximum depth of 0.3 m into natural materials (or prior refusal). Should physical evidence of gross contamination be identified during the works, sampling locations may be extended to vertically delineate contamination. During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indicators of contamination will be noted.

Samples will be placed into laboratory prepared glass sampling jars with lined screw-on caps. Sample identification details will be added to the label on each jar.

The sample jar will be preserved on ice immediately after sampling and during shipment to National Association of Testing Authorities Australia (NATA) accredited laboratories. The laboratory chain of custody documentation will be completed and accompany the samples during shipment.

Potential ACM Areas

Where potential ACM has been identified an additional 10 L sample will be collected from each 1 m interval for asbestos quantification, as detailed below:

- Environmental Consultant trained and experienced in the identification of ACM.
- If ACM is identified within stockpiled material, the AQ sample will be collected at a rate of 1/70 m³ (as per guidance provided in NEPM 2013).
- If ACM is identified within in-situ fill material, the AQ samples will be collected on a 10 m grid across the area.
- Testpit locations will be flagged for subsequent remedial works.
- ACM in stockpiled fill material will be quantified by the methods advised in NEPM 2013 and WA DoH 2009. At each sample location, recovered fill material (10 L) will be spread and raked. All ACM will be recovered and bagged. The volume of fill material within the testpit will be calculated and logged.
- One 500 mL soil sample will be collected from within the 10 L AQ sample and submitted for laboratory analysis to assess for the presence of FA/AF and free asbestos (respirable) fibres.
- ACM collected and bagged from each testpit will be weighed in-house using an externally calibrated scale with an accuracy of 1 g.
- Should any asbestos be observed during field works, these areas will be noted for later excavation for off-site disposal and validation. No allowance is made for management of such material during assessment works.

During the collection of soil samples, features such as seepage, discolouration, staining, odours and other indications of contamination (e.g. ACM, staining, odours) will be noted. Photographs of site layout and features will be taken.

Decontamination

Prior to the commencement of sampling activities, any non-disposable sampling equipment, including sampling trowel/knife will be cleaned with a water/detergent spray, rinsed with water and then air dried. The equipment will then be inspected to ensure that no soil, oil, debris or other contaminants were apparent on the equipment prior to the commencement of works. Sampling equipment will be subsequently decontaminated using the above process between each sampling location.

Duplicate and Triplicate Sample Preparation

Field soil duplicate and triplicate samples will be obtained during the field works. The collected samples will be divided laterally into three samples with minimal disturbance to reduce the potential for loss of volatiles and placed in three clean glass jars and sample bags as appropriate. Each sample will then labelled with a primary, duplicate or triplicate sample identification before being placed in the same chilled esky for laboratory transport.

Laboratory Analysis

The Environmental Consultant will contract a NATA registered primary and secondary laboratory for all analyses. Laboratory analysis of samples will be conducted as summarised in **Table 8**.

Table 10 – Unexpected Finds Sampling and Analytical Program		
UF Indicator	Sampling Strategy	COPC
Discoloured / Odorous soils (visible and odorous); Drums / bottles / containers of chemicals (visible); Construction / demolition waste (visible); Ash and/or slag contaminated soils / fill materials (visible); Petroleum contaminated soils (staining / discolouration visible); or Volatile organic compound contaminated soils (odorous).	10 m grid Or 1 per 25 m ³ Or 1 per 5 lineal meters and 1 per 25 m ²	Heavy Metals ¹ TPH/BTEX PAHs OCP/PCBs Asbestos PFAS ²
Potentially asbestos containing sheeting, fragments or insulation materials (visible)	10 m grid Or 1 per 25 m ³ Or 1 per 5 lineal meters and 1 per 25 m ²	Asbestos
Uncovering in-ground infrastructure (e.g. underground storage tanks, USTs)	As per Section 8	Heavy Metals ¹ TPH/BTEX VOCs PAHs Phenols MTBE

¹ Heavy metals analysis includes As, Ba, Cd, Cr, Cu, Pb, Ni, Hg, Ni, Zn.

² PFAS – 28 parameter suite.

Potential Groundwater Contamination

Based on the previous investigation works conducted across the Site, it is considered unlikely groundwater has been impacted. However, should other indicators of potential groundwater contamination be noted during any unexpected find assessment works, then the installation and sampling of groundwater wells will be recommended.

Indicators for potential groundwater impact can include the following:

- Concentration of contaminants in soils above the site criteria within natural soils; and / or
- odours or sheen on seepage water.

Groundwater assessment, if required, should consider DEC (2007) guidance, including adoption of appropriate groundwater investigation levels protective of relevant environmental values.

Remediation and Validation of Unexpected Finds

If any of the decisions in **Table 6** are 'yes', i.e. where unexpected finds are assessed as a potential human health or ecological risk to remain on the Site, a remediation/management plan will be developed.

Reporting

All unexpected finds will be documented in a report/letter prepared in general accordance with the NSW Office of Environment and Heritage (OEH) 2011 *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*.

11.8 Waste Classification

Contaminated soils requiring disposal off-site shall be assessed in accordance with EPA (2014) *Waste Classification Guidelines Part 1: Classifying Waste*.

11.9 Imported Fill Materials

Prior to the importation of fill materials onto the Site the following will be undertaken:

- Material characterisation reports/certification showing the material being supplied is virgin excavated natural material (VENM) / excavated natural material (ENM) must be provided.
- Each truck entry will be visually checked and documented to confirm only approved materials consistent with the environmental approvals are allowed to enter the site. Only fully tarped loads are to be accepted by the gatekeeper. Environmental assurance of imported fill material will be conducted to confirm the materials comply with NSW EPA Waste Classification Guidelines and the Earthworks Specification for the Site. The frequency of assurance testing will be endorsed by the Environmental Representative/Site Auditor.

- The importation of fill will be managed by the Importation of Fill Protocol CARAS (2018²¹)

11.10 Stockpile Management

Earthworks in the development phase are likely to, temporarily, generate excess material which may be stockpiled for re-use. Unless some event or observation indicates the material excavated and placed into the stockpile is potentially contaminated, no particular treatment is required other than normal dust suppression, and erosion controls in accordance with relevant CEMP requirements.

All stockpiles will be managed in accordance with the CEMP and sub-plans (SIMTA 2018a²²).

Subject to the agreement of the relevant Consultant, it may be possible to move and stockpile impacted material. Where temporary stockpiling is permitted such stockpiles shall be installed and maintained to eliminate risk to workers and other people due to exposure to contaminants in dust or vapours and risk to the environment as a result of silt or contamination of stormwater in accordance with the Site Materials Management and Tracking Plan as part of the CEMP.

If assessment by the Environmental Consultant or the Ordnance Contractor identifies contamination, or a stockpile is observed to be contaminated, then the Environmental Consultant will assess the stockpile in accordance with Section 11 to delineate the contamination and assess the extent of remediation, if required.

In the event that covers are required, they shall extend beyond the perimeter of the stockpiles and shall be secured to prevent being blown away by wind.

Stockpiles must be placed in a secure location onsite and covered if to remain for more than 24 hours.

11.11 Soil Classification and Treatment

All soils will be managed in accordance with the CEMP and sub-plans (SIMTA 2018a).

The handling, stockpiling and assessing any impacted materials from the Site will be done in a Contamination Assessment and Treatment Area (CATA), to be established. The CATA will be capable of receiving, assessing and subsequently treating impacted soils. The process undertaken at the CATA will include:

- Stockpiling for initial materials classification;
- Sorting based on initial assessments;
- Potential treatment – including but not limited to emu picking for bonded asbestos, bioremediation of hydrocarbon impacted soils and fixation or encapsulation (lead, PFAS, PAHs); and
- Dispatching materials classified for offsite disposal or onsite isolation.

²¹ *Moorebank Precinct East (MPE) Imported Fill Protocol (IFP)*, Construction and Remediation Advisory Services, 5 February 2018 (CARAS 2018).

²² *Early Works Spoil Management Plan Moorebank Precinct East Stage 2*, Sydney Intermodal Terminal Alliances, 27 February 2018 (SIMTA 2018a).

The material processed through the CATA can be reused on the site subject to being classified as suitable to be reused onsite.

Materials Tracking

A Materials Tracking Plan (MTP) will be implemented during the development works. The aim of the MTP is to identify the source and destination of all materials on the Site at any time and requires the following tasks:

- Establish and maintain a nomenclature system for identification of all source and destination areas for soil both on and off the Site. This includes excavations, stockpiles (both clean and potentially contaminated), soils for treatment or disposal (including final destination) and offsite sources of material;
- Use appropriate signage to identify the classification of the material and area number for each excavation prior to soil movement using the project documentation or in consultation with the Contract Administrator, prior to work being undertaken;
- Complete a 'Record of Soil Movement' sheet identifying the source of the materials, classification, volume and destination area of each load of material moved on or off-site;
- Place the soil in an approved location for the material based on its soil classification;
- Maintain the location of the soil without mixing with other soil classes; and
- Educate all operators in the requirements of the system.

12 Contamination Management Plan Periodic Review

12.1 Periodic Review

A periodic review of the CMP should be undertaken for the following:

- In accordance with the conditions of consent the CMP should be revised:
 - Where required, following the UXO/EO investigations required under condition B136.
 - Where required following any additional PFAS investigations under condition B131.
- The CMP should be reviewed and potentially revised if there are any regulatory changes relevant to the implementation of the CMP.
- The CMP should be reviewed if there is any significant change in land use or development of the Site.
- Any revisions to the CMP must be approved by the appointed NSW EPA Accredited Auditor in accordance with condition B135 (**Section 1.2**).
- Where the CMP is revised, copies should be provided to all current stakeholders, training provided and induction procedures updated where necessary.

12.2 Managing and Reporting

Incidents and Non-compliances

Incidents and non-compliances will be managed in accordance with Section 2.4 of CEMP sub-plan *Community Communication Strategy Moorebank Precinct East Stage 2* (SIMTA 2018b) and Section 2.9 and 4.4 of *Early Works Environmental Management Plan (EWEMP) Moorebank Precinct East Stage 2* (SIMTA 2018c).

Complaints

All complaints will be managed in accordance with the CEMP sub-plan *Community Communication Strategy Moorebank Precinct East Stage 2* (SIMTA 2018b).

Non-Compliances with statutory requirements

Non-compliances with statutory requirements will be managed in accordance with Section 2.4 of CEMP sub-plan *Community Communication Strategy Moorebank Precinct East Stage 2* (SIMTA 2018b) and Section 2.9 and 4.4 of *Early Works Environmental Management Plan (EWEMP) Moorebank Precinct East Stage 2* (SIMTA 2018c).

Continual Improvement

Review and improvement of this CMP will be undertaken in accordance with Section 1.2.6 of the (EWEMP) (SIMTA 2018c) and **Section 12.1**. Continuous improvement will be achieved by the ongoing

evaluation of environmental management performance and effectiveness of this plan against the environmental policies, objectives, and targets as specified in Section 1.7 of SIMTA 2018c (EWEMP).

A copy of the updated plan and changes will be distributed to all relevant stakeholders in accordance with the approved document control procedure.

13 References

Aecom 2016a, Site Audit Report and Site Audit Statement Lot 2 DP 1197707, part of Moorebank Avenue, Moorebank, NSW. Report Ref. 60493006, 13 July 2016.

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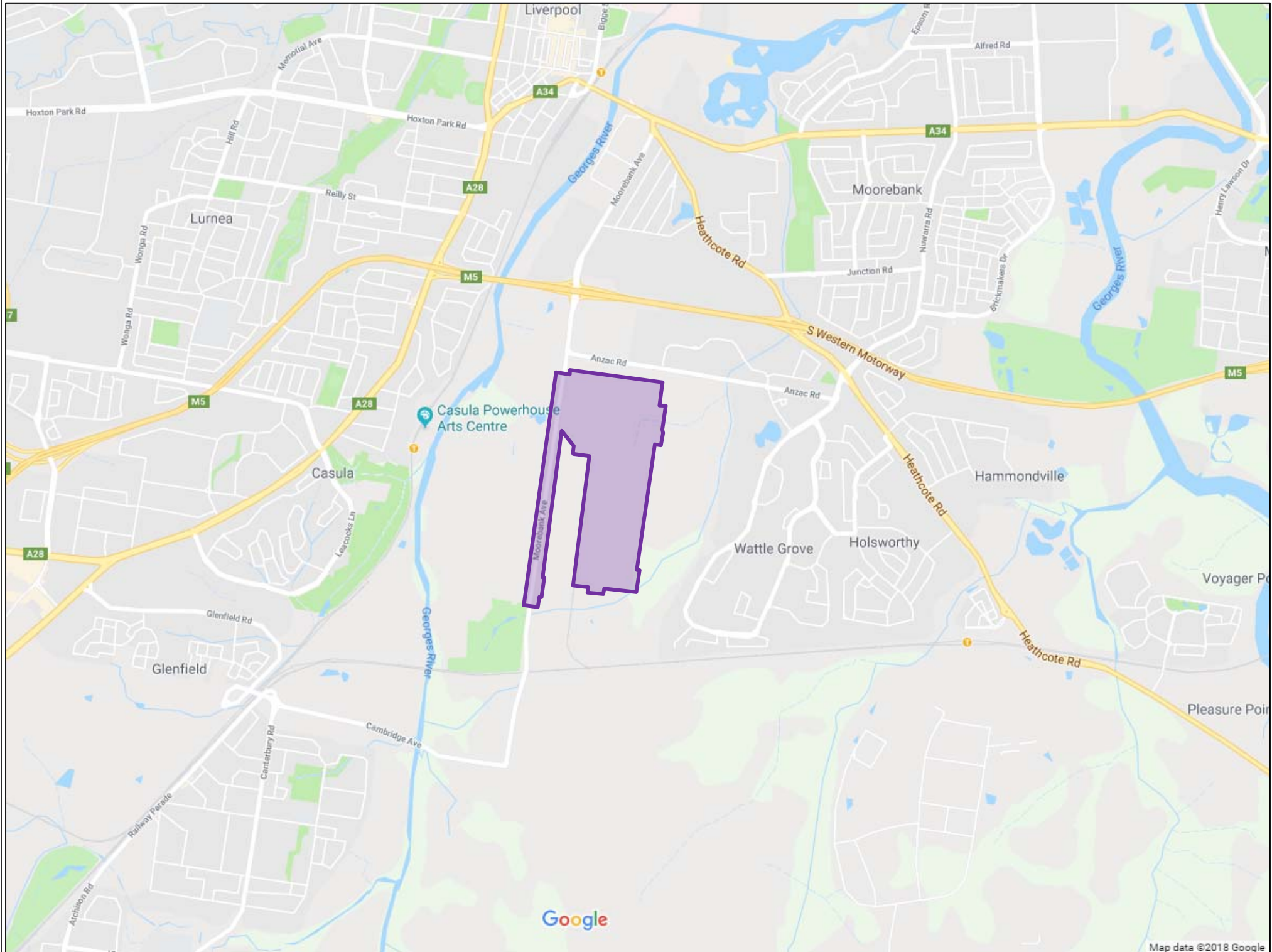
JBS&G 2016b, Site Audit Report and Statement 0503-1615 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW, JBS&G Australia Pty Ltd, 13 October 2016.

SIMTA 2018a, Early Works Spoil Management Plan Moorebank Precinct East Stage 2, Sydney Intermodal Terminal Alliances, 27 February 2018.

SIMTA 2018b, Community Communication Strategy Moorebank East Stage 2, Sydney Intermodal Terminal Alliances, 2 March 2018.

SIMTA 2018c, Early Works Environmental Management Plan Moorebank Precinct East Stage 2, Sydney Intermodal Terminal Alliances, 8 February 2018.

Figures



Legend

 Approximate Stage 2 Site Location



Figure 1 – Site Location



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Contamination Management Plan Stage 2 Moorebank Precinct East

Job No: EP0716
Date: 13/02/2018
Drawing Ref: Fig2
Version No: v2

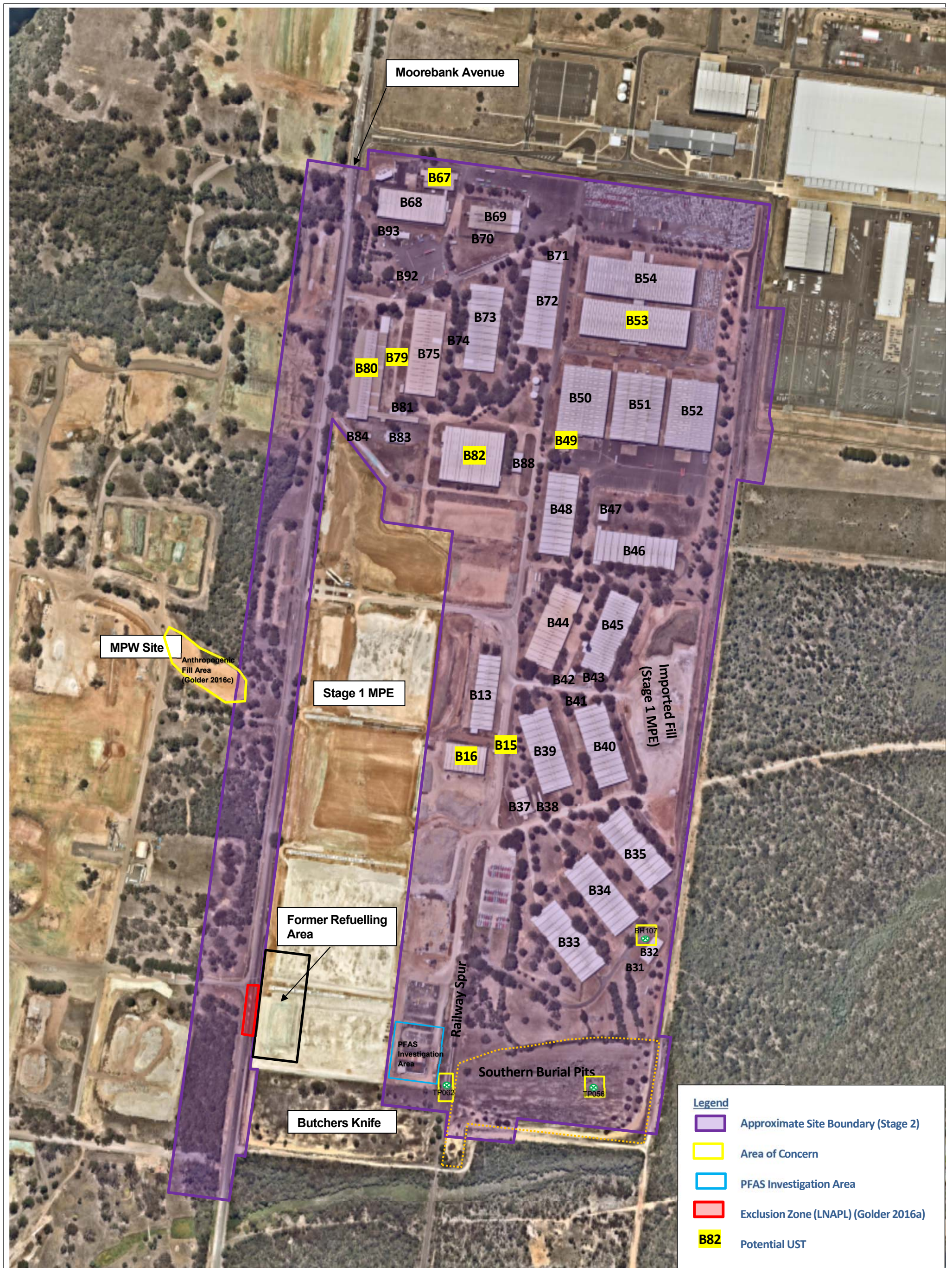


0 4 8 16
Approximate Scale Only (m)

Figure 2 – Stage 2 Site Plan and Boundary

Co-ordinate system: MGA 56
Drawn by: ER Checked by: AT
Scale of regional map not shown
Source: Google Maps





Appendix A

MOOREBANK AVENUE EXCLUSION ZONE AND
BUTCHERS KNIFE SMP'S (GOLDER 2016A AND 2016B),
FORMER DNSDC EMP (GHD 2016)



4 July 2016

MOOREBANK INTERMODAL COMPANY

Moorebank Avenue - Site Management Plan

Submitted to:

Moorebank Intermodal Company
Suite 2, Level 27
1 O'Connell Street
Sydney NSW 2000

REPORT

Report Number. 147623070-052-Rev1

Distribution:

MIC - 1 electronic
AECOM - 1 electronic





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1.0 INTRODUCTION

Golder Associates Pty Ltd (Golder) was engaged by Moorebank Intermodal Company (MIC) to prepare a Site Management Plan (SMP) for the portion of Moorebank Avenue located adjacent to the former Defence National Storage and Distribution Centre (DNSDC) Refuelling Facility located on the SIMTA Property, east of Moorebank Avenue at Moorebank, NSW.

The SMP has been prepared to document the management of the identified Light Non-aqueous Phase Liquid (LNAPL) contaminated groundwater located beneath Moorebank Avenue (the site) downgradient (west) of the former DNSDC refuelling facility, as identified in this SMP as the “*Exclusion Zone*”. The position of the Exclusion Zone is shown in the Figures attached in **Appendix A**.

1.1 Background

The Moorebank Intermodal Logistic Precinct (the Precinct) Project (the Project) involves the development of approximately 220 hectares (ha) of land. Moorebank Avenue bisects the Precinct which is comprised of the MIC property (including Moorebank Avenue) and the Sydney Intermodal Terminal Alliance (SIMTA) Property (including the former DNSDC) to the east of Moorebank Avenue (refer to **Figures 1 and 2**).

For clarity, the following terminologies will be applied throughout this document:

- Butchers Knife: the cleared land dividing the former DNSDC site (the SIMTA Property) from the vacant “*boot land*” located to the south (part Lot 4 DP1197707).
- Moorebank Avenue: The Moorebank Avenue Roadway, formally identified as Lot 2 DP 1197707;
- The SIMTA Property: the land situated to the east of Moorebank Avenue, owned by the Sydney Intermodal Terminal Alliance;
- The MIC Property West: the land situated to the west of Moorebank Avenue formerly occupied for Steele Barracks (including the School of Military Engineering [SME]) and Moorebank Barracks, leased by the Moorebank Intermodal Company;
- The MIC Property East which is also eased by the Moorebank Intermodal Company and encompasses:
 - the land designated for the Moorebank Avenue re-alignment to the east of the SIMTA property (part Lot 4 DP1197707); and
 - the *Boot Land* which is designated as an ecological conservation area (part Lot 4 DP1197707); and
 - the *Rail Access Corridor* which is designated for the development of a rail line connecting a portion of the Precinct development with the Southern Freight Corridor (part Lot 4 DP1197707).
- The Precinct: The land occupied by the proposed Moorebank Intermodal Logistical Precinct encompassing both the SIMTA property, the MIC Property West and the MIC Property East.

1.2 Requirement

Investigations of the potential contamination risks associated with the Moorebank Avenue identified LNAPL on the groundwater beneath Moorebank Avenue in the vicinity (west) of the former DNSDC Refuelling Facility. The presence of LNAPL necessitated the preparation of a site management plan (SMP) to allow ongoing use of Moorebank Avenue as a publically accessible road alignment (i.e. open space) and to facilitate the future development of the site for commercial/industrial land use until such time that the LNAPL and associated dissolved phase groundwater contamination can be remediated for the proposed commercial / industrial land use. The risks associated with the identified LNAPL are discussed within Section 4.1.

1.3 Purpose

The SMP has been prepared to document the management of the identified LNAPL contaminated groundwater located beneath Moorebank Avenue (the site) downgradient of the former DNSDC refuelling facility, as identified in this SMP as the “*Exclusion Zone*” (refer to **Figure 3**). This SMP documents the type



and extent of contaminated groundwater identified, and the controls to be implemented to minimise potential exposure and health risks associated with the identified LNAPL. The SMP also documents the responsibilities of Moorebank Intermodal Company as the organisation responsible for the future development and operation of the site.

The SMP has been prepared to manage the risks associated with LNAPL contamination until such time that the remediation activities proposed by Defence have been completed¹. At this time, this SMP will be revised on the knowledge of the outcomes of the proposed remediation actions. Where required, the management controls stipulated within this SMP will be incorporated in the wider Long Environmental Term Management Plan (LTEMP) scheduled to be developed for the Precinct.

The SMP has been prepared assuming ongoing open space use of the site as a publically accessible road alignment and the future development into commercial/industrial use. The SMP would require review and may require modification if:

- It is proposed to erect structures in the vicinity of the Exclusion Zone which would result in the potential for vapour intrusion into the structures and increased risk to site occupants; or
- It is proposed to change site usage to a more sensitive use.

¹ It is understood that the nominal schedule for the Defence remediation activities is 12 . 18 months commencing in June 2016.



2.0 SITE DESCRIPTION

2.1 Site Identification

The site locality and layout are presented in **Figure 1** and **Figure 2**, respectively. **Table 1** summarises the site identification.

Table 1: Site Identification

Item	Details
Address	Moorebank Avenue, Moorebank, NSW
Title Identification Details/ Legal Description	Lot 2 DP 1197707
Local Government Authority (LGA)	Liverpool
Site Area	Approximately 5.8 hectares
Exclusion Zone	Approximately 1,500 m ²

The site is owned by the Australian Government and will be leased to MIC under a 99 year lease, and MIC as Head Lessee will holder overarching responsibility for the development and operation of the site. On 4 June 2015, MIC, with the approval of the Commonwealth Government, entered an agreement with the Sydney Intermodal Terminal Alliance (SIMTA) under which SIMTA will obtain approvals, build and operate all stages of the Intermodal Terminal Development. SIMTA, is a consortium comprising Qube Holdings and Aurizon.

2.2 Description of Site and Surrounding Area

The site follows the alignment of Moorebank Avenue and is bound by Anzac Road in the north and the East Hills Railway Line in the south. The site bisects the Precinct separating the MIC Property West from the SIMTA Property and the MIC Property East.

Surrounding land includes, the MIC Property West which was formerly occupied by the Australian Army School of Military Engineering (SME) on Steele Barracks. While the majority of the buildings and infrastructure remains in place, the property is now unoccupied in preparation for the proposed redevelopment. The MIC Property East is land delineated for the Moorebank Avenue re-alignment. It is currently occupied by bushland and a service corridor to the east of the site. The SIMTA Property was formerly occupied by the Defence National Storage and Distribution Centre (DNSDC). Similarly to the MIC property, the SIMTA Property has retained the majority of its buildings but is currently unoccupied.

The site is relatively flat with the exception of a filled embankment in the southern portion which has been constructed to direct Moorebank Avenue over the railway line. The elevation at the northern end of the site is approximately 14 metres Australian Height Datum (m AHD) while elevations in the southern end of the site are approximately 15 m AHD. The filled embankment rises to an elevation of approximately 25 m AHD at the southern periphery of the site (Nearmap, 2016).

2.3 Summary of Site Assessments

A number of geotechnical and geochemical investigations have been previously carried out across the Precinct. These reports have been prepared primarily for the designated portions of the MIC Property East, the MIC Property West and the SIMTA Property.

Table 2 identifies the investigations which included information relevant to the Site and the former DNSDC refuelling facility.



Table 2: Previous Investigations

Author	Report Title
Groundwater Technology (1994)	Environmental Site Assessment
Dames and Moore (1996)	Environmental Management Plan and Environmental Audit
Egis Consulting Australia (2000)	Stage 1 Preliminary Site Investigation, Moorebank Defence Site
HLA Envirosciences (2002)	Soil & Groundwater Investigation Precinct H (DNSDC) Moorebank Defence Land
HLA Envirosciences (2005)	AST and UST Management Plan, Volume 10, Sydney West Defence Region
GHD (2015a)	DNSDC Moorebank Intrusive Site Investigations (21/24133/207651)
GHD (2015b)	DNSDC Moorebank Additional site investigations and remedial options evaluation (21/24133/209789)
GHD (2015c)	DNSDC Moorebank . Refuelling Area Remedial Action Plan (21/24133/211259)
Golder (2010)	Phase 1 Environmental Site Assessment, Stage 1A of Moorebank Intermodal Freight Terminal Development ((document no. 107623148-001-R-RevA)
Golder (2015b)	Remediation and Demolition Specification Moorebank Intermodal Terminal (document reference: 147623070-023-Rev1)
Golder (2015c)	Validation Plan - Principles Moorebank Intermodal Terminal (document reference: 147623070-022-Rev0)
Golder (2015d)	Onsite Quantitative Human Health Risk Assessment Moorebank Intermodal Terminal (document reference: 147623070-043-R-Rev1)
Golder (2016)	Preliminary Site Investigation . Moorebank Ave Moorebank Intermodal Terminal (document reference 147623070-50-R-Rev1)
JBS&G (2015a)	Phase 2 Environmental Site Assessment, SIMTA Intermodal Terminal Facility . Stage 1 (document no. 50342-60868 Rev3)
JBS&G (2015b)	Remedial Action Plan, SIMTA Intermodal Terminal Facility . Stage 1 (document no. 50342-61155 Rev1)

2.3.1 Review of Previous Investigations

For clarity, it is noted that two contamination investigations were undertaken on the SIMTA Property by JBS&G and GHD concurrently and independently. JBS&G were engaged by Tactical Group to conduct a Phase 2 Environmental Site Assessment (JBS&G 2015a) and Remediation Action Plan (JBS&G 2015b) that would meet the requirements of the planning application process for the first stage of development at the SIMTA property. GHD were engaged by the Department of Defence to conduct intrusive site investigations (GHD 2015a and GHD 2015b) and Remedial Action Plan (GHD 2015c) to satisfy the requirements for the Department of Defence to relinquishing their lease of the SIMTA Property.

Former DNSDC Refuelling Area – DNSDC Building 21

JBS&G (2015a) completed intrusive investigations at a number of areas of interest at the Stage 1 site and Rail Corridor on the SIMTA Property. During this investigation, JBS&G identified the former DNSDC refueling area within the Stage 1 site as having significant contamination in the form of LNAPL. Groundwater monitoring wells MW03 and BHHP34011 recorded 2.865 m and 0.684 m of LNAPL in the January 2015 gauging event.

JBS&G (2015b) developed a Remediation Action Plan (RAP) Stage 1 site of the SIMTA Property and particularly in relation to the contamination identified at the refueling area. The RAP recommended the following in relation to the contamination associated with the refueling area:



- Removal of the fuel from the six underground storage tanks (USTs) located on the site (*completed in July 2015*);
- The removal of LNAPL to the extent practicable via multi-phase extraction (MPE);
- The removal of fuel storage and distribution infrastructure including excavation and onsite bioremediation of hydrocarbon impacted soils;
- The reuse of validated bioremediation material for the backfilling of excavations; and
- Groundwater monitoring for residual groundwater contamination in the refueling area.

Concurrently with the JBS&G investigations, GHD (2015a) completed an intrusive investigation program around former DNSDC refueling area. The investigations initially included the installation of 11 new groundwater wells within the vicinity of the former DNSDC refueling area and a groundwater monitoring event. During the April-May 2015 groundwater monitoring event, LNAPL was observed in nine wells (GW002B, DNSDC2 (inferred to be MW3, installed by JBS&G 2015a), BHHP34011, GW113, GW115, GW116, GW118, GW119 and GW120).

The initial GHD investigation was augmented with an additional investigation and remediation option assessment GHD (2015b). The investigation included the installation of 28 new groundwater wells, on former DNSDC refuelling facility and further six monitoring wells were installed offsite within on the adjacent MIC West property (within the former School of Military Engineering [SME]) and within the Moorebank Avenue site. The LNAPL impact was identified offsite to the west of Tank 6 in monitoring wells GW119 and GW120, however, was delineated by a perimeter of groundwater wells not impacted by LNAPL. GHD concluded that the pattern of LNAPL distribution supports the suggestion that there are multiple sources of hydrocarbon release from the refuelling infrastructure, and the impacts identified beneath Moorebank Avenue were likely sourced from Tank 6 which contained diesel at the time of the investigations. GHD also concluded that distribution of dissolved phase impact in groundwater demonstrates significant attenuation of hydrocarbon concentrations in groundwater towards the perimeter wells.

Based on the conditions encountered on the former DNSDC refuelling area, Defence's obligations with respect to the termination of the lease agreement and the presence of off-site LNAPL (i.e. contamination present beneath Moorebank Avenue), GHD classified the DNSDC Refuelling Area as a high risk site+ (spreading LNAPL). GHD recommended a remedial approach with the goal of achieving containment with aggressive remediation of mobile LNAPL (GHD, 2015b).

Subsequent to the two rounds of investigations, GHD (2015c) developed a RAP for the refueling area. The RAP details the protocols of the proposed remediation works required to remediate the hydrocarbon and LNAPL contamination on the former DNSDC refueling area. In addition, GHD summarised the interim management measures that had been undertaken:

- Bail down tests were undertaken on DNSDC2 (MW3) and BHHP34011 in April 2015. GHD reported that LNAPL recoverability was relatively quick and Multi Phase Vacuum Extraction (MPVE) was recommended as an interim option for management of the LNAPL.
- A two day MPVE trial was completed from 9 to 10 June 2015. Over the course of the two day trial, an estimated total mass of 150.9 kg of hydrocarbon was recovered in 10 wells.
- A five day MPVE event was completed from 13 July to 17 July 2015. Over the course of the five day MPVE event, an estimated total mass of 359 kg of hydrocarbon was recovered from nine wells.
- LNAPL finger print analyses were conducted on samples collected from separate impacted areas identified by GHD. The analyses indicated that the impacted areas represented by BHHP34011, DNSDC2 (MW3) and GW120 were predominately comprised of diesel product. The impacted area represented by GW121 (up gradient of the refueling area) was a mix of petrol (15% \pm 5%) and diesel (85% \pm 5%).



GHD (2015c) recommended the remediation of the dissolved phase hydrocarbon and LNAPL contamination is carried out in three phases:

- Phase A . Source Removal (tanks and soils) : Removal of six USTs in the two tank farms and associated field delivery infrastructure and bio-remediation of the contaminated soils;
- Phase B . Risk Assessment: Human health risk assessment and fate and transport modelling; and
- Phase C . Source Removal (groundwater): GHD recommended further removal of LNAPL in the form of MVPE post completion of Phase A and B.

It is understood GHD have been commissioned by Defence, to undertake the remediation of the former DNSDC Refuelling Facility in accordance with the RAP (Golder, 2015c). And these works are scheduled to be completed over a 12 - 18 month period commencing in June 2016 (Defence, 2016 *pers. Comm.* 16 May). Currently there is no active remediation proposed within the Exclusion Zone, however, it is understood² that this will be reviewed at the completion of second phase of the remediation works (i.e. Phase B . Risk Assessment). If warranted, the proposed MPVE will be extended to the off-site impacts (H. Milne, GHD 2016 *pers. Comm.* 28 April). It is also understood the remediation works will be reviewed by Accredited Contaminated Site Auditor (Andrew Lau), and a Site Audit Statement will be prepared at the completion of the works. It is understood the current scope of the Audit is limited to the SIMTA property, however, at the time of reporting Defence has not received comment from the Auditor in regards to management of the offsite contamination (Defence, 2016 *pers. Comm.* 16 May).

² Based on communication with Helen Milne of GHD on 28 April 2016.



3.0 REGULATORY REQUIREMENTS

3.1.1 Commonwealth Framework

All works must comply with the Commonwealth statutory requirements in the planning and delivery of the works.

3.1.2 NSW Contaminated Land Legislative Framework

In broad terms the NSW legislative framework for contaminated lands consists of two tiers.

- The principal legislative vehicle is the *Contaminated Land Management Act 1997 (CLM Act)* which deals with site contamination that is significant enough to warrant regulation under the *CLM Act* given the sites current or approved use.
- The second tier is focused on departments (i.e. local councils or the NSW Department of Planning) who deal with contamination under the planning legislative framework, including State Environmental Planning Policy No. 55 . Remediation of Land and the Managing Land Contamination . Planning Guidelines (DUAP, 1998). These provide the framework for determining what remediation is needed to make land suitable for the intended use.

For the purpose of implementing this SMP, legislation, regulations and guidelines which may affect management or works within the Exclusion Zone include, but are not limited to the following:

- *NSW Contaminated Land Management Act 1997;*
- *NSW Protection of the Environment Operations Act 1997;*
- *NSW Protection of the Environment Operations Regulations 2014;*
- *NSW Work Health and Safety Act 2011; and*
- *NSW Work Health and Safety Regulation 2011.*



4.0 RISKS AND CONTROL MEASURES

4.1 Conceptual Understanding of Contamination

The current investigation has not included the installation of groundwater monitoring wells within Moorebank Avenue (the site), and the actual conditions within the Exclusion Zone have not been assessed directly. The conditions within the Exclusion Zone have been inferred based on the results of investigations undertaken on the adjacent properties which included the installation of monitoring wells immediately west of Moorebank Avenue, on MIC West, and immediately to the east, on the SIMTA owned former DNSDC refuelling facility. The following presents a summary of the conditions encountered on the adjacent properties, and is considered representative of the conditions likely to be encountered within the Exclusion Zone.

The investigations have identified the former DNSDC refuelling facility as the source of hydrocarbon contamination in the area. The historic use of the facility for vehicle refuelling has resulted in the release of hydrocarbons into the underlying groundwater and the hydrocarbons have migrated beneath Moorebank Avenue (the site) and beneath the eastern portion of the MIC West property (near the former entrance to the SME). The primary contaminants of potential concern include (GHD, 2015a) and are associated with typical Australian petroleum mixtures:

- Total reportable hydrocarbons (TRH);
- Benzene, toluene, ethyl benzene, xylene (BTEX);
- Naphthalene;
- Lead; and
- Poly-cyclic Aromatic Hydrocarbons

The GHD investigations have determined that the LNAPL below Moorebank Avenue is likely to be associated with diesel fuels. The extent of the LNAPL plume has been delineated and includes the foot print of the former refuelling station, portions of the SIMTA property to the east of the refuelling station, a portion of Moorebank Avenue (the Exclusion Zone) and a small portion of the MIC West property. Based on the Golder investigations in 2016 (which were completed approximately eight months after the MPVE trials were completed in the area) the LNAPL was measured at approximately 1.76 m apparent thickness in monitoring well GW120 located near the former entrance to the SME (MIC West) at approximately 6.5 m depth below ground (Golder, 2016).

The extent of LNAPL contamination, as delineated by GHD is presented in Figure 4 (Appendix A) and the maximum concentrations of dissolved phase contaminants reported on the DNSDC refuelling facility are summarised in Table 3.



Table 3: Summary of maximum dissolved phase contaminant concentrations (from GHD, 2015b)

Parameter	Health Levels Commercial / Industrial (mg/l) ^a	Screening Health Levels Open Space (mg/l) ^b	Maximum Concentration (mg/l) / Location
TRH . C ₆ -C ₁₀ (F1)	NL	NL	33 (GW121)
TRH . >C ₁₀ -C ₁₆ (F2)	NL	NL	2,100 (GW116)
Benzene	30	NL	21 (GW121)
Toluene	NL	NL	19 (GW121)
Ethyl benzene	NL	NL	0.96 (GW121)
Xylene	NL	NL	1.9 (GW121)
Total xylene	NL	NL	6 (GW121)
Naphthalene	NL	NL	0.99 (GW116)

A . Commercial / industrial land use, HSL(D) for vapour intrusion . clay . groundwater depth 4 -8m

B . Open space land use, HSL (C) for vapour intrusion . clay . groundwater depth 4 -8m

NL . Non-limiting³.

During the GHD well installation program, the groundwater encountered was between 9.5 m and 10.5 m depth, indicated the groundwater in the area is semi confined and is actually present at depths lower than that measured in the monitoring wells. Based on the GHD logs and previous Golder investigations the geology in the area is clay with some horizontal sandy clay lenses. The water within the impacted wells was reported by GHD as being present in low plasticity red / grey clay. The inferred groundwater flow direction is west towards the Georges River, however the presence of LNAPL around the refuelling station has limited the interpretation of flow directions.

The soil assessments completed by Golder (2016) and GHD (2015a and 2015b) did not indicate impacted soils within the shallow soil profile (i.e. <1m depth). Furthermore, the GHD (2015a and 2015b) investigations did not identify soil impacts either on the site, nor offsite which exceeded the investigation levels for vapour intrusion or direct exposure for commercial workers and intrusive maintenance workers.

It is noted that, the NEPM HSLs (2013) for groundwater beneath an open space / recreational land use are non-limiting for all groundwater depths and geologies. Furthermore, the vapour intrusion modelling completed by Fiebel and Nadebaum (2011), included the assessment of shallow intrusive maintenance workers and also derived HSL which were non-limiting for all groundwater depths and geologies. On this basis, the vapour intrusion modelling used to inform the NEPM (2013) and that completed by Fiebel and Nadebaum (2011) indicates that the presence of LNAPL is unlikely to present an unacceptable risk to the current site users. However, the vapour intrusion modelling completed by Fiebel and Nadebaum is based on soil vapour equilibrium calculations based on Henry's law constant, and does not fully consider partitioning of vapours from LNAPL. Best practice is to estimate soil vapour concentrations from LNAPL using equations based on Raoult's Law for the mole fractions of the various constituents of the NAPL, or collect soil vapour samples to allow comparison with the soil vapour HSLs. As such, further assessment of the potential vapour risks associated with the LNAPL plume is required. However, as aggressive remediation activities are proposed, it is expected that these assessments will be completed (if required) at the completion of the remediation activities.

4.2 Exposure Pathways / Hazards

The current use of the site is as a publically accessible road alignment, with a concrete footpath located on the western side of the road. There are also several underground services which travel through the road alignment. Subsequently the current users of the site are considered to include the following:

³ When a Non Limiting HSL is derived it indicates that based on the defined solubility limits, a soil vapour source could not exceed a level that would result in the maximum allowable vapour risk for the given scenario.



- Members of the public using Moorebank Avenue, including persons travelling in vehicles, bicycles and walking; and
- Maintenance workers, including shallow intrusive maintenance workers requiring access to the underground services located in the area.

Based on the review of the investigation results it is considered that the principal exposure route and potential hazard from the identified groundwater contamination for the current users of the site is via inhalation of vapours potentially emanating from the LNAPL plume. Based on the LNAPL depth (>6 m depth), and that no impacts were detected in the shallow soils within the road reserve, a direct exposure pathway is considered incomplete and unlikely to present a potential risk to the current users of the road reserve.

Due to the open space environment, the general day to day site activities are unlikely to result in exposure of site users, or the general public to the vapours potentially emanating from the LNAPL plume in the Exclusion Zone. This includes general grounds maintenance workers undertaking non-intrusive grounds maintenance on activities. There is an increased hazard for workers performing shallow underground utility maintenance works within the exclusion zone, as there is potential for vapour emanating from the LNAPL plume to accumulate within the service trenches. There is also an increased hazard for workers performing shallow excavation works within the Exclusions Zone.

Following the redevelopment of the Precinct, it is expected that portion of the site impacted with LNAPL will become part of the wider commercial / industrial development. The area is proposed to include open space rail infrastructure, and no buildings are proposed for this portion of the land. Subsequently, the potential future users are considered to include:

- Workers involved in the development of the precinct, particularly those involved in excavation activities including possible piling works;
- Future workers employed on the property, including shallow intrusive maintenance workers requiring access to underground services potentially installed in the area.

The potential exposure of future workers on the site will be subject to the outcomes of the remediation actions proposed by Defence. As the outcomes of the remediation works are not yet known, it has conservatively assumed that LNAPL will remain within the Exclusions Zone at the completion of the proposed remediation action. And based on this assumption, the principal exposure route and potential hazard for future users of the site is also via inhalation of vapours potentially emanating from the LNAPL plume. However, in regards to future site users there is also potential for workers to be directly exposed to contaminated groundwater and or soils should deep excavation (>5 m depth) and /or groundwater extraction be required during the redevelopment works. Deep excavation works, and or extraction of impacted groundwater from within in the Exclusion Zone will also increase the potential for workers to be exposure to vapours.

The potential extraction of impacted soil and or groundwater during the future development activities, also presents a potential hazard to ecological receptors if the cuttings and/or extracted is not appropriately controlled. Without appropriate containment the contaminated materials may be dispersed across the site or off-site, and present a risk to ecological receptors on the site and offsite.

4.3 Control Measures

4.3.1 Rationale

For the purpose of this SMP a worst case scenario has been assumed, with a complete exposure pathway is present via the inhalation of vapours emanating from the LNAPL plume for both the current and future users of the site.

Additional controls are also presented to address potential direct exposure risks that future construction workers undertaking deep excavation work and or undertaking groundwater extraction from within the Exclusion Zone.



4.3.2 Management Controls

Controls are required to create awareness of the presence of contamination and where possible restrict activities in the Exclusion Zone (refer **Figure 3**), such that potential vapour exposure risks are managed and that activities resulting in the disturbance of the identified LNAPL plume are minimised.

The proposed management controls are identified in Table 4 below.

Table 4: Management Controls

Management task	Commentary
Objective	Administrative controls are required to alert users of the site to the potential vapour inhalation risks and to restrict un-necessary disturbance of the contaminated groundwater located at depth in the Exclusion Zone.
Performance criteria	<p>Uncontrolled sub surface activities are not to be undertaken in the Exclusion Zone.</p> <p>Uncontrolled groundwater extraction activities are not to be undertaken in the Exclusion Zone.</p>
Management controls	<p>Prepare a training and induction process notifying all employees and contractors on the hazards associated with the Exclusion Zone, and implement as appropriate prior to works commencing.</p> <p>Notify the owners and/or managers of sub-surface utilities within the Exclusion Zone of the potential petroleum hydrocarbon vapour exposure risks.</p> <p>Prepare and implement a Job Safety Analysis (or equivalent) prior to commencement of any sub-surface utility maintenance activities. The JSA should include as a minimum the following control measures:</p> <ul style="list-style-type: none">■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to petroleum hydrocarbon vapours;■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours; and■ Definitions of appropriate person protective equipment requirements. <p>No excavation or disturbance to site soils and no extraction of groundwater from within the Exclusion Zone without written authorisation by the Site Owner or Site Manager.</p> <p>Where possible, the future redevelopments are to be designed that that the potential disturbance of the groundwater within the Exclusions Zone is minimised. This may include the consideration of designs and or construction methods which minimise deep excavations (including piling) and / or groundwater extraction within the Exclusion Zone.</p> <p>Prepare and implement a Job Safety Analysis (or equivalent) prior to commencement of excavation and /or groundwater extraction activities. The JSA must include as a minimum the following control measures:</p> <ul style="list-style-type: none">■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to petroleum hydrocarbon vapours;■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours;



Management task	Commentary
	<ul style="list-style-type: none">■ Definitions of appropriate person protective equipment requirements;■ Appropriate controls on personal hygiene to minimise ingestion by hand to mouth of potentially impacted soils and /or groundwater; and■ Appropriate personnel decontamination procedures. <p>Prepare and implement a Construction Environmental Management Plan (CEMP) prior to commencement of excavation and /or groundwater extraction activities. The CEMP must include as a minimum the following control measures for the following aspects:</p> <ul style="list-style-type: none">■ Surface water discharge of contaminated materials;■ Dust/vapour and odour emissions emanating from contaminated materials;■ On-site remediation and / or treatment of extracted contaminated soils and groundwater;■ Waste classification, haulage and offsite disposal;■ Spillage of contaminated materials; and■ Appropriate equipment decontamination procedures; <p>Permanent or temporary structures are not to be erected within the Exclusion Zone, without the consideration of potential vapour intrusion risk, and may require the installation of appropriately designed passive or active vapour management infrastructure (such as vapour barriers, or active sub-slab ventilation systems).</p> <p>Initiate corrective actions as soon as practicable and within two weeks of identification of non-conformance.</p>
Long Term Environmental Management	<p>Six monthly groundwater gauging will be undertaken, until such time that the remediation activities proposed by Defence have been completed. At this time, this SMP will be revised on the knowledge of the outcomes of the proposed remediation actions.</p> <p>A Job Safety Analysis (or equivalent) is to be prepared and implemented prior to commencement of groundwater gauging activities. The JSA should include as a minimum the following control measures:</p> <ul style="list-style-type: none">■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to petroleum hydrocarbon vapours;■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours; and■ Definitions of appropriate person protective equipment requirements. <p>Where required future activities associated with this SMP will be incorporated in the wider Long Environmental Term Management Plan (LTEMP) scheduled to be developed for the Precinct. It is expected that the LTEMP will include details on any ongoing groundwater monitoring activities required in the proposed Exclusion Zone.</p>
Record keeping and reporting	Maintain a log of inspections, non-conformances and corrective actions.
Responsibility	Head Lessee or delegate



MIC MOOREBANK AVENUE SMP

Management task	Commentary
Corrective Actions	<p>Corrective actions will be required if any of the above mentioned management controls are not complied with.</p> <p>The Non-conformance and complaints register presented as Appendix D identifies the requirement for corrective action and recommendations for preventative actions. Corrective and preventative actions are to be reviewed and implemented by the Site Manager or his/her delegate.</p>



5.0 RESPONSIBILITY

This SMP is to be implemented for the on-going use of the Exclusion Zone, or until it is proven to the satisfaction of the accredited NSW EPA contaminated site auditor (the Auditor) that the SMP is no longer required and can be revoked.

The implementation of this SMP is the responsibility of the Head Lessee (MIC) under the obligations imposed under Clause 6.1(b)(1) of the Head Lease from the Commonwealth to MIC, where:

“remediating all Contamination on, in or in respect of the Premises to the standard required under any applicable Environmental Law from time to time irrespective of who caused the Contamination and irrespective of whether the Contamination first occurred or was first caused or was first disturbed prior to the Commencement Date or the date of the Tenant’s first occupation of the Land.”

To clarify, in respect of this SMP the abovementioned term ~~remediation~~ includes the implementation of a management approach where appropriate.

The responsible person for the overall implementation of the SMP is the Head Lessee and/or their nominated representative or delegate. Implementation of the SMP during specific works is the responsibility of the works supervisor, considered to be the delegate of the Site Manager.

The roles and responsibilities for the implementation of the SMP are identified in Table 5 below.

Table 5: Roles and Responsibilities

Role	Responsibility
Head Lessee (MIC) or delegate	<p>Approve the SMP.</p> <p>Advise persons working at the site of the requirements of the SMP.</p> <p>Ensure appropriate consents and licences (as required) are obtained for the works.</p> <p>Provide training and induction of employees and contractors before and during the works, as appropriate.</p> <p>Provide a copy of the SMP to the supervisor or person-in-charge of employees and/or contractor/s who are undertaking the works.</p> <p>Ensure implementation of the SMP. Maintain a log of Project Personnel.</p> <p>Ensure staff and contractors comply with the requirements of the SMP.</p> <p>Ensure staff and contractors clearly understand the requirements of the SMP and ensure that compliance with the SMP is a condition of any agreement with contractors.</p> <p>Update the SMP if the condition of the site is changed, and, if necessary, inform other parties of the changes.</p> <p>Ensure the site is maintained in accordance with the SMP.</p> <p>Provide the SMP for inclusion on the relevant records maintained by MIC and others (including owners and /or agents responsible for the management of assets within the Exclusion Zone).</p> <p>Ensure an inspection of the site is undertaken at six-monthly intervals or at another intervals as decided by MIC and record the results of the inspections in Appendix B of the SMP.</p> <p>Ensure all non-conformance and/or complaints are recorded in Appendix C of the SMP.</p>
Site Manager	<p>Implement the SMP to ensure compliance.</p>



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Role	Responsibility
	<p>Complete the registers, databases and records required by the SMP.</p> <p>Conduct works in an environmentally responsible manner.</p> <p>Meet relevant WH&S regulatory requirements.</p> <p>Implement the works in a safe and responsible manner.</p> <p>Ensure that environmental protection measures are in place and are functioning correctly during the works and after completion of the works, if required.</p> <p>Complete non-conformance and corrective action reports as required and undertake follow-up corrective actions, as required.</p> <p>Conduct monitoring as required in the SMP.</p> <p>Undertake audits of activities in accordance with the requirements of the SMP.</p> <p>Ensure non-conformance and/or complaints are reported to the Site Manager and Site Owner.</p> <p>Undertake corrective actions in response to requests regarding specific environmental or safety issues.</p> <p>Ensure all works comply with relevant regulatory requirements.</p> <p>Inform the Site Manager if conditions change significantly from those documented in the SMP.</p>
Site Developer	<p>Provide the SMP to any maintenance worker or contractor (who is engaged under the direction of the site developer).</p> <p>Comply with the SMP during development of the site, including being aware of and accommodating the requirements of the Exclusion Zone within the design redevelopment.</p> <p>Prepare and implement a Construction Environmental Management Plan, for any activities proposed within the Exclusion Zone, and ensure the CEMP addresses the risks identified in this SMP.</p> <p>Ensure potential risks are managed through implementation of the SMP.</p> <p>Monitor adherence to the SMP.</p> <p>Initiate and undertake corrective actions for non-conformance under the SMP.</p> <p>Inform the Site Owner and Site Manager if in-ground conditions change significantly from those documented in the SMP.</p>
Maintenance Work / Contractor	<p>Comply with the SMP, including relevant legislation and guidance when conducting works at the site.</p> <p>Ensure tasks are approved by the Site Owner their delegate (Site Manager or Site Developer) prior to commencing work.</p> <p>Inform the Site Owner/ Site Manager/Site Developer if ground conditions differ and/or change significantly from those documented in the SMP.</p>



6.0 CONTINGENCY ACTIONS

Table 6 identifies contingency actions to be performed in the event of unexpected exposure of site occupants or visitors to contamination on the site occurs or the potential for exposure occurs.

Table 6: Contingency Actions

Trigger	Action
Unauthorised underground utility maintenance (including those not requiring excavation), or installation works occurring in the Exclusion Zone.	<p>If works are in process:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent run-off.■ Site Manager to engage an experienced environmental consultant⁴ to assess exposure of workers to potentially contaminated materials. <p>If excavations have occurred and the area has been reinstated:</p> <ul style="list-style-type: none">■ Assess condition of surface soils in the work area against appropriate land use criteria to confirm contaminated soils do not remain on the site surface.■ Site Manager to engage an experienced environmental consultant to assess if excavation works have increased the potential risks associated petroleum hydrocarbon vapour migration (i.e. generation of a preferential migration pathway).■ Instigate preventative action to limit the potential for reoccurrence.
Unauthorised excavations in the Excavation Exclusion Zone.	<p>If excavations are in process:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent run-off.■ Site Manager to engage an experience environmental consultant and /or occupational hygienist to assess exposure of workers to potentially contaminated materials. <p>If excavations have occurred and the area has been reinstated:</p> <ul style="list-style-type: none">■ Assess condition of surface soils in the work area against appropriate land use criteria to confirm contaminated soils do not remain on the site surface.■ Instigate preventative action to limit the potential for reoccurrence.
Identification of unexpected contaminated materials during excavation works within the Exclusion Zone.	<p>If unexpected contamination⁵ is encountered during shallow excavation works the following actions should be taken:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent run-off.

⁴ For example a member of the Australian Contaminated Land Consultants Association (ACLCA) or equivalent

⁵ Contamination may include, but not be limited to, hydrocarbons, poly cyclic aromatic hydrocarbons and asbestos.



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Trigger	Action
	<ul style="list-style-type: none">■ Site Manager to engage an experience environmental consultant to assess potentially contaminated materials.■ Update the SMP. <p>Adverse conditions which may warrant action include;</p> <ul style="list-style-type: none">■ highly malodours soils or seepage water (e.g. strong residual petroleum odours);■ hydrocarbon sheen on surface water;■ discoloured chemical deposits or soil staining with chemical waste other than of a minor nature;■ large monolithic deposits of materials (e.g. gypsum as powder, or plaster board);■ presence of putrescible refuse including material that may generate hazardous levels of ground gases (e.g. methane) such as large quantities of green waste or timber waste;■ presence of objects which may indicate the presence of chemical contamination, such as drums, tanks or other such storage items; and■ presence of asbestos containing materials (ACM).
Other	Liaise with Site Manager / Site Owner to determine appropriate actions to mitigate adverse impacts from the event.



7.0 SMP REVIEW AND TIMEFRAME

7.1 Review of SMP

This SMP must be reviewed annually by a competent person and assessed against any changes in site conditions, work requirements, legislation, environmental conditions and other relevant factors including the result of corrective and preventative action reports. Where relevant, preventative actions should be incorporated into the SMP.

If revision of this SMP is considered necessary then the revision should be agreed by at least the following:

- The Site Owner; and
- The Site Manager.

7.2 Timeframe for SMP

This SMP, or any subsequent revision, should apply in perpetuity or until:

- Investigations indicate the concentrations of the contaminants of concern in soil and or groundwater have attenuated or have been remediated to levels below the below endorsed criteria for the commercial/industrial and open space land use; or
- Reassessment of contaminant concentrations against future revisions of land use criteria indicates the measured concentrations are below endorsed criteria for the relevant land use (i.e. commercial/industrial land use or open space); or
- The redevelopment and or remediation of the Exclusion Zone has been completed, and it is agreed with the Auditor that the controls of this SMP are to be incorporated into the wider LTEMP when developed; or
- The land use changes to a more sensitive land use and reassessment of potential risks to site occupants is required.



Report Signature Page

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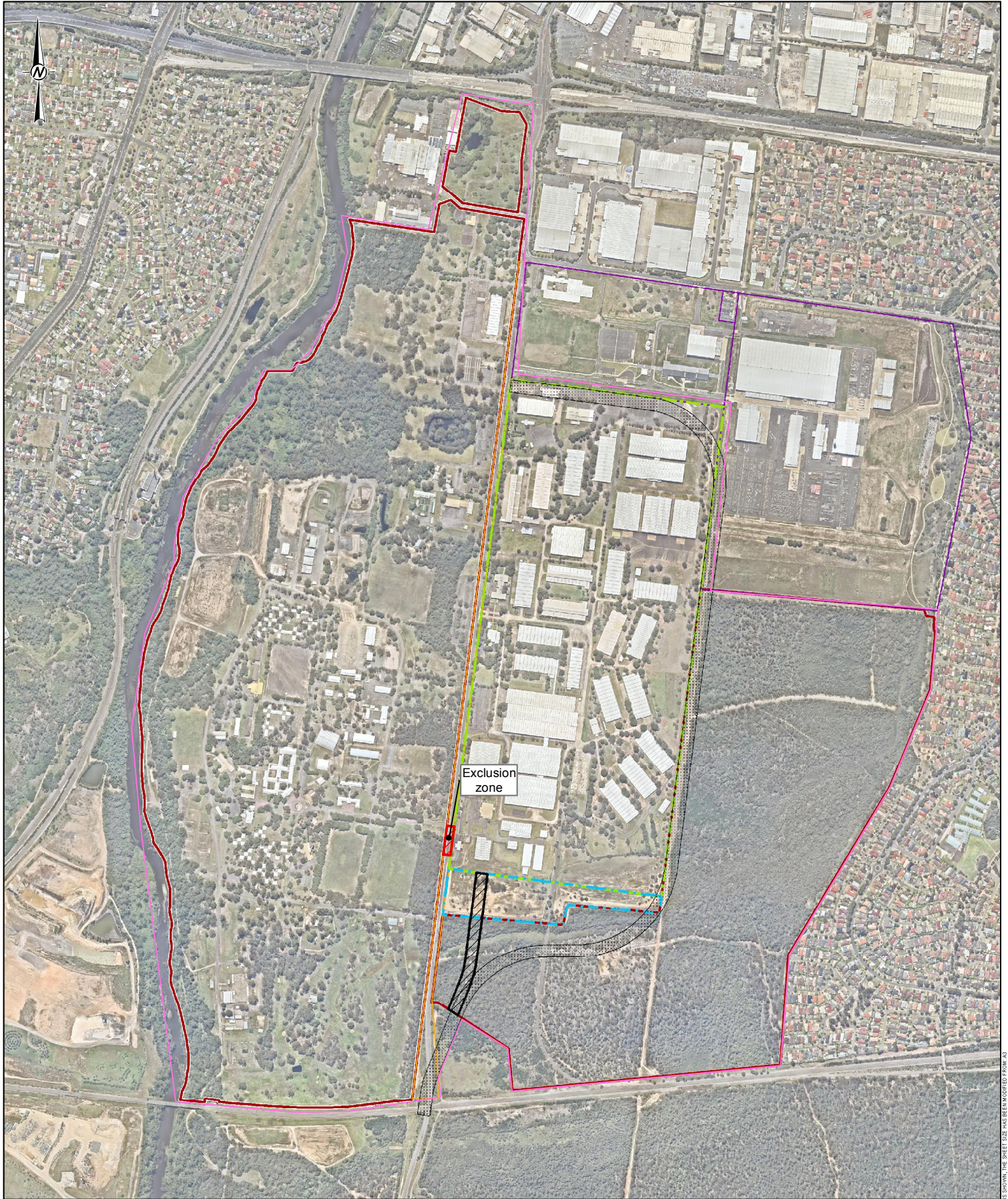


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APPENDIX A

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LEGEND

- Exclusion zone (LNAPL)
- The Precinct (approximate)
- MIC Property West
- Bootland (MIC Property East)
- Butchers Knife
- SIMTA Property
- Joint Defence Logistics Complex Moorebank
- Moorebank Ave
- Moorebank Ave Realignment
- Rail Access Corridor

NOTE(S)
LNAPL - Light Non Aqueous Phase Liquid

REFERENCE(S)
1. Lot boundaries provided by Land and Property Information NSW

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CLIENT
MOOREBANK INTERMODAL COMPANY

PROJECT
SITE MANAGEMENT PLAN -PART LOT 2 DP 1197707

TITLE
SITE OVERVIEW

CONSULTANT
 Golder Associates

YYYY-MM-DD	2016-06-24
PREPARED	KJS
DESIGNED	####
REVIEWED	GVS
APPROVED	GVS

PROJECT NO. 147623070 **CONTROL** 052 **REV.** 1 **FIGURE** 001

0 420 840
1:10,000
PROJECTION: GDA 1994 MGA Zone 56
METRES

— Drainage Lines

1:1,250
PROJECTION: GDA 1994 MGA Zone 56

APPROVED GVS

REV.
1FIGURE
002



LEGEND

- Exclusion zone (LNAPL)
- MIC Property West
- Butchers Knife
- SIMTA Property
- Moorebank Ave
- Rail Access Corridor

NOTE(S)

1. Exclusion zone digitised from G : D Groundwater Impacts summary report Figure 5

2. LNAPL - Light Non Aqueous Phase Liquid

REFERENCE(S)

1. Lot 2 DP 1197707 provided by Land and Property Information NSW

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CLIENT

MOOREBANK INTERMODAL COMPANY

PROJECT

SITE MANAGEMENT PLAN - PART LOT 2 DP 1197707

TITLE

MOOREBANK INTERMODAL COMPANY EXCLUSION ZONE

CONSULTANT	YYYY-MM-DD	2016-06-24
	PREPARED	KJS
	DESIGNED	####
	REVIEWED	GVS
	APPROVED	GVS

Golder Associates

PROJECT NO.	CONTROL	REV.	FIGURE
147623070	052	1	003

0 40 80

1:1,000

PROJECTION: GDA 1994 MGA Zone 56

METRES



APPENDIX B

SMP Inspection Report



APPENDIX B SMP INSPECTION REPORT

The purpose of this Inspection Report is to facilitate maintenance of a record of inspections undertaken at the Moorebank Avenue %Exclusion Zone+, and to record the results of the inspections including a record of any corrective actions required.

The Inspection Report is to be reviewed and signed by the site manager following completion of the inspection and corrective actions (if any).

Date:	
Time:	
Inspector (name & signature):	
Observations:	
Problems (if observed):	
Report to:	
Corrective action (if required):	
Corrective action completed (signed & dated by site manager):	
Preventative action to limit future occurrences:	
Site manager review (signed & dated):	

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APPENDIX C

Complaints and Non Conformance Register



APPENDIX D COMPLAINTS AND NON CONFORMANCE REGISTER

The purpose of this Complaints and Environmental Incident Register is to maintain a register of complaints from local residents or stakeholders, which will include a record of any action taken with respect to the complaints.

Entries into the Complaints and Environmental Incident Register are commence immediately following the receipt of any complaints associated with works undertaken on the Moorebank Avenue "Exclusion Zone".

Date	Time	Form of communication	Name, address, contact phone of complainant	Nature of complaint / non-conformance	Response / corrective action / recommended preventative action	Date of response	Date complainant notified of action	Signature / position



**APPENDIX D
COMPLAINTS AND NON CONFORMANCE REGISTER**

Date	Time	Form of communication	Name, address, contact phone of complainant	Nature of complaint / non-conformance	Response / corrective action / recommended preventative action	Date of response	Date complainant notified of action	Signature / position

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APPENDIX D

Limitations



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10 August 2016

MOOREBANK INTERMODAL TERMINAL

Contamination Summary Report, Remedial and Site Management Plan - "Butchers Knife"

Submitted to:

Moorebank Intermodal Company
Suite 2, Level 27
1 O'Connell Street
Sydney NSW 2000

Report Number. 147623070-055-R-Rev2

Distribution:

MIC - 1 electronic
AECOM - 1 electronic





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1.0 INTRODUCTION

Golder Associates (Golder) was commissioned to deliver detailed geotechnical and geochemical investigations for the Moorebank Intermodal Terminal (MIT) to the Moorebank Intermodal Company (MIC). Further to these investigations, Golder has been engaged by MIC to prepare a Contamination Summary Report for the land dividing the former Defence National Storage and Distribution Centre (DNSDC) site (owned by SIMTA) from the vacant “*boot land*” located to the south. The area of interest is referred to as the “*Butchers Knife*” (the site). The various land parcels are described in Section 1.1 and presented on Figure 1 (Appendix A).

1.1 Background

The Moorebank Intermodal Logistic Precinct (the Precinct) Project (the Project) involves the development of approximately 220 hectares (ha) of former Department of Defence (Defence) land. Moorebank Avenue bisects the Precinct, which is comprised of the MIC property (including Moorebank Avenue) to the west and the Sydney Intermodal Terminal Alliance (SIMTA) Property to the east (refer to Figures 1 and 2, Appendix A).

The Precinct will include:

- an open access import-export (IMEX) freight terminal with an ultimate capacity of up to 1.05 million twenty foot equivalent units (TEU) per annum, including on-site freight rail sidings;
- an open access interstate freight terminal with an ultimate capacity of up to 500,000 TEU per annum;
- terminal warehousing and distribution facilities comprising approximately 850,000 m² of warehouse with ancillary offices;
- a rail link, connecting the Southern Sydney Freight Line (SSFL) at the southern end of the IMEX terminal site and interstate terminal site;
- northern and southern connections into the SSFL to accommodate 1800 m trains; and
- a freight village providing support services on site including management and security offices, meeting rooms, driver facilities, retail and other business services.

On June 3 2015, MIC reached an agreement with SIMTA to develop the Project across the entire Precinct. In order to reach ‘Financial Close’ for the agreement, MIC is required to provide SIMTA with a Site Audit Statement for its land. To facilitate this, the Auditor has requested that an assessment of land suitability for commercial/industrial land use (including rail infrastructure) be completed.

For clarity, the following terminologies will be applied throughout this document:

- Butchers Knife (the ‘site’): the land dividing the former DNSDC site (the SIMTA Property) from the vacant “*boot land*” located to the south (part Lot 4 DP 1197707).
- Moorebank Avenue: The Moorebank Avenue Roadway, formally identified as Lot 2 DP 1197707.
- The SIMTA Property: the land situated to the east of Moorebank Avenue, owned by the Sydney Intermodal Terminal Alliance.
- The MIC Property West: the land situated to the west of Moorebank Avenue formerly occupied for Steele Barracks (including the School of Military Engineering (SME)) and Moorebank Barracks, which will be leased to MIC by the Australian Government under a long-term lease.
- The MIC Property East which is also leased by the MIC and encompasses:
 - the land designated for the Moorebank Avenue re-alignment to the east of the SIMTA property;
 - the *Boot Land* which is designated as an ecological conservation area; and



- the *Rail Access Corridor* which is designated for the development of a rail line connecting a portion of the Precinct development with the Southern Sydney Freight Corridor.
- The Precinct: The land occupied by the proposed Moorebank Intermodal Logistical Precinct encompassing both the SIMTA property, the MIC Property West and the MIC Property East.

1.2 Objectives

The objectives of this assessment are to sufficiently characterise the soil and groundwater contamination risks associated with Butchers Knife (part Lot 4 DP 1197707) (the 'site') and to assess the land use suitability for the proposed end uses (commercial/industrial, including rail infrastructure). The proposed end land uses for the site are outlined in Figure 2.

1.3 Scope of Works

These assessment works included in the following scope:

- **Desktop studies** - a desktop study was completed to review existing information pertaining to the Butchers Knife.
- **Site inspection** - the site was inspected to observe site conditions at the time of preparing this summary report and to confirm current conditions at the site are generally consistent with those considered as part of the previous contamination investigations.
- This **Contamination Summary Report (CSR)** was prepared.



2.0 SITE DESCRIPTION AND REGIONAL SETTING

2.1 Site Identification

The site locality and layout are presented in Figure 1 and Figure 2, respectively. Table 1 summarises the site identification.

Table 1: Site Identification

Item	Details
Address	Moorebank Avenue, Moorebank, NSW
Title Identification Details/ Legal Description	Portion of Lot 4 DP 1197707
Local Government Authority (LGA)	Liverpool
Site Area	Approximately 5.1 hectares
Zoning	IN1 General Industrial, Liverpool City Council Local Environmental Plan (LEP) 2008

2.2 Site Description

The site is positioned in the southern most portion of the fenced area formerly used as the Defence National Storage and Distribution (DNSDC) facility, between the former operational portion of the SIMTA property to the north, the Boot Land to the south and east and Moorebank Bank Avenue to the east, with the MIC Property West beyond Moorebank Avenue.

The site is relatively flat, generally with grass and scattered shrubs or trees and has no structures with the exception of a redundant rail line which passes through the approximate centre of the site in a north south direction. The elevation at the site is approximately 15 metres (m) Australian Height Datum (AHD).

2.3 Surrounding Environment

The adjoining land uses are as follows:

- North: The SIMTA Property (including the former DNSDC) and the MIC Property East (including bushland and a service corridor);
- South: The Boot Land which is undeveloped bushland and part of the MIC Property East with the East Hills Railway Line beyond the Boot Land to the south.
- East: The Boot Land which is predominately undeveloped bushland and part of the MIC Property East with the proposed Moorebank Avenue realignment located immediately east of the site within the Boot land and running north / south along the eastern boundary of the SIMTA property. The residential suburb of Wattle Grove is beyond the Boot land to the east.
- West: Moorebank Avenue, with the MIC Property West located beyond Moorebank Avenue. The activities on the MIC Property West including the former School of Military Engineering (SME) followed by the Georges River which created the western boundary of the MIC Property West.

2.4 Geology

Existing information of relevance to the geotechnical studies that is available in the public domain includes:

- Published geological maps, 1:100,000 Penrith Geological Map (NSW Department of Minerals, 1991); and
- The Penrith Soils Landscape Map (Soil Conservation Service of NSW, 1989).

The geological map shows the area on which the site lies as being characterised by Tertiary alluvial and fluvial deposits including sand, clay and silt. The published mapping indicates nearby surface rock outcrop of



Ashfield Shale and also the lower stratigraphic sequence unit Hawkesbury Sandstone. In view of the published mapping it is likely that the Ashfield Shale would be the rock unit encountered immediately below the overlying soils across the majority of the site. However, it is possible that over some portions of the site, particularly toward the south east, the Ashfield Shale may be absent from the subsurface profile and Hawkesbury Sandstone would be the first rock encountered beneath shallow soils.

A transitional unit, known as the Mittagong formation is often present between the Ashfield Shale and the underlying Hawkesbury Sandstone and has the potential to be intersected within the subsurface profile of the site. It is noted that the resolution of mapping may not capture local site scale variations in stratigraphic boundaries and whilst the majority of the site lies entirely within an area mapped as having surface coverage of Tertiary Alluvium, the site has a long history of intensive military usage with associated cut and fill activities. In some areas it is likely that the pre-existing alluvium will have been removed or re-worked as fill.

The Penrith Soils Landscape Map (Soil Conservation Service of NSW, 1989) indicates that the site lies in an area characterised by soils of the Berkshire Park Group. This group is produced on alluvial soils, commonly on elevated Tertiary terraces. The soils comprise shallow clayey sand soils, with frequent ironstone nodules.

2.5 Hydrogeology

There are two main aquifer systems at the Precinct, a shallow system within alluvial soils and a deeper aquifer within the bedrock (Golder, 2015a and JSB&G, 2015). Previous investigations at the SIMTA property intercepted groundwater at depths generally between 8 to 10 m bgl, and was expected to flow westerly – north westerly.

The GHD (2015a) investigations identified perched water between 3 and 5 m bgl in an area immediately north of the site, and also indicated that groundwater in the southern portion of the DNSDC as potentially flowing to the south towards Anzac creek. A southerly flow direction in this portion of the site would be consistent with a deeper bedrock profile identified in this portion of the Precinct, however, as there are limited groundwater monitoring wells in this portion of the Precinct and there is some uncertainty with the inferred flow directions.

Golder's review of existing groundwater bore records accessed using the NSW Water Information Database was completed on 21 July 2016. The closest registered bore was a monitoring bore located on the Glenfield Waste facility located approximately 800m west of the site on the western side of the Georges River. No extraction bores were identified within 1 km radius of the site. The site is also serviced by reticulated water, hence water is not extracted from the site for the purpose of domestic supply.

2.6 Surface Water

A small creek (Anzac Creek) passes parallel with the southern boundary of the site, and passes within approximately 20m of the southern eastern corner of the site. The creek runs from the former SME golf course (located on the MIC Property West) to the north east away from the Georges River (east), prior to re-joining the Georges River at Lake Moore, located approximately 1.8 km north east of the site.

There are no apparent surface water drainage features within the site, however, within the SIMTA Property, several open concrete-lined channels and box culverts ultimately drain surface water to the Georges River via the property's stormwater system. One such open channel is present approximately 50 m north of the site and drains water west through the Boot land and joins Anzac Creek approximately 200 m north west of the site.

Surface water from the site is expected to drain either south directly to Anzac creek or north-west into the drainage pathway located on the SIMTA property 50 m north of the site.

2.7 Acid Sulfate Soils

The Australian Soil Resource Information System (ASRIS) indicates that the site has no known occurrence of Acid Sulfate Soils (ASS). No indications of ASS or PASS were identified in the soils encountered during the SIMTA Stage 1A Phase 2 Investigations (JBS&G, 2015).



Soils encountered on the eastern boundary of the MIC Property West during the Post Phase 2 Investigation exhibited higher risk potential for acidic soils (Golder 2015a). Analytical results for soil samples collected from BH104 (collected at 7.1 m depth) and BH106 (collected at 8.8m depth) reported total actual acidity (TAA) concentrations exceeding the investigation action criteria. Based on the low soluble sulphur ($<0.02\%$ S) and no reportable oxidisable sulphur ($<0.005\%$ S_{CR}) the acid generation potential observed in these samples was unlikely to be associated oxidation of sulfides. The cause of the acidity was not known and may have been attributed to a variety of reasons, including age, landscape position and other geochemical interactions (such as organic acidity) confounding the interpretation (Golder, 2015). Both BH104 and BH106 were located on the eastern boundary of the MIC Property West approximately 40 m to the west of Moorebank Avenue and approximately 60 m west of the site.



3.0 REMEDIATION REGULATORY FRAMEWORK

3.1 *Environmental Protection and Biodiversity Conservation Act, 1999 (EPBC Act)*

Under the Commonwealth process the wider development project (inclusive of the remediation activities) is a 'controlled action' under the Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999 (EPBC Act)* and requires approval from the Commonwealth Minister for the Environment.

3.2 Contaminated Land Management Act 1997

In NSW, the management of contaminated land is shared by the NSW Environment Protection Authority (EPA), the NSW Department of Planning and Environment Infrastructure and planning consent authorities (usually local councils).

Under the NSW *Contaminated Land Management Act (CLM Act) 1997*, the NSW EPA regulates contaminated sites where the contamination is Significant Enough to Warrant Regulation (SEWR). Contaminated sites that are not regulated by the NSW EPA are managed by local councils through land use planning processes (such as change of land use or some remediation works).

The NSW EPA also administers the NSW Site Auditor scheme under Part 4 of the *CLM Act*. The NSW EPA accredits individuals under the Act as Site Auditors to provide independent review of work conducted by contaminated site consultants.

3.3 Environmental Planning and Assessment Act 1979

Under the NSW Government process a staged development approval will be sought under the NSW approvals process as a State significant development (SSD) under the *NSW Environmental Planning and Assessment Act 1979 (EP&A Act)*.

3.3.1 SEPP 55 – Remediation of Land

The *State Environmental Planning Policy No. 55 (SEPP 55) – Remediation of Land* under the *Environmental Planning and Assessment Act (EP&A Act) 1979* provides a state wide planning approach for the remediation of contaminated land. In particular, *SEPP 55* provides for Category 1 and Category 2 remediation. Projects classified as Category 1 require development consent. As the works are included within a development which requires development consent, the works are considered to be Category 1 remediation works.

3.4 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997 (NSW) (POEO Act)* is the key piece of environment protection legislation administered by the NSW EPA.

The POEO Act provides a single integrated licensing arrangement to control the air, noise, water and waste impacts of an activity. The NSW EPA is the regulatory authority for the licensing of activities specified under Schedule 1 of the *POEO Act* (scheduled activities) and in most cases councils are the regulatory authority for non-scheduled activities. Licences can also be issued to regulate water pollution from activities that are not in Schedule 1. Such licences can provide protection against prosecution for water pollution if the licence conditions are complied with.

The *POEO Act* also provides the key mechanisms (including the issuing of three types of environment protection notices including: clean-up, prevention and prohibition notices) for protecting the environment. It also provides the regulatory regime for waste management under the *Protection of the Environment Operations (Waste) Regulation 2005 (Waste Regulation)*.

All remediation works completed at the site will be conducted in compliance with the relevant requirements of the *POEO Act*.



3.4.1 Protection of the Environment Operations (Waste) Regulation 2005

The following outlines the required documentation and approvals required for the handling, off site transport and disposal of waste during the remediation works in accordance with the *Protection of the Environment Operations (POEO) (Waste) Regulation 2005* and the *POEO Act 1997*.

Waste Transporter Requirements

Under Schedule 1, Part 2 of the *POEO Act 1997* the transport of several classifications of waste in loads exceeding 200 kilograms is declared to be a scheduled activity for which a licence is required. As such the proposed transport of the selected wastes from the site to off-site disposal facilities will require the use of licensed transporters.

Waste Tracking Requirements

The *POEO (Waste) Regulation 2005* specifies requirements for the tracking of waste both within NSW and interstate. The wastes that must be tracked are listed in the Schedule 1 of the Regulation (this Schedule includes soil contaminated with waste oil/ water, hydrocarbons/ water mixtures or emulsions).

Wastes that need to be tracked need to be characterised in accordance with the NSW EPA *Waste Classification Guidelines, Part 1: Classifying Waste* (NSW EPA, November 2014). The following characteristics of the waste must also be determined:

- the form of the waste (the physical state e.g. solid);
- the waste code;
- the waste description; and
- the Dangerous Goods properties (if applicable).

A NSW EPA on line tracking system is available to track waste that is transported within NSW or into NSW from other states or territories.

Waste Disposal Facilities

Before wastes are transported from the site, it is necessary to confirm that the facility (e.g. landfill/ recycling facility) where the waste is being transported to is legally able to accept the waste.

Waste Records

If not using an approved on line tracking system records must be maintained of the waste transport certificates for at least four years. The use of the NSW EPA on line tracking system removes the requirement to maintain these records



4.0 PREVIOUS ENVIRONMENTAL ASSESSMENTS

An environmental investigation specifically designed for the assessment of the Butchers Knife has not been undertaken, however, the area has been included in several larger site investigation programs on the SIMTA site.

Initial environmental investigations on the SIMTA site were completed by Douglas Partners (DP) in 1980, then between 1993 and 1995 and were part of geotechnical investigations completed for development on specific parts of the SIMTA site. These included:

- Subsoil Investigation (Ref: SSI/5-6818, dated 17 September 1980).
- Buildings N13, N21, N22, N24 & Hardstand N20 and Associated Roads (Project 14923J, dated 7 October 1993).
- Corrosion of Steel Water Mains (Project 14923K, dated 20 October 1993).
- Report on Geophysical and Contamination Assessment Buildings N9A, N9B and N13; Project 14923M, dated 24 November 1993).
- Additional Geophysical and Contamination Assessment Buildings N9A and N9B (Project 14923N, dated 21 January 1994).
- Site Contamination Investigation Shed 2 (Project 20792, dated 12 July 1995).

The abovementioned reports have not been sighted by Golder, however, were referenced by DP in 2009 in a summary of environmental conditions (see below). Buildings N9A and N9B are now referred to as DNSDC buildings 25 and 26. The next series of investigations were completed in the period between 2000 and 2002, and were primarily completed in preparation for sale of the SIMTA site. These included:

- Egis (2000) Preliminary Site Investigation at the Defence National Supply and Distribution Centre, Moorebank Defence Lands, dated September 2000.
- URS (2002a) Assessment of DNSDC Buildings – Supplement to Egis 2000 Stage 1 Preliminary Site Investigation of Areas A1 to A6, dated March 2002.
- HLA (2002a) Work Plan Soil and Groundwater Investigation Moorebank Defence Land, dated 17 September 2002.
- HLA (2002b) Soil and Groundwater Investigation, Precinct H (DNSDC), Moorebank Defence Lands, dated November 2002.
- Milsearch (2002) Ordnance Investigation and Hazard Analysis of the DNSDC Moorebank, dated October 2002.
- URS (2002b) Investigation Review Report, DNSDC, Moorebank Defence Lands, dated December 2002.
- Contamination Management (2002a) Summary Site Audit Report, DNSDC Site, Moorebank, dated December 2002.
- Contamination Management (2002b) Site Audit Statement, Defence National Storage and Distribution Centre, Moorebank Avenue, Moorebank, dated December 2002.
- Environmental and Earth Sciences (2002a) Memorandum: Review of Reports Pertinent to Environmental Investigations Conducted at DNSDC, Moorebank, NSW, dated 12 December 2002.
- Environmental and Earth Sciences (2002a) Memorandum: Review of Investigation Review Report DNSDC, Moorebank Defence Lands (URS) and Site Audit Statement WRR118 (Dr William Ryall), dated 16 December 2002.



As part of the proposed development of the SIMTA property, several summary reports have been prepared for development approval applications submitted for the Precinct. These include:

- ARUP (2008) Stockland Moorebank Intermodal Terminal Geotechnical Desk Study Report, dated December 2008.
- Douglas Partners (2009) Summary Environmental Conditions, Proposed Intermodal Freight Terminal, DNSDC Site – Moorebank Avenue, Moorebank, dated December 2009.
- Golder Associates (2010) Phase 1 Environmental Site Assessment, Stage 1A of Moorebank Intermodal Freight Terminal Development, dated August 2011.
- Golder Associates (2013a) Phase 1 Environmental Site Assessment, Rail Corridor for SIMTA Moorebank Intermodal Terminal Facility (document no. 107623148-003-R-Rev5).
- Golder Associates (2013b) Preliminary Environmental Site Assessment, SIMTA Site and Associated Rail Corridor (document no. 107623148-004-L-Rev5).

Over the period of preparation of the above reports, the flow of information related to the environmental conditions on the sites has not been continuous. The reports completed in the period between 1993 and 1995 were identified by DP in 2009 following a search of the company's archive. As a result, the Egis 2000 report did not reference these reports, rather it stated that no previous environmental investigation had been completed but acknowledged there was anecdotal evidence that remedial activities had been undertaken at the site in the early to mid-1990's. This observation carried through in the remaining reports completed in 2002. The reviews completed in 2002 and 2009, as part of the sale and development of the site, were also based on a subset of the previous reports. Particularly, the DP 2009 report references the 1993 to 1995 reports, however, does not provide details of the investigations or remediation works completed. The Egis (2000) and HLA (2002b) reports were also excluded from the DP 2009 review.

More recently an additional series of environmental investigations has been completed. These were completed by either GHD as part of the Defence lease exit obligations from the SIMTA site, or JBS&G for inclusion in the SIMTA NSW Stage 1 State significant development (SSD) application. These investigations have included:

- GHD (2014) DNSDC Gap Analysis Report (unknown reference number).
- GHD (2015a) DNSDC Moorebank Intrusive Site Investigations (21/24133/207651).
- GHD (2015b) DNSDC Moorebank Refuelling Area Additional site investigations and remedial options evaluation (21/24133/209789).
- GHD (2015c) DNSDC Moorebank Refuelling Area Remedial Action Plan (21/24133/211259).
- GHD (2015d) Moorebank Intermodal Company – Butchers Knife Intrusive Site Investigations, Butchers Knife portion of Boot Land, Moorebank Avenue, Moorebank NSW (21/25610).
- JBS&G (2015a) Phase 2 Environmental Site Assessment, SIMTA Intermodal Terminal Facility – Stage 1 (document no. 50342-60868 Rev3).
- JBS&G (2015b) Remedial Action Plan, SIMTA Intermodal Terminal Facility – Stage 1 (document no. 50342-61155 Rev1).

The inconsistent flow of information continued during the later stages of the site's investigation. The GHD and JBS&G investigations appear to overlap and to have occurred concurrently. The GHD (2015a) intrusive site investigations also included a review of information not previously identified during the investigations completed between 2010 and 2013, nor during the JBS&G investigations completed in 2015. These additional investigations included:

- G-tek (2003a) Hazard Reduction Precinct H, Moorebank Defence Land, Moorebank NSW;
- G-tek (2003b) Hazard Reduction Precinct I, Moorebank Defence Land, Moorebank NSW; and.



- HLA (2006) Contamination Investigations, Defence Integrated Distribution Systems Sites, Defence National Storage Distribution Centre, Moorebank (reference D1045718_RPTFinal_Moorebank_Sept06).

The above mentioned reports were not reviewed by HLA in the preparation of the 2006 contamination investigations. The information presented in the G-tek reports is only summarised briefly within the GHD (2015d) intrusive investigations report.

The most pertinent information related to the wider SIMTA site is within the URS (2002b) Investigation Report Review and the Contamination Management (CM) (2002a) Summary Site Audit Report and Site Audit Statement (CM, 2002b). The URS (2002b) report was an interpretative report, presenting the findings of the intrusive soil and groundwater investigations completed by HLA (2002), and the ordnance investigation completed by Milsearch (2002). The CM (2002a) was a non-statutory contaminated site audit completed by Dr William R Ryall (NSW EPA Accredited Site Auditor No. 9809). The investigations undertaken by HLA/URS (2002) however, did not include investigations within the Butchers Knife. The investigation included several investigation locations immediately north of the site and the results of these are discussed further below.

The ensuing sections summarise the most pertinent information from the above mentioned reports, and figures from the previous reports are presented in Appendix B.

4.1 Egis (2000a) – Preliminary Site Investigation

Egis completed a Preliminary Site Investigation (PSI) of the entire Moorebank Defence Lands in 2000. It included a review of available information and historical records, as well as an inspection of the broader area. The Egis (2000) figures are presented in Appendix B1. Conclusions relevant to the site included:

- Egis (2000) noted that the south western portion of the DNSDC was an “*unauthorised*” burial ground and reported that works in the area in 1994 identified the pits, which were partially remediated at the time. Egis (2000) reported that the pits were suspected of containing batteries as the old battery store was located in this portion of the site prior to the development of the current DNSDC.

The bushland located south of the site and west of the current rail spur, was reported to have been used as grenade range from the 1950s to the 1980s. The Milsearch (2000) report, which was appended to the Egis report, provided greater detail in regards to the former grenade range. Milsearch (2000) noted that the grenade range had operated south of the DNSDC site for a considerable period, with a permanent facility constructed in the 1950s. However, it was likely that the area was initially used during World War II. The position of the grenade range was predominately on the western side of the current rail spur, however, a portion of the former lineal range may have intersected by the current rail spur. A 200m x 200m portion of the grenade range was reported to have been remediated in 1994, and was evident on the 1994 aerial photograph, however, a report on the remediation was not sighted by Milsearch or Egis. The Milsearch (2000) report recommended additional investigations be completed, particularly to delineate the areas impacted by the projected grenades and by early hand-thrown grenades including areas south-west of the previously remediated areas.

4.2 HLA (2002) and URS (2002b) Soil and Groundwater Investigation

HLA performed a soil and groundwater investigation of the DNSDC under the direction of URS Australia in 2002. This investigation included soil and groundwater sampling to assess potential contamination based on the results of PSI (Egis 2000) and included a series of approximately 170 investigation locations across the DNSDC site. The URS (2002) figures are presented in Appendix B2.

The investigations did not include locations within in the DNSDC site (i.e. the Butchers Knife), however, they included investigations within the portions of the site located immediately to the north, within the southern portion of the DNSDC. The investigation results relevant to the site included:

- Perched groundwater impacted with hydrocarbons including phase separated hydrocarbon was identified in burial pits located on the eastern boundary of the DNSDC, approximately 125 m north of the site.



- Hexachlorobenzene (HCB) was detected in soils in a test pit completed adjacent to the current rail spur approximately 20m north of the site. The detected concentration was 2.26 mg/kg which was below the current NEPM (2013) HIL D trigger value of 80 mg/kg.
- URS (2002b) reported on the observation of AC sheeting on the ground surface within the southern portions of the DNSDC.
- The occurrence of M36 grenade fragments were observed in the south eastern portion of the site, suggesting the potential for UXO to exist within this portion of the site.
- URS (2002b) considered it unlikely, but noted that there is a potential for munitions to be present in historical burial pits located in the site.

4.3 Milsearch (2002)

The investigations completed by Milsearch were completed as part of the URS / HLA investigations of the DNSDC, hence the reports did not directly include the site (i.e. the Butchers Knife). However as mentioned above as the investigations considered the southern portions of the DNSDC and therefore the investigations included information pertinent to the site. The Milsearch (2002) report also included additional details on the remediation activities completed in the 1990's as indicated by Douglas Partners (2009), and also appear to have included the geophysical assessment of the eastern portion of the site (i.e. the portion of the Butchers Knife east of the rail spur). The Milsearch (2002) figures are presented in Appendix B2.

The investigation results relevant to the site included:

- A burial trench, referred to as Pit 8 was identified as running parallel and potentially underlying the current rail spur and appeared to extend up to the boundary of the site. The pit was described as being 6 m wide and 6 m deep and continued for approximately 88 m up to the Precinct H boundary. The pit contained quantities of general stores equipment including shelving, metal mugs, building tie bars, small arms ammunition boxes (all empty) and remnants of old building material.
- A burial pit, referred to as Pit 12 was also identified on the northern boundary within the eastern portion of the site. This Pit was not investigated during the Milsearch and HLA / URS investigations in 2002.
- Debris from expended WW2 era 36M hand grenades was noted visually on the surface, and confirmed by the mine detector survey in the south eastern portion of the site DNSDC, including within the south eastern portion of the site (i.e. within the Butchers Knife). The debris was described as being typical of that found in the bursting ground of a live grenade training facility. Milsearch included reference to an interview with Warrant Officers Haz and Edwards which indicated the material may have been trucked onto the site in the late 1970s as part of an earthworks training exercise. It was indicated that the materials were sourced from the eastern half of the former Anzac Rifle Range.

4.4 Contamination Management (2002)

Dr Bill Ryall (EPA-accredited Auditor) of Contamination Management (CM) prepared a summary site audit report for the DNSDC site. This review was limited to the investigations completed on the DNSDC site, which included the ordnance investigation completed Milsearch (2002). The investigations did not extend into the site (i.e. within the Butchers Knife). However, the site audit statement noted several issues which were required to be addressed through the development and implementation of a site management plan (SMP).

Issues noted by CM (2009) which were specific to the site (i.e. the Butchers Knife) included:

- *Additional investigations be under taken in the filled areas in the south-eastern part of the site, inclusive of the areas adjacent to the rail spur;*
- *HCB be identified as a chemical of potential concern during remediation of contamination identified in the southern part of the site adjacent to the rail spur; [and]*
- *Measures be taken to prevent access to unauthorised personnel in the south-east corner of the site where fragments of grenades have been identified until an appropriate health and safety procedure has*



been implemented and undertake, as a matter of priority, a hazard reduction operation in the area according to the recommendation made in the Ordnance Investigation report by Milsearch dated 2002.

4.5 G-tek (2003)

In response to the investigations completed by Milsearch in 2002, Defence commissioned G-tek to “*locate any complete grenades,*” potentially located within precincts H and I. Precinct H was the south eastern portion of the DNSDC site, while Precinct I was the eastern portion of the Butchers Knife. G-tek completed a Total Magnetic Intensity survey across the area, with data collected at 0.1 second intervals along 0.375m transects. The data was processed into a 0.1m grid to identify items of potentially grenade size or larger. Items identified in the survey were subsequently nominated for intrusive investigation. The intrusive investigations were completed by identifying the anomaly, using a magnetometer and EM mine detector and then manually excavating the source of the signal. Excavations continued until the source of the signal was positively identified and if possible removed from the area.

Within the Butchers Knife (Precinct I) and total of 179 anomalies were investigated, 24 items the size of a grenade were located, and only 7 items were identified as grenade fragments. G-tek concluded that no grenades or any items that could be perceived as hazardous were located. A large anomaly was identified in the western portion of the investigation, however, this was investigated and identified as highly mineralised stones in what appeared to be imported soils. The G-tek (2003) figures are presented in Appendix B3.

4.6 Douglas Partners (2009)

Douglas Partners prepared two reports for Stockland Developments in December 2009 regarding the DNSDC site, one summarising the environmental conditions (2009a) and the other summarising the geotechnical conditions (2009b). These reports summarised some of the work that had been performed to date (URS 2002, CM 2002 and ARUP 2009¹), however were not related to the Butchers Knife.

4.7 Golder (2013)

Golder Associates prepared a Phase 1 ESA for the proposed SIMTA Stage 1 SSD rail corridor. The proposed rail corridor passes through the western portion of the site, and this portion of the site was considered in the Phase 1 ESA. The Golder Phase 1 ESA did not provide additional information pertaining to the site, and referenced information presented in the previous investigations. The Phase 1 ESA noted that the partially remediated “*unauthorised*” burial grounds were present in the southern portion of the DNSDC (i.e. within the Butchers Knife) and noted these as an area of potential concern warranting further investigation. The Golder (2013) figures are presented in Appendix B4.

4.8 GHD (2015)

GHD prepared four reports in 2015. The fourth report (GHD, 2015d) presented the results of the intrusive investigation completed within the vicinity of the Butchers Knife. The investigations were completed as part of the wider SIMTA property investigation, completed on behalf of Defence for the purpose of satisfying Defence’s lease obligations with SIMTA. The intrusive investigations were targeted at areas where GHD considered additional works were required through a gap analysis process (GHD, 2014). The gap analysis identified the Southern Burial Pits and the Rail Spur, as areas of potential concern warranting further assessment within the site (i.e. within the Butchers Knife). The investigations also included several of the former DNSDC buildings immediately north of the site, including the former refuelling station located on the western boundary of the SIMTA property, approximately 30 m north of the site. The GHD (2015d) figures and analytical tables are presented in Appendix B5.

The GHD investigations also included direct responses to the items raised within the CM (2002) site audit statement. GHD (2015a) concluded that each of the issues raised had been suitably closed out at the completion of the investigations. The GHD responses to the issues related to the site (i.e. the Butchers Knife) as noted by CM (2002) included the following:

¹ Note ARUP 2009 provides geotechnical information only which has not been referenced in this report.



- *Additional investigations be under taken in the filled areas in the south-eastern part of the site, inclusive of the areas adjacent to the rail spur;*

GHD's response was "Additional intrusive soil and groundwater investigations have been undertaken by HLA (2006) and GHD as part of the recent Detailed Site Investigation (2015)."

In summary, GHD completed 29 test pits within the area identified as the 'southern burial pits', inclusive of the current rail spur. Of the 29 test pits completed by GHD approximately 19 were within the site (i.e. within the Butchers Knife). One groundwater monitoring well was also installed on the southern boundary of the site (GW077). The test pits were targeted to anomalies identified during the UXO safe guarding works. The test pits included the collection and analysis of approximately 8 soil samples from within the site which were submitted for the analysis of:

- Total Reportable Hydrocarbon (TRH);
- Benzene, toluene, ethylbenzene, and xylenes (BTEX);
- Polycyclic aromatic hydrocarbons (PAHs);
- Hexachlorobenzene (HCB); and
- Asbestos

The test pits were advanced to residual soils or prior refusal, with depth ranging from 0.5 – 2.5m. Generally, no obvious visual or olfactory indicators of potential contamination were noted within the majority of the test pits. The following exceptions were noted:

- Army licence number plates were encountered in TP055 between 0.6 and 0.8 m depth, which was located north of the site;
- TP056 including electrical conduit and barbed wire at 1.2m depth, which was located north of the site;
- Within TP062 a white "waxy" substance was observed mingled with dark clay between 0.5 and 1.9m depth, which was located on the northern boundary of the site;
- Within TP063 an unidentifiable odour was observed, however no elevated PID results were recorded. TP063 was not located north of the site.
- Fragments of asbestos containing materials (ACM) were noted on the ground surface in the vicinity of TP068, TP072A, TP072B, TP073C, TP073, TP074, TP075 and TP076, which were all located within the site. ACM was also identified at depth in test pits TP062 (0.3 m) located on the northern site boundary and TP075 (0.4 m) located within the site.

GHD screened the soil sample analytical results against commercial / industrial land use criteria, which is consistent with the proposed future land use. The analytical results indicated the concentrations of potential contaminants of concern were below the adopted trigger values or the laboratory limit of reporting (LOR) with the exception of lead in two locations (TP072A at 0.5m depth and TP062 at 0.7m depth) and total PAHs in one location (TP062 at 0.7m depth). The impacts in TP062 appeared to be associated with the "waxy" substance observed in the fill materials, and lead concentrations were reported at 22,000 mg/kg. GHD (2015) concluded that the lead and PAH impacts were delineated laterally and vertically.

TP072 is located within central portion of the site, while TP062 is located adjacent to the eastern side of the rail spur on the northern boundary of the site. Each of the locations where ACM was identified are also located within the site.

A groundwater sample was collected from GW077 which was installed in the south western portion of the site against the southern fence. The sample was submitted for analysis of TRH, BTEX, PAHs and



volatile organic compounds (VOCs) which were reported below the laboratory LOR with the exception of a minor concentration of TRH which was below applicable commercial / industrial criteria.

- *Hexachlorobenzene be identified as a chemical of potential concern during remediation of contamination identified in the southern part of the site adjacent to the rail spur;*

GHD's response was *"No evidence of hexachlorobenzene impact in soil or groundwater was evident during the recent site investigations undertaken by GHD"*

GHD analysed for HCB in soil samples collected from three test pits (TP062, TP063 and TP079) and one soil bore (GW072A) completed in the vicinity of the previous HCB detection. Concentrations of HCB were below the laboratory LOR in the samples analysed.

- *Measures be taken to prevent access to unauthorised personnel in the south-east corner of the site where fragments of grenades have been identified until and appropriate health and safety procedure has been implemented and undertake, as a matter of priority, a hazard reduction operation in the area according to the recommendation made in the Ordnance Investigation report by Milsearch dated 2002.*

GHD's response was *"G-Tek was engaged by Defence in 2003 to conduct a hazard assessment of the site. A geophysical survey was undertaken. No grenades or any items that could be perceived as hazardous were located. A number of scrap items, infrastructure, and rubbish items were however identified."*

The GHD investigations also identified elevated concentrations of hydrocarbons in soil and groundwater, including the presence of LNAPL within the foot print of the former Refuelling facility (Building 21). The former Refuelling facility is located north of the site, and the southernmost extent of LNAPL and dissolved phase hydrocarbon impacts inferred by GHD to be approximately 50 m north of the site. The direction of groundwater flow in the area is not clear due to the presence of the LNAPL, however, based on the extent of the impacts the LNAPL appears to be migrating away from the site towards the north and north-west.

GHD concluded that the presence of ACM on the ground surface within the southern burial pits should be managed as part of future works in the area, and while the potential for exposure was considered to be low, GHD also recommended that the management of the localised lead hotspot at TP062 be considered as part of any further works in this area of the site.

4.9 JBS&G (2015)

JBS&G completed a Phase 2 ESA as part of the SIMTA Stage 1 SSD Environmental Impact Statement (EIS). These works included the assessment of the rail corridor, which passes through the western portion of the site. The JBS&G (2015) figures and analytical tables are presented in Appendix B6.

The JBS&G scope of work was based on the Golder (2013) Phase 1 ESA and included the excavation of four test pits (TP21, TP22, TP23 and TP24) in the area where the proposed rail corridor passed over the unauthorised burial grounds (i.e. within the butchers knife). Within these test pits, a surface layer of fill materials described as clayey sand, medium to coarse grained, yellow to orange colour was encountered between 0.2 to 0.4 m depth. No staining, odours or asbestos was observed in the fill profile. The fill materials were overlying natural materials described as clay, orange, grey red with medium plasticity. JBS&G submitted approximately one soil sample per location for analysis, and the following contaminants of potential concern were selected:

- Heavy metals/ metalloids including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc (4 samples).
- TPH (4 samples).
- BTEX (4 samples).
- OCPs / PCBs (2 samples).
- PAHs (4 samples).



- Asbestos (4 samples).
- Explosive residues (4 samples).

JBS&G screened the results against the current commercial/ industrial land use criteria, with is consistent with the proposed use of the site. The analytical results indicated the concentrations either below the laboratory LOR and / or the adopted investigation levels.

On the basis of the Phase 2 ESA, JBS&G developed a Remediation Action Plan (RAP). The extent of remediation required did not include areas within the site (i.e. within the Butchers Knife).



4.10 Key Findings

Based on the results of the pertinent investigations discussed above the following are considered key findings relevant to the site:

Burial Pits

The south western portion of the DNSDC was used as an “*unauthorised*” burial ground and burials appear to date from the period between 1940’s to approximately the 1970’s. Detailed reviews of the historic aerial photographs was completed by Egis and Milsearch in 2002. The earliest ground disturbances are apparent in the 1949 aerial photograph and Mileseach (2002) identified evidence of burial pits in the 1949, 1965 and 1970 aerial photographs.

To date, the investigations have identified numerous individual burial pits generally containing inert materials such as general stores, shelving, metal mugs, building tie bars, number plates, small arms ammunition boxes (all empty) and remnants of old building material. The burial pits located in the vicinity of DNSDC buildings 24 and 25 were remediated in approximately 1994, to facilitate the development of those buildings. However, no records are available on the remediation activities, and therefore, the extent of the remediation activities is not known but is unlikely to have included land within the site.

Intrusive investigations completed by GHD (2015) and JBS&G (2015) included the excavation of a total of 23 test pits within the site. The four test pits completed by JBS&G (2015) were targeted in the proposed rail corridor, while the GHD test pits were targeted at anomalies detected during the UXO safeguarding undertaken in the area. Generally the materials encountered during the intrusive investigations reported contaminant concentrations in the samples analysed below the NEPM 2013 commercial / industrial land use guideline values (NEPM HIL(D)). The exceptions were concentrations of lead in two locations (TP072A at 0.5m depth and TP062 at 0.7m depth).

The lead concentration in TP072A was 3,100 mg/kg, and exceeded the NEPM 2013 HIL(D) value of 1,500 mg/kg. The lower sample collected from 1.3 m depth reported lead concentrations below the HIL(D) value. The elevated lead was reported in fill materials described as including wood, metal, and glass.

The lead impacts in TP062 appeared to be associated with the “waxy” substance observed in the fill materials between 0.7 and 1.9 m depth, and lead concentrations were reported at 22,000 mg/kg. The lead concentrations in the underlying natural sands at approximately 2.0 m depth was 12 mg/kg. GHD (2015) did not provide comment on the potential source of the impacts, however, based on the ‘waxy’ description and the presence of both lead and minor concentrations of PAHs, it appears to have originally been associated with paint and/or a water proofing agent which has historically been placed in the burial pit. TP062 is located on the northern edge of the site, immediately east of the rail spur. The impacted materials were not observed by GHD in test pits TP076 and TP061 located between 10 m and 20 m south of TP062. Investigation locations were not advanced to the east or west of TP062, hence there is some uncertainty on the lateral extent of the impact in an east / west direction. The impacts appear to be associated with waste placed within the burial pit described by Milsearch as “Pit 8”. The Milsearch (2002) geophysical investigation of Pit 8 indicated the pit was approximately 6 m wide. Therefore, the extent of impact is estimated at approximately 20m long x 6m wide and extends to approximately 2m depth. There is limited information on groundwater in the area, however, the nearest monitoring wells (GW076A, GW029 and GW077) did not report elevated concentrations of lead. However, the leachability of the impacted materials was not assessed by GHD (2015).

Fragments of asbestos containing materials (ACM) were noted on the ground surface in the vicinity of TP068, TP072A, TP072B, TP073C, TP073, TP074, TP075 and TP076. ACM was also identified at depth in test pits TP062 (0.3 m) and TP075 (0.4 m). These test pits are generally located in the western portion of the site.

Limited groundwater investigations have been completed in the vicinity of the burial pits. GHD installed one monitoring well within the site (GW077) which reported low concentrations of TRH below the commercial / industrial criteria. LNAPL was identified on the groundwater in the vicinity of the former refuelling station, and GHD (2015c) inferred the edge of the LNAPL and dissolved phase hydrocarbon plume to be approximately



50 m north of the site. Based on the distribution of the hydrocarbon contaminants in the vicinity of the refuelling facility, the plume appears to have migrated to the north and north-west.

Perched groundwater was encountered between 3 and 5 m depth in the south western portion of the DNSDC, north of the site near the rail spur. Monitoring well MW076A and MW076B were installed in this portion of the site. The extent of perched water was not delineated during the GHD (2015) investigations. Based on the observations made during the various test pitting programs completed across the site and the southern burial pit areas there is potential for additional isolated areas of perched water to exist on the site. The GHD (2015) investigations also identified the presence of low level concentrations of VOCs (trichloroethylene [TCE] – 34 µg/L, vinyl chloride [VC] – 24 µg/L, and cis, 1-2-dichloroethylene [cis 1-2 DCE] – 22 µg/L) in monitoring well GW076B. These VOCs are typically associated with TCE based solvents and degreasing agents. GW076B is located approximately 50 m north of the site, immediately west of the rail spur. Historically solvents were used on the DNSDC, particularly within buildings 67 (located in the north of the DNSDC) and 16 (located in the centre of the DNDC). However, based on historic activities on the DNSDC, there is no apparent source area in the immediate proximity of the southern burial pits. Solvents may have been stored in buildings 25 and 26, but these building are located in a down gradient or across gradient position relative to GW076B. There is potential that solvents, or solvent impacted materials have historically been disposed of in the burial pits located to the north of the site, although this has not been confirmed. And the extent of the VOCs identified in the deeper groundwater has not be delineated, and is potentially migrating towards the site.

Rail spur

A rail spur passes through the centre of the site, and this was investigated by GHD (2015). Four test pits (TP062, TP061, TP075 and TP076) were completed in the vicinity of the rail spur, and the samples were analysed for chemicals of concern generally considered relevant to the historic rail activities. With the exception of elevated concentrations of lead in TP062 (as discussed above) the concentrations of chemicals of concern analysed in the samples collected by GHD were below the commercial / industrial land use.

UXO / EOW wastes

The Milsearch (2002) investigations identified debris from expended WW2 era 36M hand grenades in the south eastern portion of the DNSDC, including within the south eastern portion of the site (i.e. within the Butchers Knife). The debris was described as being typical of that found in the bursting ground of a live grenade training facility, and anecdotal information gathered at the time suggested the materials were trucked onto the site in the late 1970s as part of an earthworks training exercise. Gtek (2003) undertook further investigations of these items, and concluded that no grenades or any items that could be perceived as hazardous were located.

Former Refuelling Facility

The GHD and JBS&G investigations identified elevated concentrations of hydrocarbons in soil and groundwater, including the presence of LNAPL within the foot print of the former Refuelling facility (Building 21). The former Refuelling facility is located north of the site, and the southernmost extent of LNAPL and dissolved phase hydrocarbon impacts inferred by GHD to be approximately 50 m north of the site. The flow of the groundwater in the area is not clear due to the presence of the LNAPL, however, based on the extent of the impacts the LNAPL appears to be migrating away from the site towards the north and north-west.



5.0 PRELIMINARY CONCEPTUAL SITE MODEL

A preliminary conceptual site model (CSM) has been developed based on the information gathered through the previous investigations. The CSM is a qualitative tool used to identify potential source, receptor linkages which may exist on the site and therefore determine if there are potential risks which warrant further assessment, or remediation / management.

A risk cannot exist without a linkage between the sources of contamination, which need to be significant enough to present a potential risk and the receptors (human health and / or environment) via plausible exposure pathways.

5.1 Contaminants of Potential Concern and Sources

Based on the information presented in the previous investigations the following contaminants of potential concern (COPCs) and their source(s) have been identified within the site:

- **Lead** impacted fill materials located on the northern boundary of the site. The maximum reported lead concentration was 22,000 mg/kg which exceeded the NEPM HIL(D) trigger value for commercial / industrial use of 1500 mg/kg. The impacts are associated with a "waxy" substance, which is potentially paint or water proofing agents disposed of within the burial pit, and encountered up to 1.9 m depth. The extent of the impacts are expected to be limited to a localised portion of the burial pit, however, as the burial activities were unknown there is potential for similar materials to be present elsewhere within the burial pits. The waxy materials were first encountered at approximately 0.3m depth within TP062, and based on the GHD (2015) test pit log were not apparent in the surface soils.

There is limited information on groundwater in the area, however, the nearest monitoring wells (GW076A, GW029 and GW077) did not report elevated concentrations of lead. However, the leachability of the impacted materials was not assessed by GHD (2015), and the groundwater in the immediate vicinity of the burial pit has not been assessed.

- **Asbestos** fragments were encountered in numerous locations across the site in both the surface soils and within the fill materials. The ACM fragment are likely to be associated with the historic disposal of building materials in the burial pits.

Based on the information presented in the previous investigations the following contaminants of potential concern (COPCs) and their source(s) have also been identified immediately adjacent to the site and warrant consideration within the preliminary CSM:

- **Petroleum Hydrocarbon** impacted groundwater has been identified in the vicinity of the former refuelling facility which is located approximately 50m north of the western end of the site. The groundwater in the areas has been impacted with LNAPL and dissolved phase hydrocarbons. Currently the petroleum hydrocarbon plume appears to have migrated north and northwest.
- **Chlorinated hydrocarbon** impacted groundwater has been identified in the deeper groundwater in the vicinity of the burial pit located 50 m north of the central portion of the site. The source of the impacts is not apparent, and the extent of the impacts has not been delineated.

5.2 Receptors

The Butchers Knife will be included as part of the wider Precinct redevelopment into an intermodal terminal, which will include the installation of rail, road infrastructure and warehousing structures. As such the future land use for the Butchers Knife will be commercial / industrial land use, inclusive of rail infrastructure and commercial structures. Subsequently, the potential future users are considered to include:

- Workers involved in the development of the precinct, particularly those involved in excavation works;
- Future workers employed on the property, including shallow intrusive maintenance workers requiring access to underground services potentially installed in the area.



The contaminated materials may also present a risk to ecological receptors on the site and offsite if not appropriately managed. The nearest offsite ecologically sensitive receptors include:

- The Boot Land which has been nominated as ecological conservation area, and includes Anzac creek which passes 25 m from the southern boundary of the site at its nearest point; and
- The Georges River, and the associated riparian zone which is located approximately 750 m west of the site.

5.3 Pathways

5.3.1 Lead Exposure

The lead presents a potential risk to future users of the site through either direct contact and / or the inhalation of dust. Based on the observed depth of the impacts and the current grass cover in the area this is only likely to occur during future excavation works and if the exposed materials are not appropriately managed during those works. The risks associated with dust are only likely to occur if the impacted materials are exposed and allowed to dry and generate dust.

The potential extraction of impacted soil during the future development activities, also presents a potential hazard to ecological receptors, if the cuttings are not appropriately controlled.

Elevated concentrations of lead were not identified in the groundwater surrounding the area, however, as the leachability of the impacted materials has not been assessed it is not known if there is potential for the materials to impact the underlying groundwater.

5.3.2 Asbestos Exposure

Bonded ACM is the most common form of asbestos contamination in or on soil across Australia (NEPC, 2013), and generally arises from inadequate removal and disposal practices during demolition activities, widespread dumping and historic filling using unsorted demolition materials. Bonded ACM in sound condition represents a low human health risk, however, fibrous asbestos (FA) and asbestos fines (AF) have the potential to release asbestos fibres and need to be carefully managed.

The identified ACM fragments present a potential risk to future users of the site through the inhalation of respirable fibres, and requires management during the future development of the site.

5.3.3 Petroleum Hydrocarbon Exposure

The potential exposure of future workers to the hydrocarbons identified to the north of the site will be subject to the outcomes of the remediation actions proposed by Defence. As the outcomes of the remediation works are not yet known, it should be conservatively assumed that residual LNAPL will remain on the groundwater in close proximity to the northern boundary of the site. Furthermore, due to the presence of LNAPL the groundwater flow direction is not clearly apparent, hence there is potential for the LNAPL to migrate beneath the site, particularly if the construction activities on the site include the extraction of groundwater, or excavation dewatering.

The principal exposure route and potential hazard for future users of the site is also via inhalation of vapours potentially emanating from the LNAPL and dissolved hydrocarbon plume. There is also potential for workers to be directly exposed to contaminated groundwater and/or soils should deep excavation (>5 m depth) and/or groundwater extraction be required during the redevelopment works. Deep excavation works, and/or extraction of impacted groundwater will also increase the potential for workers to be exposed to vapours.

The potential extraction of impacted soil and/or groundwater during the future development activities, also presents a potential hazard to ecological receptors if the cuttings and/or extracted materials are not appropriately controlled. Without appropriate containment the contaminated materials may be dispersed across the site or off-site, and present a risk to ecological receptors on the site and offsite.



5.4 Key Data Gaps

Based on the preliminary conceptual site model, the following have been identified as key data gaps in the current information pertaining to the contamination risks on the site;

- **Chlorinated hydrocarbons** – only relatively low level concentrations have been identified approximately 50 m north of the site. However, there is limited information available on the source of these impacts and the vertical and lateral extent in both soil and groundwater. Furthermore, the assessments have not considered possible vapour risks to future site users.
- **Lead** – Elevated concentrations of lead were not identified in the groundwater surrounding the area, however, as the leachability of the impacted materials has not been assessed it is not known if there is potential for the lead impacted wastes to contaminate the underlying groundwater. And the extent of any contamination is not known.
- **Unidentified Contamination** – due to the historic use of the site for unauthorised disposal activities there is potential for additional unidentified areas of contamination to be present across the site. Furthermore, as demonstrated in TP062 there is also potential for the wastes to vary significantly within the known burial pits. Limited geophysical and intrusive investigations have been completed across the site, and the majority of the intrusive investigation locations targeted anomalies detected with a mine detector. As such the locations were potentially biased to where the burial pits contained metal.

5.5 Preliminary CSM Outcomes

Based on the investigations completed within the site the following are considered to be the principle outcomes of the CSM:

- Without appropriate management or remediation, there is a potential for future site users to be exposed to soils impacted with lead and asbestos.
- If not appropriately controlled there is also potential for future users of the site to negatively influence the migration of the petroleum hydrocarbon impacted groundwater identified to the north of the site through uncontrolled excavation dewatering and or groundwater extraction.
- There are also gaps in the current understanding of the burial pits across the site, the distribution of chlorinated hydrocarbons identified in the groundwater to the north of the site, and the presence of absence of lead impacts in groundwater in the vicinity of the lead impacted burial pit.

Subsequently, contamination management measures will need to be implemented to facilitate the future redevelopment of the site.



6.0 SITE MANAGEMENT PLAN - CONTROLS

6.1 Rationale

Based on the investigations completed within the site there is a potential for a complete exposure pathway to be present between the contaminated soils identified on the site and future site users. There are also gaps in the current understanding of contamination on the site. Subsequently, the future development of the site will require the implementation of appropriate controls to ensure the contamination risks are appropriately managed during the future development of the site.

We note that the terms “remediation” and “management” in the context of this document refer to actions required to either treat material, remove it offsite or to isolate it on-site to provide an acceptable risk outcome for the proposed land uses. The context of “management” is also inclusive of administrative controls put in place during development and construction to ensure the risks posed by contamination are appropriately managed.

The objectives of the SMP is to ensure the risks associated with the identified contamination and key data gaps are appropriately managed or remediated to allow the future development of the site for commercial / industrial land use, including a rail access corridor.

6.2 Lead Hot Spot Remediation and Management

Due to the concentrations of lead (22,000 mg/kg) identified in the soils in TP062 between 0.3 and 1.9 m depth, it is recommended that the hot spot be remediated prior to or during the proposed redevelopment of the site. The extent of impact is estimated at approximately 20 m long x 6 m wide and extends to approximately 2 m depth. Interim management measures should also be implemented prior to and during the remediation works.

The identified impacts are similar to other hot spots of contamination identified on the MIC Property West and the future management of these impacts are to comply with the requirements specified within the MIC RAP (PB, 2014) and the MIC Validation Plan – Principles (Golder, 2015c) particularly *Section 6.2 Approach to Materials Classification*.

6.2.1 Remediation Strategy

The hot spot of lead contaminated soil will be excavated, and the excavated materials disposed offsite at a facility licenced to receive hazardous waste / special waste (asbestos waste). The subsequent excavation will be validated. The location of the proposed remediation excavation is shown on Figure 2 (Appendix A).

The abovementioned approach to the lead hot spot remediation is based on a worst case scenario, in which the lead impacted materials will present a long term risk if retained on the site, and subsequently the materials are required to be excavated and disposed off-site. Based on the limited volume of the materials the above mentioned approach is considered to be the most efficient remedial option. Further assessments are required to determine the full extent of the impacts, and should the volume of contaminated materials requiring offsite disposal increase significantly, consideration should be given to alternative remediation approaches. Any alternative approached to the management of the materials will need to be approved by the appointed NSW EPA Accredited Site Auditor.

6.2.2 Validation the Lead Hotspot Excavation

Excavation validation soil sampling will be carried out to confirm that contaminated soil has been removed. The walls and bases of the excavations will be validated through the collection of representative soil samples to confirm the absence of residual contamination, or identify requirements for further management. The excavations will be left open and fenced to prevent access until analytical validation results have been obtained and confirm acceptable residual concentrations of contaminants of concern.

Validation of the resulting excavation will be undertaken as follows:



- Validation soil sampling of the base of the excavations will be undertaken at a minimum of two samples and on a 10 m by 10 m grid with additional targeted sampling in areas of known or potential environmental concern for larger excavations.
- Validation soil samples from the walls of excavations will be applied to each depth unit within each excavation with a minimum of one validation sample per exposed face or per 10 m length of exposed face for every one metre depth of each depth unit will be collected.
- Validation soil samples will be submitted for laboratory analysis for lead and asbestos. Where required additional contaminants will also be scheduled where field observations (odour, staining and photoionisation detector [PID] readings) indicate an additional area of concern.

The asbestos validation samples will be classified using the gravimetric approach, as described within the ASC NEPM (NEPC, 2013), where the soil is tested using a representative number of individual 10L samples. If materials are heterogeneous, then each individual 10L sample will be considered representative of specific soil materials present within the stockpile. Should bonded ACM be identified in poor condition, additional laboratory analysis, in accordance with AS4964 – 2004, may also be required to validate the materials.

Where validation samples record results in excess of the adopted remediation criteria (refer to Appendix C), further excavation of the material will be undertaken followed by collection of additional validation samples, as described above. The extent of further excavations will be evaluated by the Environmental Consultant and presented on a plan defining the excavation extents by co-ordinates and depth.

6.2.3 Lead Hot Spot Management Controls

Management Controls are required to create awareness of the presence of contamination and ensure the exposure risks are appropriately managed prior to and during the abovementioned remediation works. The proposed management controls to be implemented during the lead hot spot remediation are identified in Table 2 below.

Table 2: Management Controls – Lead Hot Spot Remediation

Management task	Commentary
Objective	Management controls are required to alert users of the site to the potential direct exposure and dust inhalation risks associated with the lead impacted soil present within the Lead Hot Spot Exclusion Zone.
Performance criteria	Uncontrolled sub surface activities are not to be undertaken in the Lead Hot Spot Remediation Zone (refer to Figure 2). Appropriate controls are to be implemented during the proposed remediation works.
Management controls	Prepare a training and induction process notifying all employees and contractors on the hazards associated with the Lead Hot Spot Remediation Zone (refer to Figure 2), and implement as appropriate prior to works commencing. No excavation or disturbance to site soils within the Exclusion Zone without written authorisation by the Head lessee or Site Manager. Prepare and implement a Job Safety Analysis (or equivalent) prior to commencement of excavation and /or groundwater extraction activities. The JSA must include as a minimum the following control measures: <ul style="list-style-type: none">■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to lead and asbestos impacted soils.■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours.



Management task	Commentary
	<ul style="list-style-type: none">■ Definitions of appropriate person protective equipment requirements.■ Appropriate controls on personal hygiene to minimise ingestion by hand to mouth of potentially impacted soils and /or groundwater.■ Appropriate personnel decontamination procedures. <p>Prepare and implement a Construction Environmental Management Plan (CEMP) prior to commencement of remediation / excavation activities. The CEMP must include as a minimum the following control measures for the following aspects:</p> <ul style="list-style-type: none">■ Surface water discharge of contaminated materials.■ Dust/vapour and odour emissions emanating from contaminated materials.■ On-site remediation and / or treatment of extracted contaminated soils and groundwater.■ Waste classification, haulage and offsite disposal.■ Spillage of contaminated materials.■ Appropriate equipment decontamination procedures. <p>Initiate corrective actions as soon as practicable and within two weeks of identification of non-conformance.</p>
Responsibility	Head Lessee or delegate
Corrective Actions	<p>Corrective actions will be required if any of the above mentioned management controls are not complied with.</p> <p>The Non-conformance and complaints register presented as Appendix D identifies the requirement for corrective action and recommendations for preventative actions. Corrective and preventative actions are to be reviewed and implemented by the Site Manager or his/her delegate.</p>

6.3 Management of Asbestos in or on Soils

The identification of ACM on and in the soils will require management during the future development to prevent the exposure of future site workers to respirable asbestos fibers. The identified asbestos materials are consistent with that identified on the wider sections of the SITMA Property and MIC Property West. Therefore, the future management of these impacts are to comply with the requirements specified within the MIC RAP (PB, 2014), the JBS&G (2015) SIMTA Stage 1 RAP and the MIC Validation Plan – Principles (Golder, 2015c) particularly *Section 6.8 Approach to Asbestos*.

In summary the following approach is to be implemented during the proposed development works:

- An asbestos management plan (AMP) will be prepared by a competent person as defined within the NSW WorkCover and Safe Work Australia *How to Safely Remove Asbestos, Code of Practice (December 2011)*. The AMP will define the actions, roles and responsibilities associated with the management of asbestos on the site including consultation requirements, licencing requirements, health monitoring and air monitoring requirements. The AMP could be prepared on a site wide or stage specific approach as part of the CEMP.
- Prior to commencing works within a specific site area, a grid-based walkover of the areas will be completed by an appropriately qualified person and/or occupational hygienist to assess for the presence of visible surface asbestos. The observations will assist in defining whether the area has a



high potential for asbestos contamination in or on soil, and will assist in determining the asbestos management strategy for the selected area.

- Any visual observations of asbestos will be recorded by GPS, as well as the asbestos type, and the asbestos will be manually collected via 'emu-bobbing' using a licensed asbestos removal contractor. The walkover will generally use a methodology consistent with those proposed by the Western Australia Department of Health (WA DOH, 2009). Validation will comprise the issuance of a clearance certificate by an occupational hygienist confirming no visible asbestos remains in the area targeted for clearance.
- Where required, the known asbestos in sub-surface soils will be targeted for active remediation excavation and validation. Excavation validation will comprise the issuance of a clearance certificate by an occupational hygienist confirming no visible asbestos has been identified. Following excavation, asbestos impacted soils will be disposed of offsite, or placed in a location considered suitable for onsite containment and management through the LTEMP.
- Stockpiled materials will be validated using the gravimetric approach, as described within the ASC NEPM (NEPC, 2013), where the soil is tested using a representative number of individual 10L samples. If the stockpile comprises heterogeneous materials, then each individual 10L samples will be considered representative of specific soil materials present within the stockpile. Should bonded ACM be identified in poor condition, additional laboratory analysis, in accordance with AS4964 – 2004 may also be required to validate the stockpiled materials.

Asbestos identified at the site will be mapped on the site GIS Interactive Map, and is it expected that this mapping will continue throughout the remediation and development process. The ongoing mapping of asbestos will include:

- Surface observations of visible ACM via site walkovers.
- Subsurface observations through, soil investigation programs, that encountered during excavations or that encountered within stockpiles.

6.4 Management of Foreign Materials (Wastes)

The previous investigations have identified the presence of disposal pits across the site where foreign materials (wastes) have been buried (referred to as tip sites). These have been the subject of previous investigations, and the majority of the materials sampled reported chemical concentrations below the adopted investigation levels (with the exception of the lead hot spot noted above). These tip sites include various forms of wastes, and are likely to include some soil discolouration and residual odour. They also include occasional pieces of asbestos containing materials.

The location and nature of the identified tip sites is consistent with those identified on the wider sections of the SIMTA Property and MIC Property West. Therefore, the future management of these areas is to comply with the requirements specified within the MIC RAP (PB, 2014), the JBS&G (2015) SIMTA Stage 1 RAP and the MIC Validation Plan – Principles (Golder, 2015c) particularly *Section 6.9 Approach to Aesthetics and Foreign Materials (Wastes)*.

Given the proposed commercial / industrial land use it is not expected that aesthetic issues form a driver for remediation, nor would they necessitate the need to validate these areas of the site. Any remediation or management actions and the subsequent validation will focus on the mitigation of the risks posed by the elevated chemical concentrations, in the context of the proposed future commercial / industrial land use.

There is potential that additional unidentified tip sites are present on the site. If a previously unidentified tip site is encountered and there is a requirement for the materials to be excavated, and if adverse conditions are observed, then an assessment and validation process appropriate for the volume and character of the materials observed will be implemented. The adverse conditions which may warrant additional assessment and validation include;

- highly malodorous soils or seepage water (e.g. strong residual petroleum odours);



- hydrocarbon sheen on surface water;
- discoloured chemical deposits or soil staining with chemical waste other than of a minor nature;
- large 'monolithic' deposits of materials (e.g. gypsum as powder, or plaster board);
- presence of putrescible refuse including material that may generate hazardous levels of ground gases (e.g. methane) such as large quantities of green waste or timber waste; and
- presence of objects which may indicate the presence of chemical contamination, such as drums, tanks or other such storage items.

The materials within the tip sites may not be geotechnically suitable and rectification works maybe required. The ASC NEPM (NEPC, 2013) notes that geotechnical issues should be considered separately to contamination issues. However, with the uncertainty regarding additional un-identified tip sites remaining on the site, there is opportunity to use the processes associated with geotechnically preparing the site for development to provide evidence that additional unidentified tip sites do not exist within the footprint of the proposed development.

The verification that an area has achieved the required geotechnical characteristics to allow filling or development, is also considered to provide sufficient evidence that that site area does not include significant volumes of anthropogenic fill (waste). Records of geotechnical testing and any improvement activities will need to be included within the Validation Report, and presented to the Site Auditor for review.

6.5 Management of UXO and EOW

The previous investigations have identified the potential for UXO and / or EOW to be present in areas immediately adjacent to the site. The UXO investigations (G-tek, 2014) concluded that the primary UXO risks were associated with the unauthorized grenade range, located to the south of the site.

A detailed area specific UXO Management Plan will need to be developed as part of the detailed design process for the site. The object of the management will be to ensure a safe working environment is established during construction phase earthworks, and that site is remediated (where required) safe such that future workers within the site are protected. The UXO Management Plan is to be prepared by a suitably qualified UXO contractor, such as a member of the Department of Defence Environmental and Heritage Panel F2 stream, and is to be specific to the proposed development works particularly any excavations works.

In general EOW and UXO Management plan is to include, but not be limited to the following:

- **Roles and Responsibilities** – appropriate management personnel should be designated with specific responsibilities in the event of UXO or EOW being identified within the Site during the development works. Where required, these roles should include appropriately qualified contractors, such as UXO contractors who are members of the Department of Defence Environmental and Heritage Panel F2 stream. A UXO / EOW Contact list is to be maintained as part of the management plan, detailing the name, position, responsibility and contact details of each individual who may need to be involved in any UXO/EOW activity;
- **Fencing and Signage** – installation and maintenance of appropriate fencing and signage, sufficient to prevent access by unauthorized persons. Signage shall be placed at a maximum of 50 m intervals around the boundary detailing "no unauthorized access", and also be placed in key areas where persons are likely to enter the area. Signs are to be placed at a maximum height of 1.5m above ground level and be maintained such that they are clear of vegetation and clearly visible. Access is to be controlled by the Head Lessee (or their delegate), and the site only accessed by persons authorized by the Head Lessee (or their delegate) following completion of the required induction process as defined with the UXO / EOW management plan.
- **Site Induction** – a UXO/EOW awareness training process is to be detailed within the UXO/EOW management plan. The induction process is to detail the UXO/EOW safety induction for all staff



engaged in Site works regardless of whether they are directly involved in excavation activities. The induction should include but not be limited to:

- Site History;
 - Potential UXO/EOW that may be remnant within the Site;
 - Roles and Responsibilities of all staff and key UXO/EOW staff;
 - Process to be followed if UXO/EOW is potentially encountered.
- **Management Process** – a clear management process is to be detailed for the discovery of a potential UXO/EOW item during future site works. This is to include, but not be limited to the following:
- The communication protocol notifying the UXO/EOW contractor or UXO /EOW manager on the site as soon as practical;
 - The process for making the discover site safe, such as making sure the discovered item should not be moved or touched and works that could move or disturb the items are ceased. An exclusion area of 5m radius be established and enforced around the item until the UXO/EOW contractor or UXO/EOW manager has completed the initial assessment;
 - Notification of occupants of any work sites or buildings in close proximity to the exclusion zone, in case future evacuation is required;
 - The assessment process, where the UXO/EOW contractor or UXO/EOW manager will assess the discovered item to determine whether it is a risk. If identified as a risk, the UXO /EOW manager will inform the Site Manager and if required increase the exclusion zone;
 - The clearance process, where subject to the class of the materials identified the UXO/EOW manager and Site Manager will liaise with the Department of Defence to ensure the timely and appropriate disposal of the materials.
 - The documentation process, where the UXO/EOW contractor and or UXO/EOW manager will maintain an incident register and record any reported discovery, outlines any assessment and the final disposal of the materials identified. These records will be presented to the appropriate consent authority on request.

The future LTEMP developed for the Moorebank Avenue realignment will need to include appropriate fencing / signage and unexpected finds protocols which will stipulate what fencing and signage requirements are to be installed and maintained following development and what actions are to be followed should additional UXO/EOW be identified during the future operation of the site (i.e. an unexpected finds protocol).

The UXO/EOW remediation and management plan will need to be presented to the Environmental Auditor for comment, and records of the UXO/EOW materials encountered and the removal or management activities implemented during the remediation / development documented and presented to the appropriate consent authority on request.

This approach is generally consistent with the MIC Validation Plan – Principles (Golder, 2015c) particularly *Section 6.10 Approach to UXO and EOW*.

6.6 Management of Groundwater Extraction

Controls are required to create awareness of the presence of hydrocarbon contaminated groundwater to the north of the site and where possible restrict activities on the site to minimise the potential disturbance of the identified LNAPL and dissolved hydrocarbon plume. The proposed management controls are identified in Table 3 below.

Table 3: Management Controls – Offsite Hydrocarbon Plume



Management task	Commentary
Objective	Administrative controls are required to alert users of the site to the presence of LNAPL and dissolved phase hydrocarbons to the north of the site in the vicinity of the former Refuelling Facility and to restrict un-necessary disturbance of the contaminated groundwater located at depth in the western portion of the site.
Performance criteria	<p>Uncontrolled sub surface activities are not to be undertaken on the site.</p> <p>Uncontrolled groundwater extraction activities are not to be undertaken on the site.</p>
Management controls	<p>Prepare a training and induction process notifying all employees and contractors on the hazards associated with the adjacent LNAPL plume, and implement as appropriate prior to works commencing.</p> <p>No excavation or disturbance to site soils and no extraction of groundwater from within the site without written authorisation by the Head Lessee or Site Manager.</p> <p>Where possible, the future redevelopments are to be designed that that the potential disturbance of the groundwater within the site is minimised. This may include the consideration of designs and or construction methods which minimise deep excavations (including piling) and / or groundwater extraction.</p> <p>Prepare and implement a Job Safety Analysis (or equivalent) prior to commencement of excavation and /or groundwater extraction activities. The JSA must include as a minimum the following control measures:</p> <ul style="list-style-type: none"> ■ Appropriate confined space gas/vapour monitoring procedures suitable for management of potential exposure to petroleum hydrocarbon vapours. ■ Appropriate hot work permitting procedures including gas/vapour testing procedures suitable for management of explosive risks associated with petroleum hydrocarbon vapours. ■ Definitions of appropriate person protective equipment requirements. ■ Appropriate controls on personal hygiene to minimise ingestion by hand to mouth of potentially impacted soils and /or groundwater. ■ Appropriate personnel decontamination procedures. <p>Prepare and implement a Construction Environmental Management Plan (CEMP) prior to commencement of excavation and /or groundwater extraction activities. The CEMP must include as a minimum the following control measures for the following aspects:</p> <ul style="list-style-type: none"> ■ Surface water discharge of contaminated materials. ■ Dust/vapour and odour emissions emanating from contaminated materials. ■ On-site remediation and / or treatment of extracted contaminated soils and groundwater. ■ Waste classification, haulage and offsite disposal. ■ Spillage of contaminated materials. ■ Appropriate equipment decontamination procedures. <p>Initiate corrective actions as soon as practicable and within two weeks of identification of non-conformance.</p>



Management task	Commentary
Record keeping and reporting	Maintain a log of inspections, non-conformances and corrective actions.
Responsibility	Head Lessee or delegate
Corrective Actions	<p>Corrective actions will be required if any of the above mentioned management controls are not complied with.</p> <p>The Non-conformance and complaints register presented as Appendix D identifies the requirement for corrective action and recommendations for preventative actions. Corrective and preventative actions are to be reviewed and implemented by the Site Manager or his/her delegate.</p>

6.7 Additional Investigations – Chlorinated Hydrocarbons and Lead in Groundwater

Low level concentrations of chlorinated hydrocarbons have been identified in the deeper groundwater approximately 50 m north of the site. However, based on current investigations there is limited information available on the source impacts and the vertical and lateral extent of the impacts in both soil and groundwater. Furthermore, the current assessments have not considered possible vapour risks to future site users.

Chlorinated hydrocarbons have historically been used in selected areas of the site, and there is potential that chlorinated hydrocarbons and chlorinated hydrocarbon impacted materials have been disposed of in the burial pits / tip site located either in the site or in close proximity to the site.

Furthermore, the leachability of the lead impacted materials has not been assessed, and therefore the extent of any lead impacted groundwater is not known.

Further assessments are recommended, and the objective of the investigation should be to develop sufficient evidence that the impacts are not going to present an unacceptable risk to the future users of the site, and / or the offsite receiving environments. The objectives chlorinated hydrocarbon investigations are to assess the potential migration and intrusion of vapours in to future buildings positioned on this portion of the site, and the objective of the lead impacted groundwater investigations are to determine of the groundwater is impacted with lead, and whether those impacts (if present) pose a risk to offsite receptors.

Prior to commencing the additional investigations a Sampling Analysis and Quality Plan (SAQP) should be prepares in consultation with the Auditor. The SAQP is to be prepared in accordance with the Data Quality Objectives (DQO) process, as described in the NSW EAP Contaminated Site Auditor Guidelines (2997) and provide detail on the proposed investigation scope and the investigation methods. The SAQP is to consider the most appropriate investigation methods to achieve the objectives of the investigation.



7.0 SITE MANAGEMENT PLAN - IMPLEMENTATION

7.1 Responsibility

The contamination management measures detailed in this report are to be implemented for the ongoing use of the site, or until it is proven to the satisfaction of the accredited NSW EPA contaminated site auditor (the Auditor) that the site is suitable for ongoing commercial / industrial use.

The implementation of the contamination control measures described in this report is the responsibility of the Head Lessee (MIC) under the obligations imposed under Clause 6.1(b)(1) of the Head Lease from the Commonwealth to MIC, where:

“remediating all Contamination on, in or in respect of the Premises to the standard required under any applicable Environmental Law from time to time irrespective of who caused the Contamination and irrespective of whether the Contamination first occurred or was first caused or was first disturbed prior to the Commencement Date or the date of the Tenant's first occupation of the Land.”

To clarify, in respect of this report the abovementioned term “remediation” includes the implementation of a management approach where appropriate.

The responsible person for the overall implementation of the contamination management measures is the Head Lessee and/or their nominated representative or delegate. Implementation of the contamination management plan during specific works is the responsibility of the works supervisor, considered to be the delegate of the Site Manager.

The roles and responsibilities for the implementation of the SMP are identified in Table 4 below.

Table 4: SMP Roles and Responsibilities

Role	Responsibility
Head Lessee (MIC) or delegate	<p>Approve the SMP and contamination management measures.</p> <p>Advise persons working at the site of the requirements of the SMP.</p> <p>Ensure appropriate consents and licences (as required) are obtained for the works.</p> <p>Ensure appropriate fencing and signage is installed and maintained, such that unauthorised access to the site is controlled.</p> <p>Provide training and induction of employees and contractors before and during the works, as appropriate.</p> <p>Provide a copy of the SMP to the supervisor or person-in-charge of employees and/or contractor/s who are undertaking the works.</p> <p>Ensure implementation of the SMP. Maintain a log of Project Personnel.</p> <p>Ensure staff and contractors comply with the requirements of the SMP.</p> <p>Ensure staff and contractors clearly understand the requirements of the SMP and ensure that compliance with the SMP is a condition of any agreement with contractors.</p> <p>Update the SMP if the condition of the site is changed, and, if necessary, inform other parties of the changes.</p> <p>Ensure the site is maintained in accordance with the SMP.</p> <p>Provide the SMP for inclusion on the relevant records maintained by MIC and others (including owners and /or agents responsible for the management of assets within the site).</p>



Role	Responsibility
	<p>Ensure an inspection of the site is undertaken at six-monthly intervals or at another intervals as decided by MIC and record the results of the inspections in Appendix E.</p> <p>Ensure all non-conformance and/or complaints are recorded in Appendix D of the SMP.</p>
Site Manager	<p>Implement the SMP to ensure compliance.</p> <p>Complete the registers, databases and records required by the SMP.</p> <p>Conduct works in an environmentally responsible manner.</p> <p>Meet relevant WH&S regulatory requirements.</p> <p>Implement the works in a safe and responsible manner.</p> <p>Ensure that environmental protection measures are in place and are functioning correctly during the works and after completion of the works, if required.</p> <p>Complete non-conformance and corrective action reports as required and undertake follow-up corrective actions, as required.</p> <p>Conduct monitoring as required in the SMP.</p> <p>Undertake audits of activities in accordance with the requirements of the SMP.</p> <p>Ensure non-conformance and/or complaints are reported to the Site Manager and Site Owner.</p> <p>Undertake corrective actions in response to requests regarding specific environmental or safety issues.</p> <p>Ensure all works comply with relevant regulatory requirements.</p> <p>Inform the Site Manager if conditions change significantly from those documented in the SMP.</p>
Site Developer	<p>Provide the SMP to any maintenance worker or contractor (who is engaged under the direction of the site developer).</p> <p>Comply with the SMP during development of the site, including being aware of and accommodating the requirements of the contamination management measures site within the design redevelopment.</p> <p>Prepare and implement a Construction Environmental Management Plan, for any activities proposed within the site, and ensure the CEMP addresses the risks identified in this SMP and any supplementary plans including but not limited to a an AMP and UXO/EOW management plan.</p> <p>Ensure potential risks are managed through implementation of the SMP.</p> <p>Monitor adherence to the SMP.</p> <p>Initiate and undertake corrective actions for non-conformance under the SMP.</p> <p>Inform the Site Owner and Site Manager if in-ground conditions change significantly from those documented in the SMP.</p>
Maintenance Work / Contractor	<p>Comply with the SMP, including relevant legislation and guidance when conducting works at the site.</p>



Role	Responsibility
	Ensure tasks are approved by the Site Owner their delegate (Site Manager or Site Developer) prior to commencing work. Inform the Site Owner/ Site Manager/Site Developer if ground conditions differ and/or change significantly from those documented in the SMP.

7.2 Contamination Management Contingency Actions

Table 5 identifies contingency actions to be performed in the event of unexpected exposure of site occupants or visitors to contamination on the site occurs or the potential for exposure occurs.

Table 5: SMP Contingency Actions

Trigger	Action
Unauthorised excavations in the site.	<p>If excavations are in process:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent surface water run-off.■ Site Manager to engage an experience environmental consultant and /or occupational hygienist to assess exposure of workers to potentially contaminated materials. <p>If excavations have occurred and the area has been reinstated:</p> <ul style="list-style-type: none">■ Assess condition of surface soils in the work area against appropriate land use criteria to confirm contaminated soils do not remain on the site surface.■ Instigate preventative action to limit the potential for reoccurrence.
Identification of unexpected contaminated materials during excavation works on the site.	<p>If unexpected contamination² is encountered during excavation works the following actions should be taken:</p> <ul style="list-style-type: none">■ Stop work and contact the Site Manager and Site Owner.■ Stockpile suspected contaminated material which has been excavated on an impervious surface (concrete slab or minimum two layers of builders plastic), cover stockpile and bund to prevent run-off.■ Site Manager to engage an experience environmental consultant to assess potentially contaminated materials.■ Update the SMP. <p>Adverse conditions which may warrant action include;</p> <ul style="list-style-type: none">■ highly malodours soils or seepage water (e.g. strong residual petroleum odours);■ hydrocarbon sheen on surface water;

² Contamination may include, but not be limited to, hydrocarbons, poly cyclic aromatic hydrocarbons and asbestos.



Trigger	Action
	<ul style="list-style-type: none"> ■ discoloured chemical deposits or soil staining with chemical waste other than of a minor nature; ■ large monolithic deposits of materials (e.g. gypsum as powder, or plaster board); ■ presence of putrescible refuse including material that may generate hazardous levels of ground gases (e.g. methane) such as large quantities of green waste or timber waste; ■ presence of objects which may indicate the presence of chemical contamination, such as drums, tanks or other such storage items; and ■ presence of asbestos containing materials (ACM).
Identification of unexpected UXO during excavation works on the site.	<p>If unexpected UXO / EOW is encountered during works the following actions should be taken:</p> <ul style="list-style-type: none"> ■ Stop work and contact the Site Manager and Head Lessee. ■ Site Manager and Head Lessee to notifying the UXO/EOW contractor or UXO /EOW manager as soon as practical. ■ The discovered item should not be moved or touched and works that could move or disturb the items are ceased. ■ An exclusion area of 5m radius be established and enforced around the item until the UXO/EOW contractor or UXO/EOW manager has completed the initial assessment. ■ Notify occupants of any work sites or buildings in close proximity to the exclusion zone, in case future evacuation is required. ■ UXO/EOW contractor or UXO/EOW manager to assess the discovered item to determine whether it is a risk. If identified as a risk, the UXO /EOW manager will inform the Site Manager and Head Lessee if required increase the exclusion zone. ■ UXO/EOW contractor or UXO/EOW manager to complete the required clearance process and will liaise with the Department of Defence to ensure the timely and appropriate disposal of the materials. ■ Site Manager is to maintain an incident register and record any reported discovery, outlines any assessment and the final disposal of the materials identified. These records will be presented to the appropriate consent authority on request.
Other	Liaise with Site Manager / Site Owner to determine appropriate actions to mitigate adverse impacts from the event.

7.3 Contamination Management Review and Timeframe

7.3.1 Review

This SMP must be reviewed annually by a competent person and assessed against any changes in site conditions, work requirements, legislation, environmental conditions and other relevant factors including the result of corrective and preventative action reports. If required, this SMP must be reviewed at the conclusion of the additional groundwater and soil vapour investigations described within Section 6.7. Where relevant,



preventative actions should be incorporated into the SMP, including additional actions required to manage the potential risks of the known and potential groundwater contamination.

If revision of this SMP is considered necessary then the revision should be agreed by at least the following:

- the Head lessee;
- the Site Manager;
- the Auditor, as required.

7.3.2 Timeframe

This SMP, or any subsequent revision, should apply in perpetuity or until:

- Investigations indicate the concentrations of the contaminants of concern in soil and or groundwater have attenuated or have been remediated to levels below the below endorsed criteria for the commercial/industrial land use. And this assessment has been endorsed by the appointed NSW EPA Accredited Contaminated Site Auditor; or
- Reassessment of contaminant concentrations against future revisions of land use criteria indicates the measured concentrations are below endorsed criteria for the relevant land use (i.e. commercial/industrial land use); or
- The redevelopment and or remediation of the site has been completed, and it is agreed with the appointed NSW EPA Accredited Contaminated Site Auditor that the controls of this SMP are to be incorporated into the wider LTEMP when developed; or
- The land use changes to a more sensitive land use and reassessment of potential risks to site occupants is required.



8.0 CONCLUSION AND RECOMMENDATIONS

It is considered that extensive information is available on the surface and shallow subsurface contamination status of the SIMTA site, and portions of this information are relevant to the Butchers Knife.

Based on the investigations completed within the site the following are the principal outcomes of the CSM:

- Without appropriate management or remediation, there is a potential for future site users to be exposed to soils impacted with lead and asbestos.
- If not appropriately controlled there is also potential for future users of the site to negatively influence the migration of the petroleum hydrocarbon impacted groundwater identified to the north of the site through uncontrolled excavation dewatering and or groundwater extraction.
- There are also gaps in the current understanding of the burial pits across the site, and the distribution of chlorinated hydrocarbons identified in the groundwater to the north of the site.

Subsequently, contamination management measures will need to be implemented to facilitate the future redevelopment of the site. The following remediation and contamination management controls are recommended for the site:

- Remediation of the soils impacted with lead in the vicinity of test pit TP062, through delineation and subsequent excavation, then offsite disposal of the impacted soils and validation of the resultant excavation. The extent of impacted materials is estimated at approximately 240m³ (insitu), however, further assessments are recommended to delineate the extent of impacts.
- Implementation of a management approach to the identified asbestos in soils, waste / tip sites and potential UXO / EOW risks. The nature of the impacts are similar to those identified on the MIC Property West, and it is recommended that the adopted management approaches be commensurate with those presented in the PB (2014) RAP and Golder (2015) Validation Plan – Principles developed for the MIC Property West.
- Implementation of a management approach to the minimise the potential disturbance of the LNAPL and dissolved phase hydrocarbon plume identified in the vicinity of the former refuelling station located approximately 50 m north of the site.
- Undertake further assessments of the chlorinated hydrocarbons identified in groundwater approximately 50 m north of the site with the objective of determining whether the impacts present an unacceptable risk to the future users of the site. Particularly through the migration and intrusion of vapours in to future buildings positioned on this portion of the site.
- Undertake further assessments to determine whether the lead impacted materials in the burial pit have leached to groundwater, and whether the lead impacted groundwater presents a potential risk to offsite environmental receptors.
- Implementation of the SMP presented within this report, including revising the SMP as required at the conclusion of the abovementioned additional groundwater and soil vapour investigations.



Report Signature Page

GOLDER ASSOCIATES PTY LTD

[Faint signature]

Principal Environmental Scientist

Principal Environmental Scientist

GVS/GB/gvs

A.B.N. 64 006 107 857

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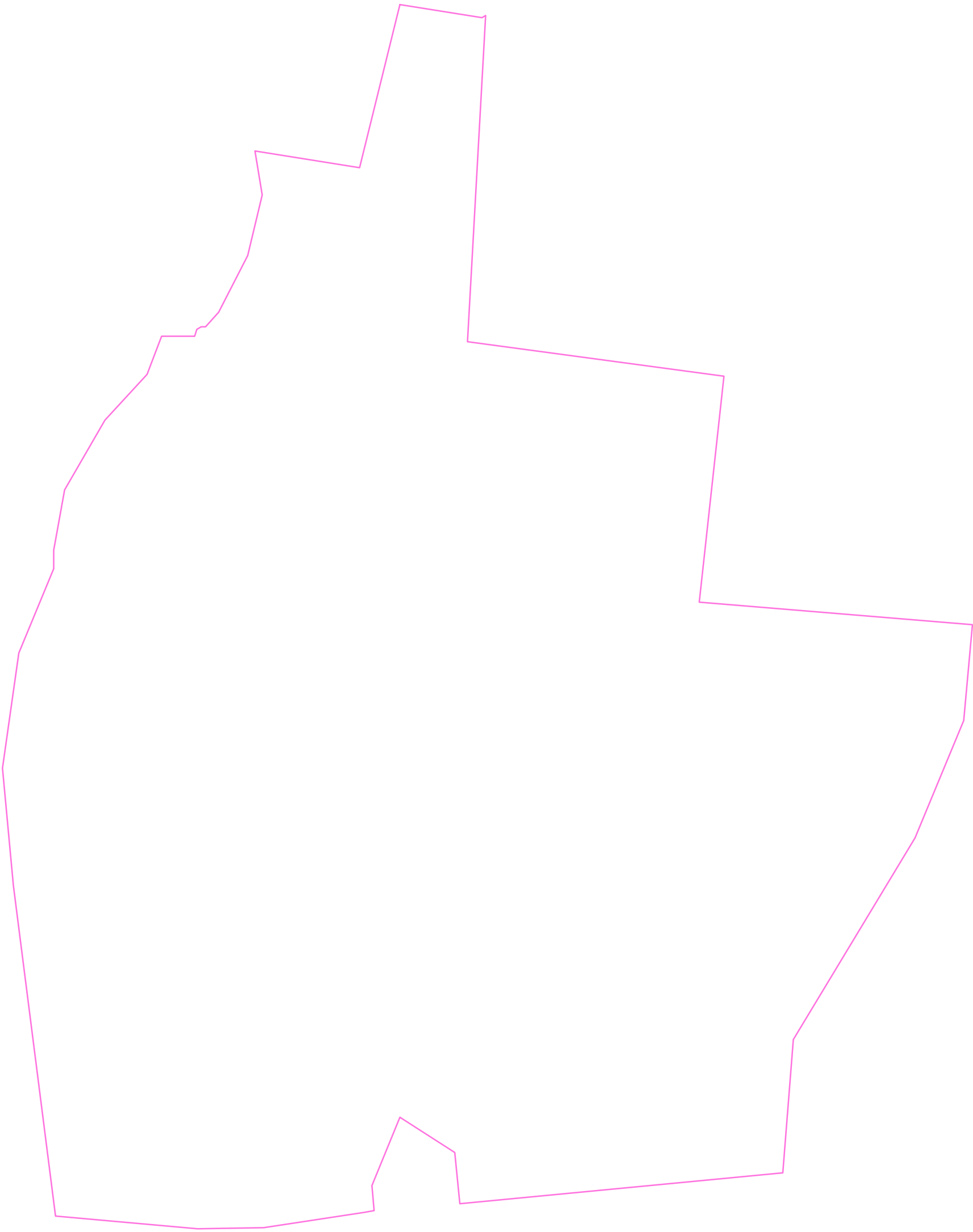


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APPENDIX A

Figures



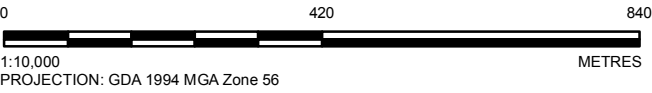
LEGEND

- The Precinct (approximate)
- MIC Property West
- Bootland (MIC Property East)
- Butchers Knife (The Site)
- SIMTA Property
- Joint Defence Logistics Complex Moorebank
- Moorebank Ave
- Moorebank Ave Realignment
- Rail Access Corridor

NOTE(S)
LNAPL - Light Non Aqueous Phase Liquid

REFERENCE(S)
1. Lot boundaries provided by Land and Property Information NSW

COPYRIGHT
Aerial Photography Copyright
1.NearMap Pty Ltd.



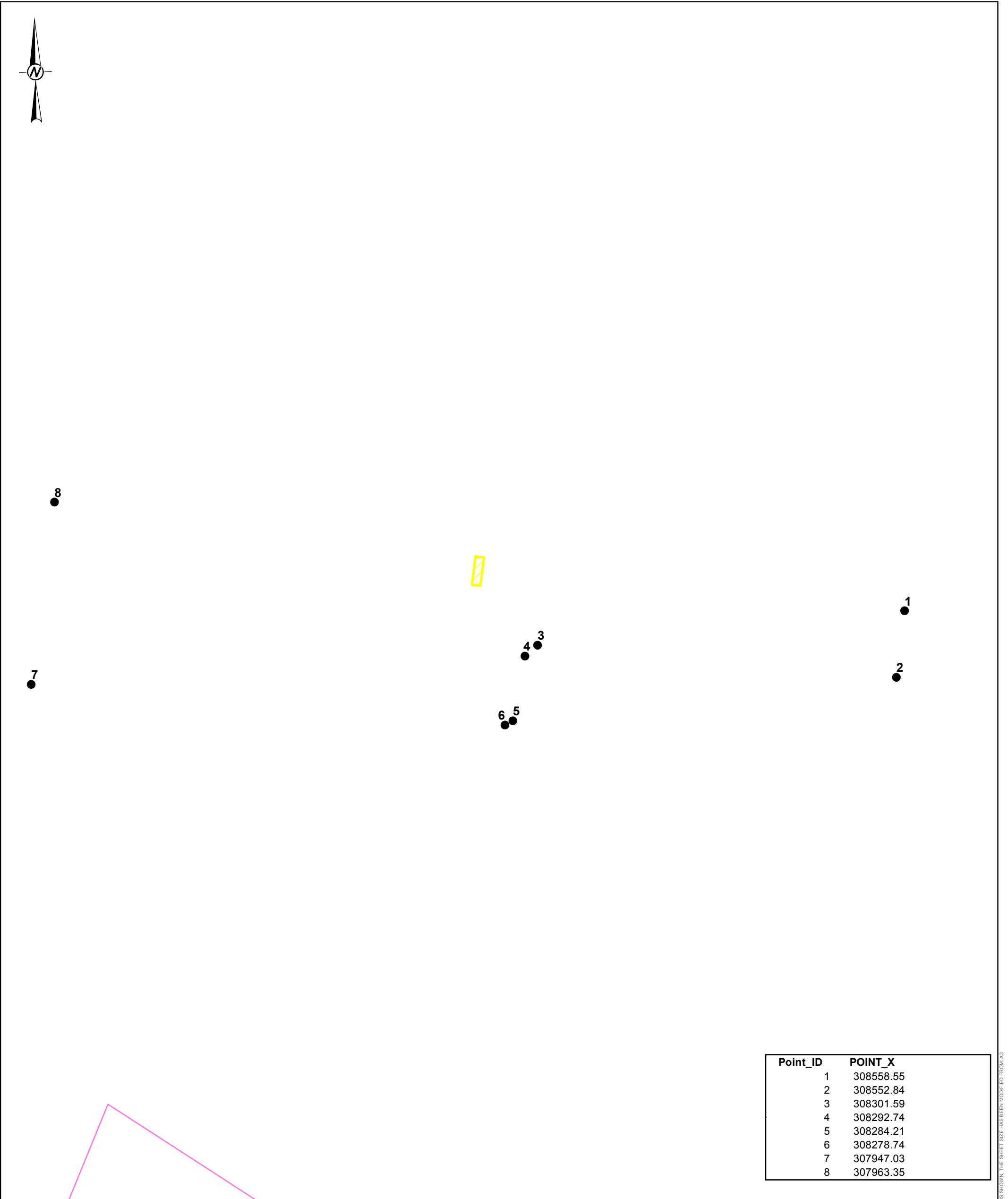
CLIENT
MOOREBANK INTERMODAL COMPANY

PROJECT
BUTCHERS KNIFE SUMMARY REPORT AND SMP

TITLE
SITE OVERVIEW

	CONSULTANT	YYYY-MM-DD	2016-07-13
		PREPARED	KJS
		DESIGNED	####
		REVIEWED	GVS
		APPROVED	GVS

PROJECT NO. 147623070	CONTROL 055	REV. 1	FIGURE 001
--------------------------	----------------	-----------	---------------



Point_ID	POINT_X
1	308558.55
2	308552.84
3	308301.59
4	308292.74
5	308284.21
6	308278.74
7	307947.03
8	307963.35

LEGEND

- Lead Remediation Area
- Rail Access Corridor
- The Precinct (approximate)
- MIC Property West
- Bootland (MIC Property East)
- Butchers Knife (The Site)
- SIMTA Property
- Moorebank Ave
- Moorebank Ave Realignment

NOTE(S)
LNAPL - Light Non Aqueous Phase Liquid

REFERENCE(S)
1. Lot boundaries provided by Land and Property Information NSW


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1.NearMap Pty Ltd.

0100200
1:2,500
PROJECTION: GDA 1994 MGA Zone 56
METRES

CLIENT
MOOREBANK INTERMODAL COMPANY

PROJECT
BUTCHERS KNIFE SUMMARY REPORT AND SMP

TITLE
LEAD REMEDIATION AREA

	CONSULTANT	YYYY-MM-DD	2016-07-27
		PREPARED	KJS
		DESIGNED	####
		REVIEWED	GVS
		APPROVED	GVS

PROJECT NO. 147623070	CONTROL 055	REV. 1	FIGURE 002
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APPENDIX B

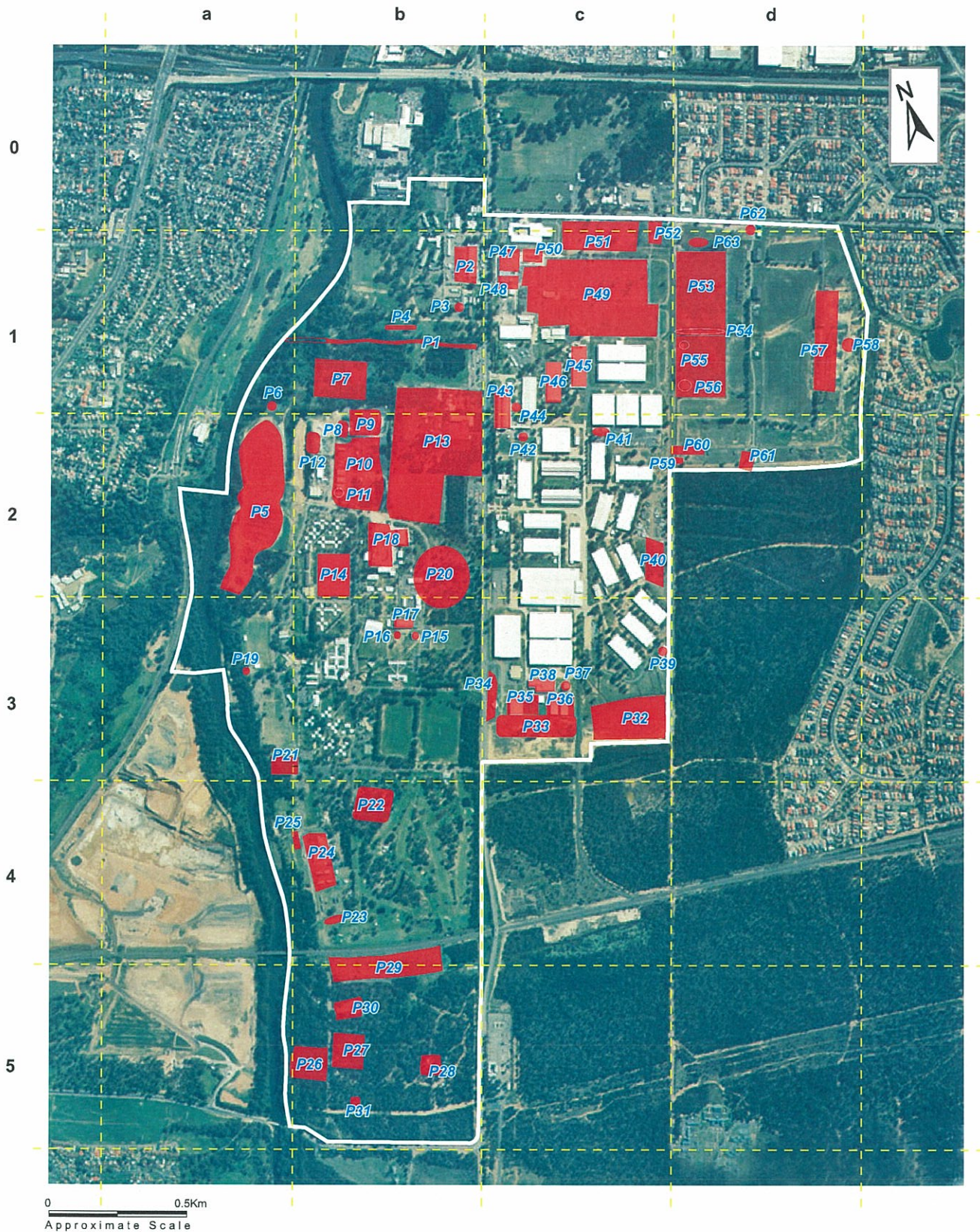
Figures and Tables from Previous Consultants Reports



APPENDIX B1 – FIGURES FROM EGIS (2000)

SITE INSPECTION

MOOREBANK DEFENCE LANDS



See attached Table

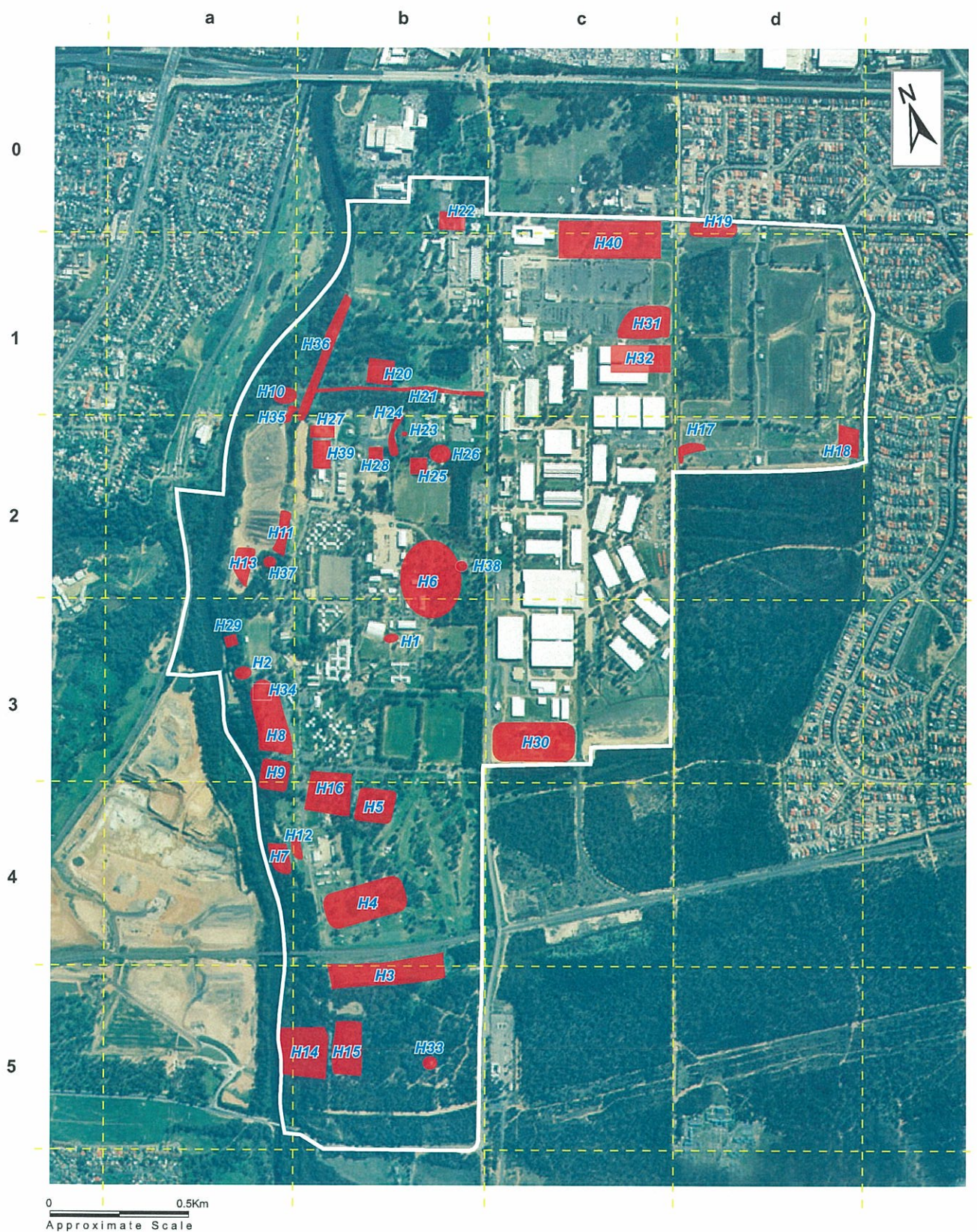
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Date : 3 August 2000

File Name : VA033427.cdr

SITE HISTORY

MOOREBANK DEFENCE LANDS



See attached Table

Source : Copyright Surveyor General's Department, 29 September 1998

Date : 3 August 2000

File Name : VA033434.cdr



APPENDIX B2 – FIGURES AND TABLES FROM URS (2002)

ALPHA GEOSCIENCE Pty. Limited.
(ABN 14 080 819 209)
Suite 1, 23 Gray Street
Sutherland, NSW, 2232, Australia
Telephone +61 2 9542 5266
Facsimile +61 2 9542 5263
E-mail info@alpha-geo.com
Website www.alpha-geo.com



Acquisition Parameters

Instrument:
Sampling mode:
Sample interval:
Line spacing:
Acq. software:

Processing Parameters

Data recovery: AGSProc V1.73
Data gridding: AGSProc V1.73
method: Minimum curvature
Grid cell size: 0.40m x 0.40m
Other processing:

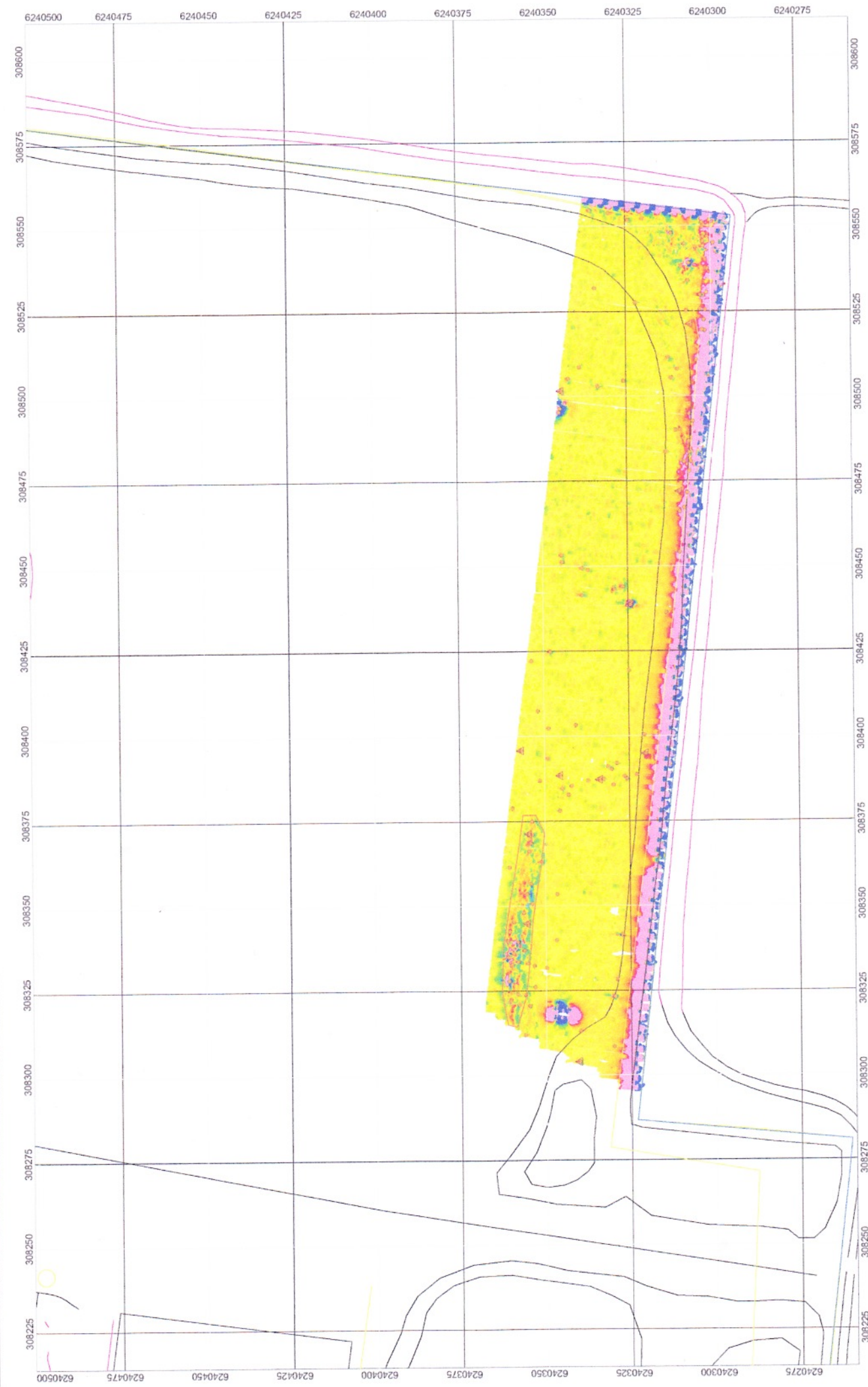
Colour Image of Total Magnetic Field

Project: DNSDC, Moorebank
Project ID: AG-058
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Processed by: Timothy Pippett
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Date printed: 29 October 2002
Program version: AGSProc V1.73

Total_Site



APPENDIX B3 - FIGURES FROM G-TEK (2003)



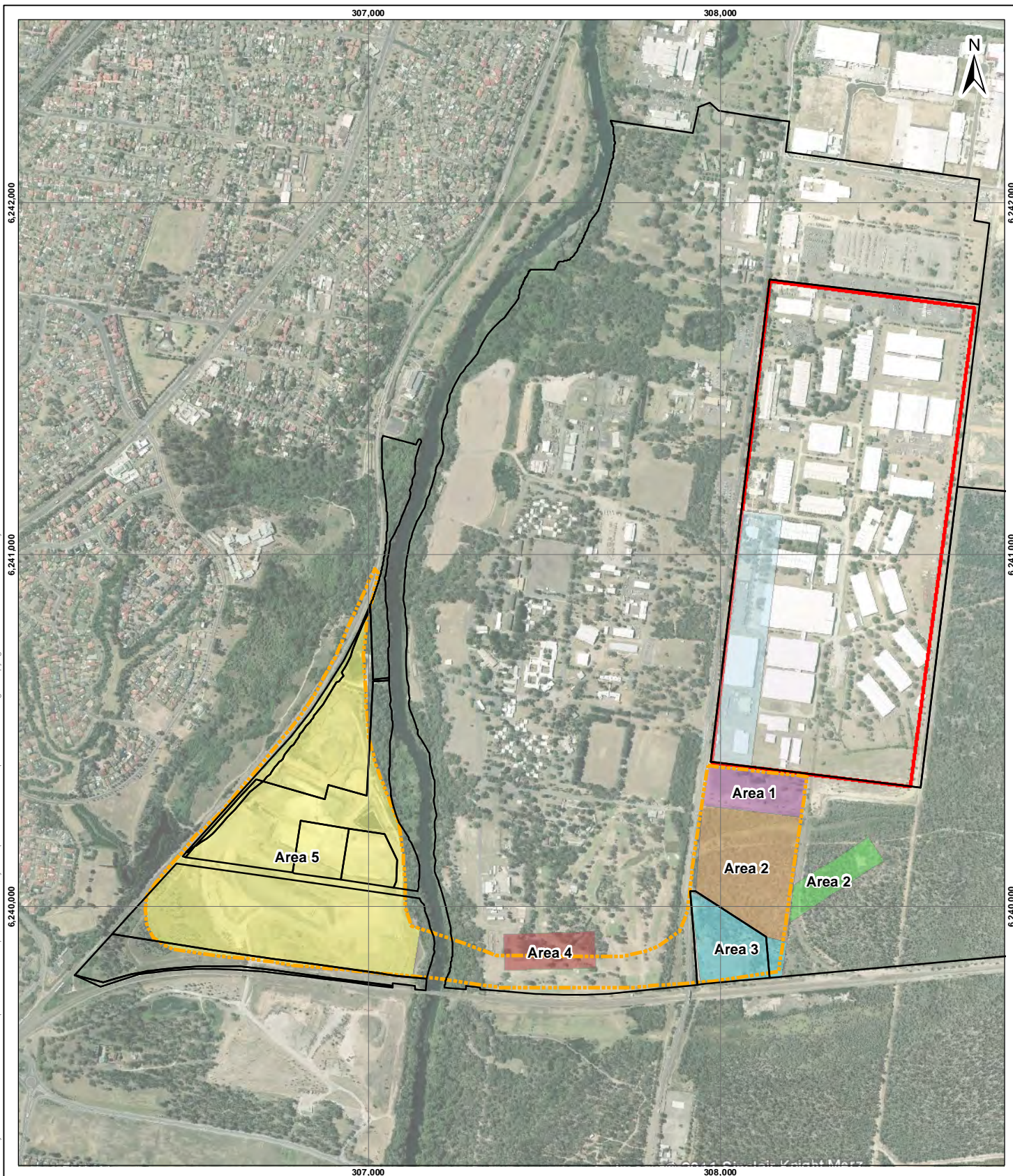
- INVESTIGATION**
- INTERPRETATION QC
 - STANDARD
 - INVESTIGATION QC
 - Analogue Search

**Hazard Reduction
Precinct I
Moorebank Defence Lands**





APPENDIX B4 – FIGURES FROM GOLDER 2013



PHASE 1 ASSESSMENT OF RAIL CORRIDOR ALLOTMENT

STOCKLAND DEVELOPMENTS PTY LTD

AREAS OF ENVIRONMENTAL INTEREST

COPYRIGHT
Google Earth 2009



Legend

- Cadastre
- Rail Link
- Area 1a
- DNSDC Boundary
- Areas Of Environmental Interest**
 - Area 1 - Unauthorised Dumping Area
 - Area 2 - Former Grenade Range
 - Area 2 - Illegal Dumping Identified
 - Area 3 - Area of Land Filling
 - Area 4 - Former Mock Viet Cong Village
 - Area 5 - Glenfield Quarry & Waste Disposal Facility

0 55 110 220 330 440 550 metres

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DATUM GDA 94, PROJECTION MGA Zone 56

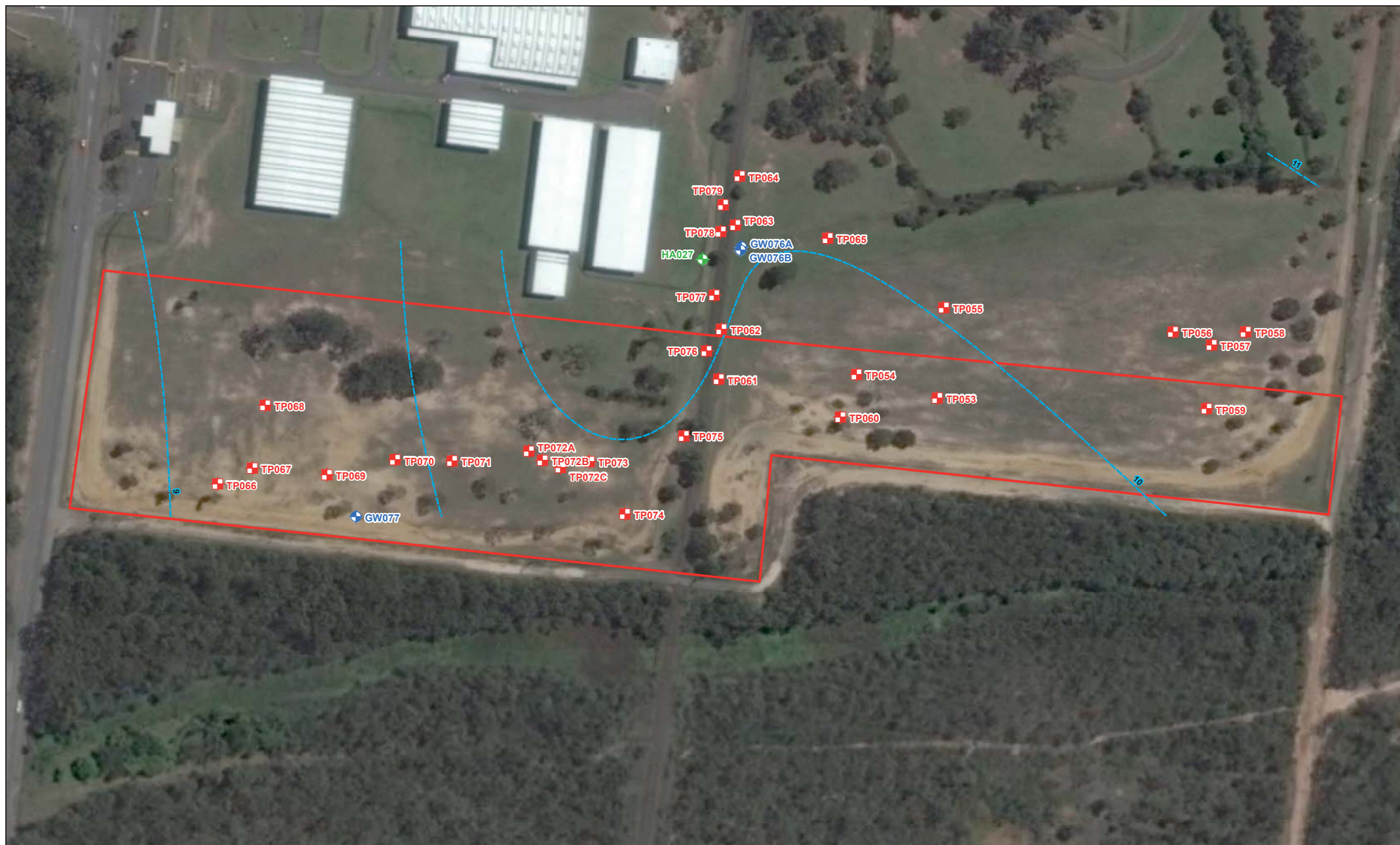
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DATE: 26/08/2011
DRAWN: AJW
CHECKED: GS

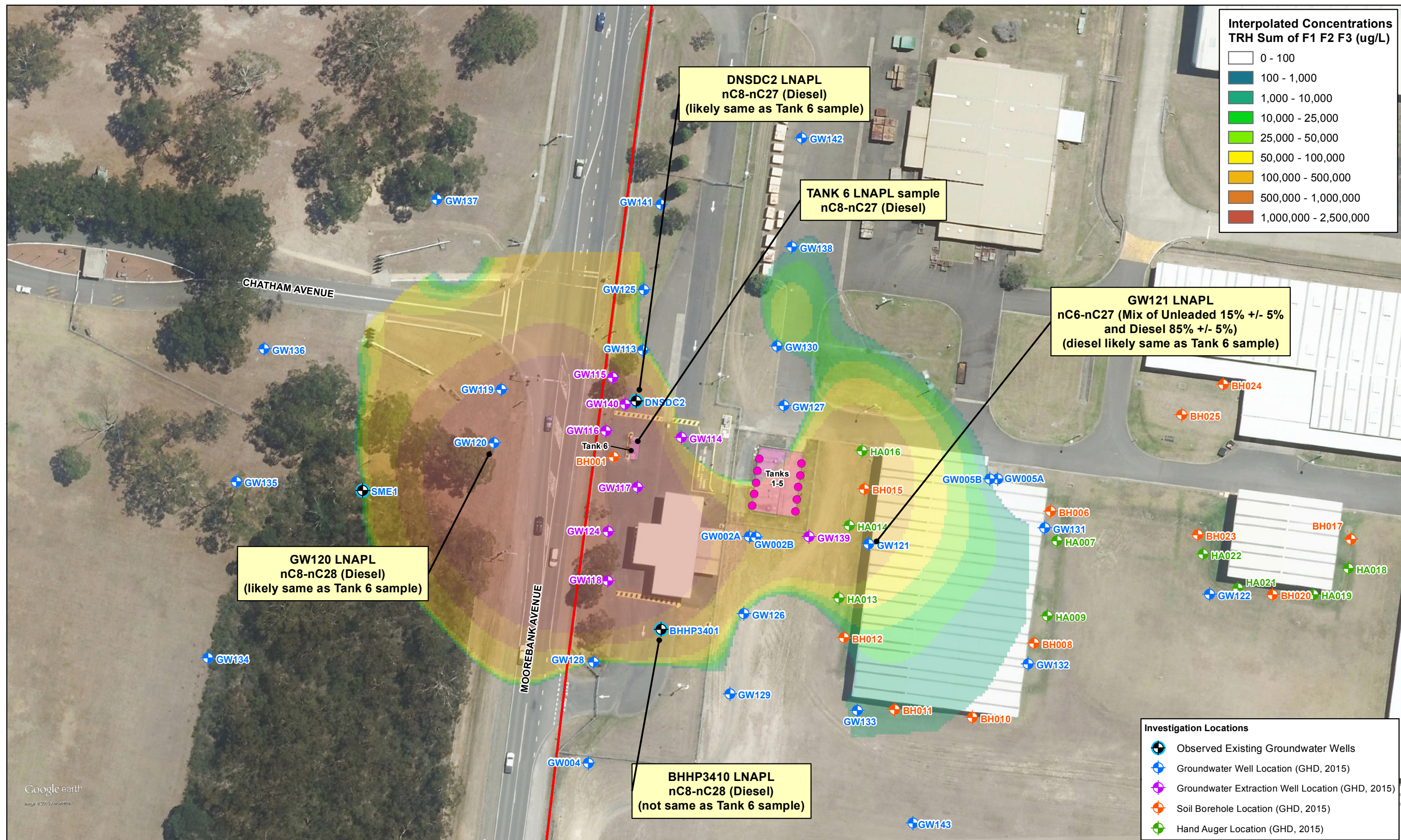
FIGURE 2



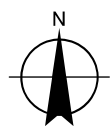


APPENDIX B5 – FIGURES AND TABLES FROM GHD (2015)





0 10 20 30 40
Metres



Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

G:\21\24133\GIS\MapDeliverables\21_24133_2022_DNSDC_RAP_Groundwater_Impact_Summary.mxd
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GHD and Google Earth, cannot accept liability of any kind (whether in contract, tort or otherwise) for any expenses, losses, damages and/or costs (including indirect or consequential damage) which are or may be incurred as a result of the product being inaccurate, incomplete or unsuitable in any way and for any reason.
Data Source: Imagery - Google Earth Pro (Imagery Date: 2014). Created by: mwbeber



Department of Defence
DNSDC, Moorebank NSW
Remedial Action Plan

Job Number 21-24133
Revision A
Date 13 Nov 2015

Groundwater Impacts Summary **Figure 5**

Level 15, 133 Castlereagh Street Sydney NSW 2000 T 61 2 9239 7100 F 61 2 9239 7199 E sydmil@ghd.com.au W www.ghd.com.au

Appendix [C]

**Table A: Soil summary analytical data
DNSDC Moorebank
Stage 2 Contaminated site assessment**

[illegible]

Table B: Groundwater summary analytical data
DNSDC Moorebank
Stage 2 Contaminated site assessment

			AFFF Compounds			Metals										TRH - NEPM 2013					BTEX					PAH																
			PFO8	6:2 Fluorotelomer Sulfonate (6:2 FS)	Perfluorooctanoate	Arenatic (Filtered)	Cadmium (Filtered)	Chromium (III+VI) (Filtered)	Copper (Filtered)	Lead (Filtered)	Manganese (Filtered)	Mercury (Filtered)	Nickel (Filtered)	Zinc (Filtered)	C8-C10 minus BTEX (F1)	>C10-C16 minus Naphthalene (F2)	>C16 - C34 Fraction (F3)	>C34 - C46 Fraction (F4)	>C10 - C46 (Sum of Total)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene Total	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(b)pyrene	Benzo(g,h,i)fluoranthene	Benzo(k)fluoranthene	Benzo(a,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total) - Lab calc	
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	
EOL			0.01	0.05	0.01	1	0.1	1	1	1	1	0.1	1	5	20	50	100	100	100	1	1	1	1	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Clay																																										
2-4m																				30,000	NL	NL		NL																	NL	
4-8m																				30,000	NL	NL		NL																	NL	
>8m																				35,000	NL	NL		NL																	NL	
NEPM 2013 Table 1C GILs, Fresh Waters						13 (a)	0.2		1.4	3.4	1900	0.06	11	8						950			350																	16		
US EPA Region 4 (2009)			0.2	5	0.4																																					
Location Code	Sample Date	Monitoring Zone	-	-	-	<1	0.4	<1	7	2	-		67	64	<20	<50	100	<100	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
GW077	14/04/2015	Burial Pits	-	-	-	<1	<0.1	<1	<1	<1	-	74	<1	13	<20	<50	<100	<100	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
GW076A	14/04/2015	Rail Spur	-	-	-	<1	<0.1	<1	<1	<1	-		<1	12	14	<20	<50	<100	<100	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
GW076B	14/04/2015	Rail Spur	<0.01	<0.05	<0.01	<1	<0.1	<1	<1	<1	-		<1	12	14	60	<50	<100	<100	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1

(a) Conservative application of freshwater guideline for As(V)
(b) Low reliability trigger value for freshwater (ANZECC 2000)
NL Not Limiting

Table B: Groundwater summary analytical data
DNSDC Moorebank
Stage 2 Contaminated site assessment

			Phenols				VOCs						MNA Parameters					
			2-methylphenol	3,4-methylphenol	Pentachlorophenol	Phenol	1,3,5-trimethylbenzene	1,2,4-trichlorobenzene	TCE	Vinyl chloride	1,2,4-trimethylbenzene	Isopropylbenzene	Hexachlorobenzene	Sulphate	Methane	Nitrate (as N)	Cyanide (Free)	Ferrous Iron
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	mg/L	µg/L	mg/L	
EOL			2	4	10	2	1	1	1	1	1	1	0.1	2	50	0.01	5	0.5
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour intr																		
2-4m																		
4-8m																		
>8m																		
NEPM 2013 Table 1C GILs, Fresh Waters					3.6	320				330 ^(a)	100 ^(b)							
US EPA Region 4 (2009)																		
Location Code	Sample Date	Monitoring Zone																
GW077	14/04/2015	Burial Pits	<2	<4	<10	<2	<1	<1	<1	<1	<1	<1	<0.1	-	-	-	-	-
GW076A	14/04/2015	Rail Spur	<2	<4	<10	<2	<1	<1	<1	<1	<1	<1	<0.1	29	2200	<0.1	<5	8.5
GW076B	14/04/2015	Rail Spur	<2	<4	<10	<2	<1	22	34	24	<1	<1	<0.1	-	-	-	<5	-

(a) Conservative application of freshwater guide
(b) Low reliability trigger value for freshwater
NL Not Limiting



APPENDIX B6 – FIGURES AND TABLES FROM JBS&G (2015)

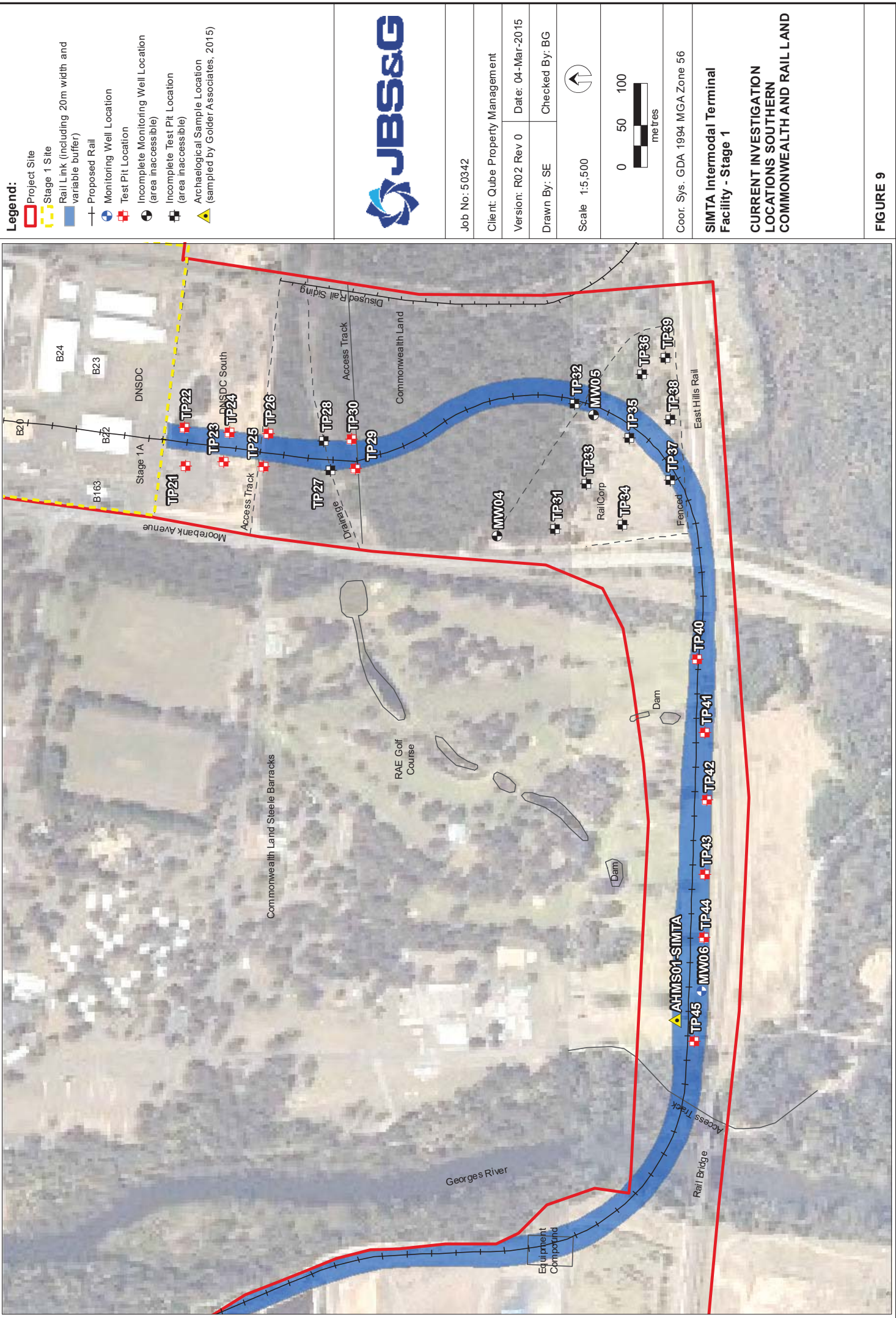


Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment




EOL	Chlorinated Alkanes												Chlorinated Alkenes					
	1,1,1,2-tetrachloroethane mg/kg	1,1,1-trichloroethane mg/kg	1,1,2,2-tetrachloroethane mg/kg	1,1,2-trichloroethane mg/kg	1,2-trichloroethane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloroethane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg
NEPC 2013 BIL, ELU Aged Sediment																		
NEPC 2013 ES1 Commercial and Industrial, Coarse Soil																		
NEPC 2013 Management Limits - Commercial and Industrial, Coarse																		
NEPC 2013 Soil HIL D																		
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 0 to <1m																		
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 1 to <2m																		

Location Area	Sample	Location	Depth Range	1,1,1,2-tetrachloroethane mg/kg	1,1,1-trichloroethane mg/kg	1,1,2,2-tetrachloroethane mg/kg	1,1,2-trichloroethane mg/kg	1,2-trichloroethane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloroethane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg	1,2-dichloropropane mg/kg
Stage 1 DNSDC	MW01 0-0.1	MW01	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	QC04	MW01	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW02 0-0.1	MW02	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW02 1.6-1.8	MW02	1.6-1.8	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Stage 1 DNSDC	MW03 0.1-0.2	MW03	0.1-0.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW03 0.4-1.0	MW03	0.4-1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW03 0.4-0.6	MW03	0.4-0.6	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Stage 1 DNSDC	MW04 0-0.1	MW04	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW04 0.2-0.3	MW04	0.2-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW04 0-0.1	MW04	0-0.1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Stage 1 DNSDC	MW04 0.5-0.7	MW04	0.5-0.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW04 0-0.1	MW04	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW05 0-0.1	MW05	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW05 1.0-1.1	MW05	1.1-1	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Stage 1 DNSDC	MW06 0-0.1	MW06	0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW06 0.3-0.4	MW06	0.3-0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW07 0-0.15	MW07	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW08 0-0.15	MW08	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW09 0-0.15	MW09	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW10 0-0.15	MW10	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW11 0-0.15	MW11	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW12 0-0.15	MW12	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW13 0-0.15	MW13	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW14 0-0.15	MW14	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW15 0-0.15	MW15	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW16 0-0.15	MW16	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW17 0-0.15	MW17	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW18 0-0.15	MW18	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW19 0-0.15	MW19	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	MW20 0-0.15	MW20	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Stage 1 DNSDC	QC03	MW20	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP21 0.2-0.3	TP21	0.2-0.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP21 0-0.15	TP21	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP22 0.5-0.6	TP22	0.5-0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP22 0-0.15	TP22	0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP23 0.5-0.6	TP23	0.5-0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment





Chlorinated Alkanes												Chlorinated Alkenes																	
mg/kg	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,2-trichloroethane	1,2,3-trichloropropane	1,2-dichloropropane	1,2-dichloropropane	1,3-dichloropropane	bromodichloromethane	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	dibromochloromethane	Dichlorodifluoromethane	Dichloromethane	Hexachloroethane	Trichlorofluoromethane	1,1,2,2-tetrachloroethylene	1,1-Dichloroethene	1,1-Dichloroethene	4-chlorotoluene	cis-1,2-dichloroethene	cis-1,3-dichloropropene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichloroethene	Vinyl Chloride	
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.50	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	
EQCL																													
NEPC 2013 EIL, EILs Aged Sediment																													
NEPC 2013 ESL Commercial and Industrial, Coarse Soil																													
NEPC 2013 Management Limits - Commercial and Industrial, Coarse																													
NEPC 2013 Soil HIL D																													
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 0 to <1m																													
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 1 to <2m																													
Location Area	Sample	Location	Depth Range	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP23 0.0-0.15	TP23	0.0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP24 0.3-0.4	TP24	0.3-0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
DNISDC South	TP24 0.0-0.15	TP24	0.0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Commonwealth	TP25 0.0-0.1	TP25	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Commonwealth	TP25 0.3-0.5	TP25	0.3-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Commonwealth	TP26 0.0-0.1	TP26	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Commonwealth	TP26 0.3-0.4	TP26	0.3-0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Commonwealth	TP29 0.0-0.15	TP29	0.0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Commonwealth	TP30 0.5-0.6	TP30	0.5-0.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Southern Commonwealth	TP30 0.0-0.15	TP30	0.0-0.15	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	TP40 0.0-0.1	TP40	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	TP41 0.2-0.4	TP41	0.2-0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	TP42 0.0-0.1	TP42	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	QC02	TP42	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	TP43 0.4-0.5	TP43	0.4-0.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	TP44 0.0-0.1	TP44	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	TP45 1.1-1.3	TP45	1.1-1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	MMW06 1.2-1.4	MMW06	1.2-1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
North of East Hills Rail Corridor (Golf Course)	AHM501 - SIMTA 0.3-0.4	Goldier TP05	0.3-0.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenfield	TP46 0.0-0.1	TP46	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenfield	QC01	TP46	0.0-0.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenfield	TP47 0.8-1.0	TP47	0.8-1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenfield	TP48 0.6-0.8	TP48	0.6-0.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenfield	TP49 2.8-3.0	TP49	2.8-3.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenfield	TP50 1.0-1.2	TP50	1.1-1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Glenfield	TP51 1.8-2.0	TP51	1.8-2.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

* Value for Chromium VI used



	Monocyclic Aromatic Hydrocarbons						Miscellaneous Hydrocarbons					
	1,4-trimethyl benzene mg/kg	1,5-trimethyl benzene mg/kg	Bromobenzene mg/kg	Isopropylbenzene mg/kg	styrene mg/kg	1,2-dibromethane mg/kg	2-Butanone (MEK) mg/kg	4-Methyl-2-pentanone (MIBK) mg/kg	Bromoforn mg/kg	Bromomethane mg/kg	Dibromomethane mg/kg	Iodomethane mg/kg
EOL	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
NEPC 2013 EIL, EILs Aged Sediment												
NEPC 2013 EIL Commercial and Industrial, Coarse Soil												
NEPC 2013 Management Limits - Commercial and Industrial, Coarse												
NEPC 2013 Soil HIL D												
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 0 to <1m												
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 1 to <2m												

Location Area	Sample	Location	Depth Range
DNISDC South	TP23 0.0-0.15	TP23	0.0-0.15
DNISDC South	TP24 0.3-0.4	TP24	0.3-0.4
DNISDC South	TP24 0.0-0.15	TP24	0.0-0.15
DNISDC South	TP25 0.0-0.1	TP25	0.0-0.1
Southern Commonwealth	TP25 0.0-0.1	TP25	0.0-0.1
Southern Commonwealth	TP26 0.3-0.5	TP26	0.3-0.5
Southern Commonwealth	TP26 0.0-0.1	TP26	0.0-0.1
Southern Commonwealth	TP29 0.3-0.4	TP29	0.3-0.4
Southern Commonwealth	TP29 0.0-0.15	TP29	0.0-0.15
Southern Commonwealth	TP29 0.5-0.6	TP29	0.5-0.6
Southern Commonwealth	TP30 0.0-0.15	TP30	0.0-0.15
North of East Hills Rail Corridor (Golf Course)	TP40 0.0-0.1	TP40	0.0-0.1
North of East Hills Rail Corridor (Golf Course)	TP41 0.2-0.4	TP41	0.2-0.4
North of East Hills Rail Corridor (Golf Course)	TP42 0.0-0.1	TP42	0.0-0.1
North of East Hills Rail Corridor (Golf Course)	TP42	TP42	0.0-0.1
North of East Hills Rail Corridor (Golf Course)	QC02	QC02	0.0-0.1
North of East Hills Rail Corridor (Golf Course)	TP43 0.4-0.5	TP43	0.4-0.5
North of East Hills Rail Corridor (Golf Course)	TP44 0.0-0.1	TP44	0.0-0.1
North of East Hills Rail Corridor (Golf Course)	TP45 1.1-1.3	TP45	1.1-1.3
North of East Hills Rail Corridor (Golf Course)	MW06 1.2-1.4	MW06	1.2-1.4
North of East Hills Rail Corridor (Golf Course)	AHM501 - SIMTA 0.3-0.4	Golden TPO5	0.3-0.4
Glenfield	TP46 0.0-0.1	TP46	0.0-0.1
Glenfield	QC01	QC01	0.0-0.1
Glenfield	TP47 0.8-1.0	TP47	0.8-1.0
Glenfield	TP48 0.6-0.8	TP48	0.6-0.8
Glenfield	TP49 2.8-3.0	TP49	2.8-3.0
Glenfield	TP50 1.0-1.2	TP50	1.1-1.2
Glenfield	TP51 1.8-2.0	TP51	1.8-2.0

* Value for Chromium VI used

Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment



Organochlorine Pesticides																			
Aldrin		alpha-BHC		beta-BHC		delta-BHC		Chlordane		DD		DDE		DDT		DDT+DDE+DDD (Sum of Total)		Dieldrin	
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
0.05	0.05	0.05	0.05	0.05	0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Endosulfan Sulphate		Endosulfan alpha		Endosulfan beta		Endrin		Endrin aldehyde		Endrin ketone		Heptachlor		Heptachlor Epoxide		Lindane		Methoxychlor	
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
100	100	2000	3600	50	50	100	50	50	50	50	50	50	50	50	50	2500	2500	1	160
NEPC 2013 BIL Elia Agred Sediment																			
NEPC 2013 ESL Commercial and Industrial, Coarse Soil																			
NEPC 2013 Management Limits - Commercial and Industrial Coarse																			
NEPC 2013 Soil HIL D																			
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 0 to <1m																			
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 1 to <2m																			

Location Area	Sample	Location	Depth Range
Stage 1 DNSDC	MW01 0-0.1	MW01	0-0.1
Stage 1 DNSDC	QC04		
Stage 1 DNSDC	MW02 0-0.1	MW02	0-0.1
Stage 1 DNSDC	MW02 1.6-1.8	MW02	1.6-1.8
Stage 1 DNSDC	MW03 0.1-0.2	MW03	0.1-0.2
Stage 1 DNSDC	MW03 0.4-1.0	MW03	0.4-1.0
Stage 1 DNSDC	MW04 0.4-0.6	MW04	0.4-0.6
Stage 1 DNSDC	MW04 0-0.1	MW04	0-0.1
Stage 1 DNSDC	MW02 0.2-0.3	MW02	0.2-0.3
Stage 1 DNSDC	MW07 0-0.1	MW07	0-0.1
Stage 1 DNSDC	MW08 0-0.1	MW08	0-0.1
Stage 1 DNSDC	MW04 0.5-0.7	MW04	0.5-0.7
Stage 1 DNSDC	MW04 0-0.1	MW04	0-0.1
Stage 1 DNSDC	MW05 0-0.1	MW05	0-0.1
Stage 1 DNSDC	MW05 1.0-1.1	MW05	1-1.1
Stage 1 DNSDC	TP01 0-0.1	TP01	0-0.1
Stage 1 DNSDC	TP02 0.3-0.4	TP02	0.3-0.4
Stage 1 DNSDC	TP02 0-0.15	TP02	0-0.15
Stage 1 DNSDC	TP03 0.3-0.4	TP03	0.3-0.4
Stage 1 DNSDC	TP03 0-0.15 (LIGHT BROWN)	TP03	0-0.15
Stage 1 DNSDC	TP04 0-0.1	TP04	0-0.1
Stage 1 DNSDC	TP05 0.3-0.4	TP05	0.3-0.4
Stage 1 DNSDC	TP05 0-0.15	TP05	0-0.15
Stage 1 DNSDC	TP06 0-0.15	TP06	0-0.15
Stage 1 DNSDC	TP06 1.0-1.1	TP06	1-1.1
Stage 1 DNSDC	TP07 0.2-0.3	TP07	0.2-0.3
Stage 1 DNSDC	TP07 0-0.1	TP07	0-0.1
Stage 1 DNSDC	TP08 0.3-0.4	TP08	0.3-0.4
Stage 1 DNSDC	TP09 0.4-0.5	TP09	0.4-0.5
Stage 1 DNSDC	TP09 0-0.15	TP09	0-0.15
Stage 1 DNSDC	TP10 0.3-1.1	TP10	0.3-1.1
Stage 1 DNSDC	TP11 0-0.4	TP11	0-0.4
Stage 1 DNSDC	TP12 0.4-0.5	TP12	0.4-0.5
Stage 1 DNSDC	TP12 0-0.15	TP12	0-0.15
Stage 1 DNSDC	TP13 0.3-0.4	TP13	0.3-0.4
Stage 1 DNSDC	TP13 0-0.15	TP13	0-0.15
Stage 1 DNSDC	TP13 0.4-0.5	TP13	0.4-0.5
Stage 1 DNSDC	TP14 0-0.15	TP14	0-0.15
Stage 1 DNSDC	TP14 0.6-0.7	TP14	0.6-0.7
Stage 1 DNSDC	TP14 0-0.15	TP14	0-0.15
Stage 1 DNSDC	TP15 0-0.1	TP15	0-0.1
Stage 1 DNSDC	TP16 0.2-0.3	TP16	0.2-0.3
Stage 1 DNSDC	TP16 0-0.15	TP16	0-0.15
Stage 1 DNSDC	TP17 0.2-0.3	TP17	0.2-0.3
Stage 1 DNSDC	TP17 0-0.15	TP17	0-0.15
Stage 1 DNSDC	TP18 0.2-0.3	TP18	0.2-0.3
Stage 1 DNSDC	TP18 0-0.15	TP18	0-0.15
Stage 1 DNSDC	TP19 0.4-0.5	TP19	0.4-0.5
Stage 1 DNSDC	TP19 0-0.15	TP19	0-0.15
Stage 1 DNSDC	TP20 0-0.15	TP20	0-0.15
Stage 1 DNSDC	QC03		
DNISDC South	TP21 0.2-0.3	TP21	0.2-0.3
DNISDC South	TP21 0-0.15	TP21	0-0.15
DNISDC South	TP22 0.5-0.6	TP22	0.5-0.6
DNISDC South	TP22 0-0.15	TP22	0-0.15
DNISDC South	TP23 0.5-0.6	TP23	0.5-0.6

Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment




Organochlorine Pesticides																			
ECL	Aldrin		alpha-BHC		beta-BHC		delta-BHC		Chlordane		DD		DDE		DDT		DDT+DDE+DDD (Sum of Total)		Toxaphene
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NEPC 2013 EIL, EILs Aged Sediment	0.05		0.05	0.05	0.05	0.10	0.05	0.10	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	1
NEPC 2013 EIL Commercial and Industrial, Course Soil																			
NEPC 2013 EIL Commercial and Industrial, Course Soil																			
NEPC 2013 Soil HIL D	45							530									3600		2500
NEPC 2013 Soil HIL D																			
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 0 to <1m																			
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 1 to <2m																			

Location Area	Sample	Location	Depth Range	Aldrin	alpha-BHC	beta-BHC	delta-BHC	Chlordane	DD	DDE	DDT	DDT+DDE+DDD (Sum of Total)	Endosulfan alpha	Endosulfan beta	Endosulfan Sulphate	Endrin	Endrin aldehyde	Endrin ketone	Hepachlor	Hepachlor Epoxide	Lindane	Methoxychlor	Toxaphene
DNISDC South	TP23 0.0-1.5	TP23	0.0-1.5	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
DNISDC South	TP24 0.3-0.4	TP24	0.3-0.4	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
DNISDC South	TP24 0.0-0.15	TP24	0.0-0.15	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Southern Commonweath	TP25 0.0-1	TP25	0.0-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Southern Commonweath	TP26 0.3-0.5	TP26	0.3-0.5	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Southern Commonweath	TP26 0.0-0.15	TP26	0.0-0.15	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Southern Commonweath	TP28 0.3-1.4	TP28	0.3-1.4	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Southern Commonweath	TP29 0.0-1.5	TP29	0.0-1.5	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Southern Commonweath	TP29 0.5-0.6	TP29	0.5-0.6	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Southern Commonweath	TP30 0.0-1.5	TP30	0.0-1.5	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	TP40 0.0-1	TP40	0.0-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	TP41 0.2-0.4	TP41	0.2-0.4	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	TP42 0.0-1	TP42	0.0-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	QC02	TP42	0.0-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	TP43 0.4-0.5	TP43	0.4-0.5	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	TP44 0.0-1	TP44	0.0-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	TP45 1.1-1.3	TP45	1.1-1.3	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	MW06 1.2-1.4	MW06	1.2-1.4	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
North of East Hills Rail Corridor (Golf Course)	AHM501 - SIMTA 0.3-0.4	Golden TP05	0.3-0.4	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Golden TP05	TP46 0.0-1	TP46	0.0-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Golden TP05	QC01	TP46	0.0-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Golden TP05	TP47 0.8-1.0	TP47	0.8-1	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Golden TP05	TP48 0.6-0.8	TP48	0.6-0.8	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Golden TP05	TP49 2.8-3.0	TP49	2.8-3	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Golden TP05	TP50 1.0-1.2	TP50	1-1.2	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1
Golden TP05	TP51 1.8-2.0	TP51	1.8-2	<0.05	0.05	<0.05	<0.05	<0.1	<0.05	<0.05	<0.05	0.075	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<1

* Value for Chromium VI used

Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment





Chlorinated Benzenes										Phthalates						Ethers			Anilines			Amines							
1,3,4-tetrachlorobenzene	1,3,5-tetrachlorobenzene	1,2,3-trichlorobenzene	1,2,4-trichlorobenzene	1,2,4,5-tetrachlorobenzene	1,2,4-trichlorobenzene	1,2-Dichlorobenzene	1,3,5-trichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Hexachlorobenzene	Pentachlorobenzene	D(2-ethylhexy) phthalate	Dibutyl phthalate	Diethyl phthalate	Dimethyl phthalate	D(4-n-ocyl) phthalate	Butyl benzyl phthalate	Bis(2-chloroisopropyl) ether	4-Chlorophenyl phenyl ether	4-Bromophenyl phenyl ether	2-Nitroaniline	Aniline	1-Naphthylamine	2-Naphthylamine	N-Nitrosodibutylamine	N-Nitrosodipropylamine	N-Nitrosopiperidine		
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	
0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.05	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50		
ECL																													
NEPC 2013 EIL, EILs Aged Sediment																													
NEPC 2013 ESL Commercial and Industrial, Course Soil																													
NEPC 2013 Management Limits - Commercial and Industrial, Course																													
NEPC 2013 Soil HIL D																													
NEPC 2013 Soil HSL D for Vapour Intrusion- Sand 0 to <1m																													
NEPC 2013 Soil HSL D for Vapour Intrusion- Sand 1 to <2m																													
80																													

Location Area	Sample	Location	Depth Range
DNISDC South	TP23 0.0-1.5	TP23	0.0-1.5
DNISDC South	TP24 0.3-0.4	TP24	0.3-0.4
DNISDC South	TP24 0.0-1.5	TP24	0.0-1.5
DNISDC South	TP25 0.0-1.5	TP25	0.0-1.5
Southern Commonwealth	TP25 0.0-1.5	TP25	0.0-1.5
Southern Commonwealth	TP26 0.3-0.5	TP26	0.3-0.5
Southern Commonwealth	TP26 0.0-1.5	TP26	0.0-1.5
Southern Commonwealth	TP29 0.3-1.4	TP29	0.3-1.4
Southern Commonwealth	TP29 0.0-1.5	TP29	0.0-1.5
Southern Commonwealth	TP30 0.5-1.6	TP30	0.5-1.6
Southern Commonwealth	TP30 0.0-1.5	TP30	0.0-1.5
North of East Hills Rail Corridor (Golf Course)	TP40 0.0-1.1	TP40	0.0-1.1
North of East Hills Rail Corridor (Golf Course)	TP41 0.2-0.4	TP41	0.2-0.4
North of East Hills Rail Corridor (Golf Course)	TP42 0.0-1	TP42	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP42 0.0-1	TP42	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP43 0.4-0.5	TP43	0.4-0.5
North of East Hills Rail Corridor (Golf Course)	TP44 0.0-1	TP44	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP45 1.1-1.3	TP45	1.1-1.3
North of East Hills Rail Corridor (Golf Course)	TP45 1.2-1.4	TP45	1.2-1.4
North of East Hills Rail Corridor (Golf Course)	TP46 0.0-1	TP46	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP46 0.0-1	TP46	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP47 0.8-1.0	TP47	0.8-1
North of East Hills Rail Corridor (Golf Course)	TP48 0.6-0.8	TP48	0.6-0.8
North of East Hills Rail Corridor (Golf Course)	TP49 2.8-3.0	TP49	2.8-3
North of East Hills Rail Corridor (Golf Course)	TP50 1.0-1.2	TP50	1.1-2
North of East Hills Rail Corridor (Golf Course)	TP51 1.8-2.0	TP51	1.8-2

* Value for Chromium VI used

Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment




	Herbicides & Fungicides												Phenols														
	2,4-D	2,4-DB	Picamba	Dichloroprop	Dinitro-o-cresol	Dinoseb	Penoprop	MCPA	MCPB	Meocrop	Propyzamide	Trifluralin	2,4,5-trichlorophenol	2,4,6-trichlorophenol	2,4-dichlorophenol	2,4-dimethylphenol	2,4,4-dinitrophenol	2,6-dichlorophenol	2-chlorophenol	2-Methylphenol	2-nitrophenol	o- & p-Methylphenol	4-Chloro-3-Methylphenol	m-nitrophenol	2-nitrophenol	2,6-nitrophenol	
FCI	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	1	1	0.50	0.50	0.50	0.50	0.20	1	0.40	1	1	5	1	0.50
NEPC 2013 EIL, EILs Agri Sediment																											
NEPC 2013 EIL Commercial and Industrial, Coarse Soil																											
NEPC 2013 EIL Commercial and Industrial, Fine Soil																											
NEPC 2013 Soil HLL D								5000	5000																		
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 0 to <1m	5000	9000																									
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 1 to <2m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 2 to <3m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 3 to <4m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 4 to <5m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 5 to <6m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 6 to <7m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 7 to <8m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 8 to <9m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 9 to <10m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 10 to <11m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 11 to <12m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 12 to <13m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 13 to <14m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 14 to <15m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 15 to <16m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 16 to <17m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 17 to <18m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 18 to <19m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 19 to <20m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 20 to <21m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 21 to <22m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 22 to <23m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 23 to <24m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 24 to <25m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 25 to <26m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 26 to <27m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 27 to <28m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 28 to <29m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 29 to <30m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 30 to <31m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 31 to <32m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 32 to <33m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 33 to <34m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 34 to <35m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 35 to <36m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 36 to <37m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 37 to <38m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 38 to <39m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 39 to <40m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 40 to <41m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 41 to <42m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 42 to <43m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 43 to <44m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 44 to <45m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 45 to <46m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 46 to <47m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 47 to <48m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 48 to <49m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 49 to <50m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 50 to <51m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 51 to <52m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 52 to <53m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 53 to <54m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 54 to <55m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 55 to <56m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 56 to <57m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 57 to <58m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 58 to <59m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 59 to <60m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 60 to <61m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 61 to <62m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 62 to <63m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 63 to <64m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 64 to <65m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 65 to <66m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 66 to <67m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 67 to <68m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 68 to <69m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 69 to <70m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 70 to <71m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 71 to <72m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 72 to <73m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 73 to <74m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 74 to <75m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 75 to <76m																											
NEPC 2013 Soil HSL D for Vapour Intrusion - Sand 76 to <77m																									</		

[illegible]

Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorbanks Assessment





ECOL	Metals & Metalloids								Asbestos		Polychlorinated Biphenyls								Explosives		Nitrobenzenes					Nitrotoluenes					
	Arsenic (Total)	Cadmium	Chromium (Total)	Copper	Lead	Mercury (Inorganic)	Nickel	Zinc	Asbestos - WJ guidelines	Asbestos - ID	Asbestos - Type	Archlor 1016	Archlor 1221	Archlor 1232	Archlor 1242	Archlor 1248	Archlor 1254	Archlor 1260	PCBs (Total)	PCBs (Sum of Total)	2,4- & 2,6-Dinitrotoluene	4-Nitrotoluene (4-NT)	Hexahydro-1,5-dinitro-1,3,5-triazine (RDX)	1,3,5-trinitrobenzene	1,3-dinitrobenzene	Nitrobenzene	pentachloronitrobenzene	2,4,6-trinitrotoluene	2,4-dinitrotoluene	3-nitrotoluene	
2	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	%W/W	ID	-	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
160			323	113	1963		5	5	0.001	-	-	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	0.10	1.00	0.50	0.50	1	0.50	0.50	0.50	1	0.50	0.50	0.50
							60	132																							

Location Area	Sample	Location	Depth Range	7.3	<0.4	19	6	20	<0.1	5.1	39	<0.001	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
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Table 1: Soil Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment



Semi-volatile Organic Compounds															Other VOCs	
mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Hechchlorobutadiene	mg/kg	Hechchlorocyclopentadiene	mg/kg	Hechchloroethane	mg/kg	Benzyl chloride	mg/kg	Bis(2-chloroethoxy)methane	mg/kg	Dibenz(a,j)acridine	mg/kg	Dibenzofuran	mg/kg	Dimethylaminobenzene	mg/kg	2-Picoline
mg/kg	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.05
NEPC 2013 EIL, EILs Agred Sediment																
NEPC 2013 EIL Commercial and Industrial, Coarse Soil																
NEPC 2013 Management Limits - Commercial and Industrial, Coarse																
NEPC 2013 Soil RHL D																
NEPC 2013 Soil RHL D for Vapour Intrusion - Sand 0 to <1m																
NEPC 2013 Soil RHL D for Vapour Intrusion - Sand 1 to <2m																
80																

Location Area	Sample	Location	Depth Range
Stage 1 DNSDC	MW01 0.0-1	MW01	0.0-1
Stage 1 DNSDC	QC04		
Stage 1 DNSDC	MW02 0.0-1	MW02	0.0-1
Stage 1 DNSDC	MW02 1.6-1.8	MW02	1.6-1.8
Stage 1 DNSDC	MW03 0.1-0.2	MW03	0.1-0.2
Stage 1 DNSDC	MW03 0.2-1.0	MW03	0.2-1.0
Stage 1 DNSDC	MW03 0.4-0.6	MW03	0.4-0.6
Stage 1 DNSDC	MW04 0.0-1	MW04	0.0-1
Stage 1 DNSDC	MW04 0.2-0.3	MW04	0.2-0.3
Stage 1 DNSDC	MW04 0.0-1	MW04	0.0-1
Stage 1 DNSDC	MW04 0.5-0.7	MW04	0.5-0.7
Stage 1 DNSDC	MW04 0.0-1	MW04	0.0-1
Stage 1 DNSDC	MW05 0.0-1	MW05	0.0-1
Stage 1 DNSDC	MW05 1.0-1.1	MW05	1.1-1
Stage 1 DNSDC	TP01 0.0-1	TP01	0.0-1
Stage 1 DNSDC	TP02 0.3-0.4	TP02	0.3-0.4
Stage 1 DNSDC	TP02 0.0-15	TP02	0.0-15
Stage 1 DNSDC	TP03 0.3-0.4	TP03	0.3-0.4
Stage 1 DNSDC	TP03 0.0-15 (LIGHT BROWN)	TP03	0.0-15
Stage 1 DNSDC	TP04 0.0-1	TP04	0.0-1
Stage 1 DNSDC	TP05 0.3-0.4	TP05	0.3-0.4
Stage 1 DNSDC	TP05 0.0-15	TP05	0.0-15
Stage 1 DNSDC	TP06 0.0-15	TP06	0.0-15
Stage 1 DNSDC	TP06 1.1-1	TP06	1.1-1
Stage 1 DNSDC	TP07 0.2-0.3	TP07	0.2-0.3
Stage 1 DNSDC	TP07 0.0-1	TP07	0.0-1
Stage 1 DNSDC	TP08 0.3-0.4	TP08	0.3-0.4
Stage 1 DNSDC	TP09 0.4-0.5	TP09	0.4-0.5
Stage 1 DNSDC	TP09 0.0-15	TP09	0.0-15
Stage 1 DNSDC	TP10 0.3-0.4	TP10	0.3-0.4
Stage 1 DNSDC	TP11 0.0-15	TP11	0.0-15
Stage 1 DNSDC	TP12 0.3-0.4	TP12	0.3-0.4
Stage 1 DNSDC	TP13 0.0-15	TP13	0.0-15
Stage 1 DNSDC	TP13 0.3-0.4	TP13	0.3-0.4
Stage 1 DNSDC	TP14 0.6-0.7	TP14	0.6-0.7
Stage 1 DNSDC	TP14 0.0-15	TP14	0.0-15
Stage 1 DNSDC	TP15 0.0-1	TP15	0.0-1
Stage 1 DNSDC	TP16 0.2-0.3	TP16	0.2-0.3
Stage 1 DNSDC	TP17 0.2-0.3	TP17	0.2-0.3
Stage 1 DNSDC	TP17 0.0-15	TP17	0.0-15
Stage 1 DNSDC	TP18 0.2-0.3	TP18	0.2-0.3
Stage 1 DNSDC	TP18 0.0-15	TP18	0.0-15
Stage 1 DNSDC	TP19 0.4-0.5	TP19	0.4-0.5
Stage 1 DNSDC	TP20 0.0-15	TP20	0.0-15
Stage 1 DNSDC	QC03		
DNISDC South	TP21 0.2-0.3	TP21	0.2-0.3
DNISDC South	TP21 0.0-15	TP21	0.0-15
DNISDC South	TP22 0.5-0.6	TP22	0.5-0.6
DNISDC South	TP22 0.0-15	TP22	0.0-15
DNISDC South	TP23 0.5-0.6	TP23	0.5-0.6



EOL	Semi-volatile Organic Compounds													Other VOCs	
	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
NEPC 2013 EIL, EILs Aged Sediment	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.05	0.05
NEPC 2013 EIL Commercial and Industrial, Course Soil															
NEPC 2013 EIL Commercial and Industrial, Commercial and Industrial, Course															
NEPC 2013 Soil HIL D	80														
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 0 to <1m															
NEPC 2013 Soil HIL D for Vapour Intrusion - Sand 1 to <2m															

Location Area	Sample	Location	Depth Range
DNSSC South	TP23 0.0-1.5	TP23	0.0-1.5
DNSSC South	TP24 0.3-0.4	TP24	0.3-0.4
DNSSC South	TP24 0.0-1.5	TP24	0.0-1.5
Southern Commonwealth	TP25 0.0-1	TP25	0.0-1
Southern Commonwealth	TP26 0.3-0.5	TP26	0.3-0.5
Southern Commonwealth	TP28 0.0-1.5	TP28	0.0-1.5
Southern Commonwealth	TP29 0.3-1.4	TP29	0.3-1.4
Southern Commonwealth	TP30 0.5-1.6	TP30	0.5-1.6
Southern Commonwealth	TP30 0.0-1.5	TP30	0.0-1.5
North of East Hills Rail Corridor (Golf Course)	TP40 0.0-1	TP40	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP41 0.2-0.4	TP41	0.2-0.4
North of East Hills Rail Corridor (Golf Course)	TP42 0.0-1	TP42	0.0-1
North of East Hills Rail Corridor (Golf Course)	QC02	TP42	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP43 0.4-0.5	TP43	0.4-0.5
North of East Hills Rail Corridor (Golf Course)	TP44 0.0-1	TP44	0.0-1
North of East Hills Rail Corridor (Golf Course)	TP45 1.1-1.3	TP45	1.1-1.3
North of East Hills Rail Corridor (Golf Course)	MW06 1.2-1.4	MW06	1.2-1.4
North of East Hills Rail Corridor (Golf Course)	AHM501 - SIMTA 0.3-0.4	Golden TPO5	0.3-0.4
Glenfield	TP46 0.0-1	TP46	0.0-1
Glenfield	QC01	TP46	0.0-1
Glenfield	TP47 0.8-1.0	TP47	0.8-1
Glenfield	TP48 0.6-0.8	TP48	0.6-0.8
Glenfield	TP49 2.8-3.0	TP49	2.8-3
Glenfield	TP50 1.0-1.2	TP50	1-1.2
Glenfield	TP51 1.8-2.0	TP51	1.8-2

* Value for Chromium VI used



Well ID	Date Gauged and Purged	Top of Casing Elevation	Depth to water (mbTOC)	Depth to LNAPL (mbTOC)	Groundwater Elevation (AHD)	Bottom of Screen (mbTOC)	Volume Removed (L)	Physical Parameters					Comments
								Dissolved Oxygen (mg/L)	Electrical Conductivity (uS/cm)	pH	Redox (mV)	Temperature (°C)	
MW01*	12/23/2014	-	7.935	-	-	10.500	12	-	-	-	-	-	Purged Dry
MW02*	12/23/2014	-	10.000	-	-	10.101	0	-	-	-	-	-	Dry
MW03*	12/23/2014	-	-	9.123	-	9.123	5	-	-	-	-	-	Purged dry, strong hydrocarbon odour, yellow colour
MW06*	12/23/2014	-	10.000	-	-	9.000	0	-	-	-	-	-	Dry
MW01 ¹	1/12/2015	-	8.538	-	-	10.500	2.4	0.22	7.29 mS/cm	4.80	124.0	22.5	No odour, grey, turbid, no sheen
MW02 ¹	1/12/2015	-	8.640	-	-	10.101	2	1.23	18.81 mS/cm	5.09	97.0	22.8	No odour, slight grey, very low turbidity, no sheen
MW03 ¹	1/12/2015	-	-	6.163	-	9.123	2.4	-	-	-	-	-	Strong hydrocarbon odour (diesel)
BHHP34011 ¹	1/12/2015	-	-	6.335	-	10.540	1.5	-	-	-	-	-	Hydrocarbon odour (diesel)
MW06 ¹	1/12/2015	-	6.602	-	-	9.000	2.1	1.81	671	5.67	25.0	20.4	No odour, no colour, non-turbid, no sheen
MW01 ²	1/22/2015	-	8.563	-	-	-	-	-	-	-	-	-	-
MW02 ²	1/22/2015	-	8.653	-	-	-	-	-	-	-	-	-	-
MW03 ²	1/22/2015	-	9.020	6.155	-	-	-	-	-	-	-	-	-
BHHP34011 ²	1/22/2015	-	7.111	6.427	-	-	-	-	-	-	-	-	-
MW06 ²	1/22/2015	-	7.354	-	-	-	-	-	-	-	-	-	-

Comment

bTOC = Below top of casing

* Initial Purge post-installation 23/12/2014

1 Water levels and Field parameters during Groundwater monitoring Event on 12/01/2015

2 Groundwater levels during Groundwater Gauging event on 22/01/2015

Table 2: Groundwater Analytical Results
 Project Number: 50342
 Project Name: SIMTA Stage 1 Moorebank Assessment






Product ID	BTEX						TPHs (NEPC 1999)					TRHs (NEPC 2013)					
	Benzene µg/L	Ethylbenzene µg/L	Toluene µg/L	Xylene (m & p) µg/L	Xylene (o) µg/L	Xylene (Total) µg/L	C6-C9 Fraction µg/L	C10-C14 Fraction µg/L	C15-C28 Fraction µg/L	C29-C36 Fraction µg/L	C10-C36 Fraction (Total) µg/L	>C10-C16 Fraction µg/L	>C16-C34 Fraction µg/L	>C34-C40 Fraction µg/L	>C10 - C16 less Naphthalene (F2) µg/L	C6-C10 Fraction µg/L	C6 - C10 less BTEX (F1) µg/L
EQL	1	1	1	2	1	3	20	50	100	100	100	50	100	100	50	20	20
NEPC 2013 Groundwater Investigation Levels - Fresh Waters	950			200	350												
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 4 to <8m	5000	NL	NL			NL									NL		6000
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 8m+	5000	NL	NL			NL									NL		7000

Sample ID	Location	Sample Date		<1	<1	<1	<2	<1	<3	<20	<50	<100	<100	<100	<50	<100	<100	<20	<20	<20
MW01	MW01	1/12/2015	-	<1	<1	<1	<2	<1	<3	<20	<50	<100	<100	<100	<50	<100	<100	<20	<20	<20
MW02	MW02	1/12/2015	-	<1	<1	<1	<2	<1	<3	<20	<50	<100	<100	<100	<50	<100	<100	<20	<20	<20
MW03	MW03	1/12/2015	Diesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC01	MW03	1/12/2015	Diesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC01A	MW03	1/12/2015	Diesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHHP34011	BHHP34011	1/12/2015	Diesel	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW06	MW06	1/14/2015	-	<1	<1	<1	<2	<1	<3	<20	<50	<100	<100	<100	<50	<100	<100	<20	<20	<20

*Value for Arsenic V used

Table 2: Groundwater Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment






Chlorinated Alkanes														Chlorinated Alkenes										
µg/L	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,2,3-trichloropropane	1,2-dichloroethane	1,2-dichloropropane	1,3-dichloropropane	bromodichloromethane	Carbon tetrachloride	Chloroform	Chloroethane	Chloromethane	1,1,1,2-tetrachloroethane	1,1-Dichloroethene	4-chlorotoluene	cis-1,2-dichloroethene	cis-1,3-dichloropropene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichloroethene	Vinyl Chloride	
1	1	1	5	1	1	1	1	1	1	1	1	5	1	1	1	1	1	1	1	1	1	1	1	1
EQCL				6500																				
NEPC 2013 Groundwater Investigation Levels - Fresh Waters																								
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 4 to <8m																								
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 8m+																								
Sample ID	Location	Sample Date																						
MW01	MW01	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW02	MW02	1/12/2015	<1	<1	<5	<1	<1	<1	<1	<1	<1	<5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
MW03	MW03	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC01	MW03	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC01A	MW03	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHP34011	BHP34011	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW06	MW06	1/14/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*Value for Arsenic V used

Table 2: Groundwater Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment





	Miscellaneous Hydrocarbons							Monocyclic Aromatic Hydrocarbons							Polycyclic Aromatic Hydrocarbons																
1,2-dibromomethane	1	1	1	1	1	5	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2-Butanone (MEK)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
4-Methyl-2-pentanone (MIBK)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Bromoforn	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Bromomethane	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Dibromomethane	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Iodomethane	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
1,2,4-trimethyl benzene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
1,3,5-trimethyl benzene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Bromobenzene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Isopropylbenzene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
styrene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
2-Methylnaphthalene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
3-Methylcholanthrene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Acenaphthylene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Anthracene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benz(a)anthracene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benz(a)pyrene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo(b,j)fluoranthene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo(g,h,i)perylene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Benzo(k)fluoranthene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Chrysene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Dibenz(a,h)anthracene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fluoranthene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Fluorene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Indeno(1,2,3-c,d)pyrene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Naphthalene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Phenanthrene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
PAHs (Total)	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Pyrene	1	1	1	1	1	1	1	1	1	1	1	1	2	2	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01

EQCL

NEPC 2013 Groundwater Investigation Levels - Fresh Waters

NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 4 to <8m


NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 8m+

Sample ID	Location	Sample Date																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																									</
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*Value for Arsenic V used

Table 2: Groundwater Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment






Organophosphorus Pesticides																		Chlorinated Benzenes												
Azinphos methyl	Chlorpyrifos	Cumaphos	Demeton	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Ethoprophos	Fenitrothion	Fensulfothion	Fenthion	Malathion	Mevinphos	Monocrotophos	Parathion	Parathion methyl	Phorate	Protenofos	Ronnel	Strophos	Sulprofos	Trichloronate	1,2-Dichlorobenzene	1,3-dichlorobenzene	1,4-dichlorobenzene	Hexachlorobenzene	Pentachlorobenzene		
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L		
2	2	2	4	2	2	2	2	2	2	2	2	2	2	2	20	2	2	2	2	2	2	2	2	1	1	1	1	0.10	2	
EQI																														
NEPC 2013 Groundwater Investigation Levels - Fresh Waters																														
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 4 to <8m																														
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 8m+																														
Sample ID	Location	Sample Date																												
MW01	MW01	1/12/2015																												
MW02	MW02	<2	<2	-	-	<2	<2	<2	<2	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	-	-	<1	<1	<1	<2	-		
MW03	MW03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
QC01	MW03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
QC01A	MW03	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
BHP34011	BHP34011	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW06	MW06	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.1	-	

*Value for Arsenic V used

Table 2: Groundwater Analytical Results
 Project Number: 50342
 Project Name: SIMTA Stage 1 Moorebank Assessment





Polychlorinated Biphenyls										Phenols								Heavy Metals								Non-Metallic Inorganics		Anilines				
Arclor 1016	Arclor 1232	Arclor 1242	Arclor 1248	Arclor 1254	Arclor 1260	PCBs (Total)				2-chlorophenol	2-methylphenol	2-nitrophenol	3- & 4-methylphenol	4-Chloro-3-Methylphenol	4-nitrophenol	Pentachlorophenol	Phenol	Phenols (Total)	Arsenic (Total) (Filtered)	Cadmium (Filtered)	Chromium (Total) (Filtered)	Copper (Filtered)	Lead (Filtered)	Mercury (Inorganic) (Filtered)	Nickel (Filtered)	Zinc (Filtered)	Ammonia	Sulfate (as S)	Nitrate (as N)	2-Nitroaniline	Aniline	
µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/L	µg/L	µg/L	µg/L	µg/L
1	1	1	1	1	1	1	1	1	1	2	2	2	4	2	2	10	2	10	1	0.10	1	1	1	1	0.10	1	1	10	2	10	4	2
EQCL										340						3.6	320		13*	0.2	1	1.4	3.4	0.06	11	8		900				8
NEPC 2013 Groundwater Investigation Levels - Fresh Waters																																
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 4 to <8m																																
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 8m+																																
Sample ID	Location		Sample Date																													
MW01	MW01		1/12/2015																													
MW02	MW02		1/12/2015																													
MW03	MW03		1/12/2015																													
QC01	MW03		1/12/2015																													
QC01A	MW03		1/12/2015																													
BHP34011	BHP34011		1/12/2015																													
MW06	MW06		1/14/2015																													

*Value for Arsenic V used

Table 2: Groundwater Analytical Results
Project Number: 50342
Project Name: SIMTA Stage 1 Moorebank Assessment





Nitrobenzenes				Nitrotoluenes				Phthalates				Miscellaneous Chemicals				Major Cations				Major Anions			
1,3,5-trinitrobenzene µg/L	1,3-dinitrobenzene µg/L	Nitrobenzene µg/L	pentachloronitrobenzene µg/L	2,4,6-trinitrobenzene µg/L	2-nitrobenzene µg/L	2,4 & 2,6-Dinitrobenzene µg/L	3-nitrobenzene µg/L	Di(2-ethylhexyl) phthalate µg/L	Dibutyl phthalate µg/L	Diethyl phthalate µg/L	Dimethyl phthalate µg/L	di-n-octylphthalate µg/L	Hexachlorobutadiene µg/L	Carbon disulfide µg/L	RDX µg/L	Hexachlorocyclopentadiene µg/L	Calcium mg/L	Magnesium mg/L	Sodium mg/L	Potassium - Dissolved mg/L	Bicarbonate Alkalinity as CaCO3 mg/L	Chloride mg/L	Carbonate Alkalinity as CaCO3 mg/L
50	50	2	2	50	50	100	50	20	2	2	2	2	2	1	50	4	0.50	0.50	0.50	0.50	5	1	5
EQCL				140				10	1000	3700													
NEPC 2013 Groundwater Investigation Levels - Fresh Waters																							
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 4 to <8m																							
NEPC 2013 Groundwater HSL D for Vapour Intrusion - Sand 8m+																							

Sample ID	Location	Sample Date																					
MW01	MW01	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<10	110	1500	<10	18	2900	<5
MW02	MW02	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	50	750	4500	<10	43	9900	<5
MW03	MW03	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC01	MW03	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
QC01A	MW03	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
BHP34011	BHP34011	1/12/2015	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
MW06	MW06	1/14/2015	<50	<50	<50	<100	<50	-	-	-	-	-	-	-	-	-	14	10	110	1.4	45	170	<10

*Value for Arsenic V used



APPENDIX C

Remediation Criteria



Tier 1 Soil Criteria

Guidance on the assessment of contaminant concentrations on sites is presented in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 2013), herein referred to as the ASC NEPM (NEPC, 2013). Exposure settings considered in the ASC NEPM (NEPC, 2013) are low and high density residential; recreational/open space; and commercial / industrial land uses.

As the site is proposed for commercial / industrial purposes it is considered appropriate to compare the results of soil analysis against the investigation levels for commercial / industrial land.

The following health based criteria have been considered as assessment criteria:

- Health investigation levels (HILs) are generic assessment criteria for a range of metals and organic substances designed to be used in the first stage of the assessment of potential risks to human health from chronic exposure to contaminants. Table 1A(1) in Schedule B1 of ASC NEPM 2013 presents the HILs, which are generic to all soil types; and
- The ASC NEPM (NEPC, 2013), provides HSL for asbestos in soil, which are based on scenario specific likely exposure levels adopted from the Western Australia Department of Health (WA DoH) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2009). Table 7 in Schedule B1 of ASC NEPM 2013 presents the HSLs for asbestos contamination in soil.

Although the majority of the site will be converted to terrestrial ecosystem of limited value (i.e. a commercial/ industrial development), in accordance with Section 2.5.3 in Schedule B1 of the ASC NEPM 2013, consideration should also be given to the ecological investigation levels (EILs) within commercial/industrial land uses and EILs have been derived for commercial/industrial land uses. Furthermore, EILs have been derived for areas of ecological significance, which are considered to be areas where the planning provisions or land use designation is for the primary intention of conserving and protecting the natural environment, and include areas designated conservation areas (ASC NEPM, 2013). Therefore, the following ecological based criteria have been considered as assessment criteria:

- Generic ecological investigation levels (EILs) are provided for lead in Schedule B1 of NEPC 2013, and are independent of soil type.

Summary of Adopted Commercial/Industrial Soil Assessment Criteria (mg/kg)

Analyte	HIL – D Commercial Industrial	EIL- Commercial / Industrial
Inorganics		
Lead	1,500	1,800
Asbestos		
Bonded ACM	0.05% w/w	-
Friable Asbestos	0.001% w/w	-

Notes:

- No guideline available

+ HSLs for direct contact where HSL for vapour intrusion is NL adopted from CRC Care, 2011.

* ESLs are of low reliability except where indicated by * which indicates the ESL is of moderate reliability



APPENDIX D

Non Conformance Register



APPENDIX D COMPLAINTS AND NON CONFORMANCE REGISTER

The purpose of this Complaints and Environmental Incident Register is to maintain a register of complaints from local residents or stakeholders, which will include a record of any action taken with respect to the complaints.

Entries into the Complaints and Environmental Incident Register are to commence immediately following the receipt of any complaints associated with works undertaken on the "Butchers Knife".

Date	Time	Form of communication	Name, address, contact phone of complainant	Nature of complaint / non-conformance	Response / corrective action / recommended preventative action	Date of response	Date complainant notified of action	Signature / position



APPENDIX D COMPLAINTS AND NON CONFORMANCE REGISTER

Date	Time	Form of communication	Name, address, contact phone of complainant	Nature of complaint / non-conformance	Response / corrective action / recommended preventative action	Date of response	Date complainant notified of action	Signature / position

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APPENDIX E

Site Inspection Records



APPENDIX E SMP INSPECTION REPORT

The purpose of this Inspection Report is to facilitate maintenance of a record of inspections undertaken at the "Butchers Knife", and to record the results of the inspections including a record of any corrective actions required.

The Inspection Report is to be reviewed and signed by the site manager following completion of the inspection and corrective actions (if any).

Date:	
Time:	
Inspector (name & signature):	
Observations:	
Problems (if observed):	
Report to:	
Corrective action (if required):	
Corrective action completed (signed & dated by site manager):	
Preventative action to limit future occurrences:	
Site manager review (signed & dated):	

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APPENDIX F

Important information relating to this document



LIMITATIONS

This Document has been provided by Golder Associates Pty Ltd ("Golder") subject to the following limitations:

This Document has been prepared for the particular purpose outlined in Golder's proposal and no responsibility is accepted for the use of this Document, in whole or in part, in other contexts or for any other purpose.

The scope and the period of Golder's Services are as described in Golder's proposal, and are subject to restrictions and limitations. Golder did not perform a complete assessment of all possible conditions or circumstances that may exist at the site referenced in the Document. If a service is not expressly indicated, do not assume it has been provided. If a matter is not addressed, do not assume that any determination has been made by Golder in regards to it.

Conditions may exist which were undetectable given the limited nature of the enquiry Golder was retained to undertake with respect to the site. Variations in conditions may occur between investigatory locations, and there may be special conditions pertaining to the site which have not been revealed by the investigation and which have not therefore been taken into account in the Document. Accordingly, additional studies and actions may be required.

In addition, it is recognised that the passage of time affects the information and assessment provided in this Document. Golder's opinions are based upon information that existed at the time of the production of the Document. It is understood that the Services provided allowed Golder to form no more than an opinion of the actual conditions of the site at the time the site was visited and cannot be used to assess the effect of any subsequent changes in the quality of the site, or its surroundings, or any laws or regulations.

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Department of Defence

Former DNSDC, Moorebank, NSW
Environmental Management Plan

September 2016

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Appendices

Appendix A - Environmental Management Plans



1. Introduction

1.1 Introduction

GHD Pty Ltd (GHD) was engaged by Department of Defence (Defence) to prepare an Environmental Management Plan (EMP) for the former Defence National Storage and Distribution Centre (DNSDC) at Moorebank Avenue, Moorebank NSW (the site). **Figure 1** provides details of the site location.

The site forms most of Lot 1 in DP 1048263 but excludes the licenced area also known as the former DNSDC Refuelling Area. **Figure 2** provides a site plan and details of the site boundary.

1.2 Background

The former DNSDC has been subject to a number of stages of investigation and remediation works. Although investigation and remediation work had reportedly been completed as early as the 1990s, GHD has only been provided with documentation of work dating back to 2000. GHD completed a review of available pertinent documentation relating to the site. The aim of the information review was to identify what, if any, remaining areas of potential concern were present within the site, in order to close out or manage contamination issues and meet Defence's obligations under the conditions of sale and lease agreement. Details of these document reviews are provided in GHD (2015) Intrusive Site Investigation Report – Moorebank DNSDC, GHD, September, 2015 (GHD, 2015), which provided the basis for GHD's intrusive investigation which investigated and assessed the presence or absence of contamination in various areas of the site.

Following completion of the most recent intrusive investigation in 2015, GHD concluded that soil and groundwater analytical data were generally consistent with that reported by others during previous investigations. Detections of some contaminants of potential concern (CoPC), including total recoverable hydrocarbons (TRH), polycyclic aromatic hydrocarbons (PAH), volatile organic compounds (VOC's) and aqueous film forming foam (AFFF) compounds were identified in soils and groundwater at some locations; however, the concentrations were typically low and below the nominated investigation levels with the following exceptions:

- Elevated concentrations of lead were reported in shallow soils from a depth of approximately 0.7 to -0.8 metres in one location adjacent to the Rail Spur, corresponding with field observations of a white, waxy material. The extent of the impact appeared to be limited both vertically and horizontally and the material was not encountered at any other test pit locations across the site.
- Fragments of asbestos containing material (ACM) were noted on the ground surface and shallow soils at several locations across the site (most notably in the southern portion of the site associated the Southern Burial pits which extend off site to the south and adjacent to the Rail Spur. The potential for widespread presence of ACM on the surface across this portion of the site cannot be discounted.
- GHD considers there is a potential risk of unexploded ordinance (UXO) or explosive ordnance waste (EOW) in the southern burial pits to the southern portion of the site.



Map Projection: Transverse Mercator

Horizontal Datum: Geocentric Datum of Australia (GDA)

Grid: Map Grid of Australia 1994, Zone 56

Lot Boundaries

Figure 2

N:\AUSydney\Projects\21125471\GIS\Maps\Deliverables\21_25471_2010_DNSDC_EMP_LotBoundaries.mxd

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The groundwater at several locations across the site contains concentrations of metals that are greater than the nominated groundwater investigation levels (GILs). GHD discounted metals as a CoPC as they are similar to natural background levels. The above-described impacts are the subject of this EMP. This EMP was subject to auditor approval to satisfy Section 4.3 of the Deed of Surrender of Lease.

1.3 Objective

This EMP has been developed to outline the procedures to control potential exposure to receptors (human health and the environment) from residual contaminated soil, ACM, and potential UXO at the site. The EMP has been prepared based on the findings of GHD's 2015 intrusive investigation (refer to **Section 1.2**).

The objectives of this EMP are to:

- Document the known contamination on site;
- Identify contaminants and waste material that may present adverse impacts to human health or the environment;
- Detail the controls to mitigate potential exposure to contamination or possible contaminants, ACM, and UXO;
- Provide a system to ensure the maintenance of the controls and prevent future exposure to contamination, ACM, and UXO; and
- Provide necessary procedures to be followed in the event latent contaminants are identified.

This EMP is not intended to replace or supersede health and safety plans or emergency procedures for the site. This EMP should be considered as a supplement to these documents, and is intended to mitigate risks associated with contaminated media, ACM, possible UXO, and should form part of any site inductions completed prior to persons entering the site. Previous investigation reports should also be reviewed such that the Site Owner is aware of the nature and extent of soil contamination at the site.

1.4 Responsibilities

The implementation of the procedures provided in this EMP will be the responsibility of the Site Owner and/or Site Occupier and Site Supervisors, as detailed in **Table 1**. The responsibilities may include informing other parties of their obligations to comply with the EMP. All individuals accessing the site are responsible for complying with the requirements under this EMP, as applicable.

Table 1 Responsibilities for EMP implementation

Position and Company/Entity	Responsibilities
Site Owner/Occupier	<ul style="list-style-type: none"> • Approve the EMP. • Advise persons occupying and working at the site of the requirements of the EMP. • Ensure appropriate consents and licences (as required) are obtained for any monitoring/survey works.

Position and Company/Entity	Responsibilities
	<ul style="list-style-type: none"> • Provide training and induction of employees and contractors before and during any monitoring/survey works, as appropriate. • Provide a copy of the EMP to the supervisor or person-in-charge of occupier/tenant employees and/or contractor/s who are undertaking any monitoring/survey works. • Ensure project/occupier/tenant staff and contractors comply with the requirements of the EMP. • Ensure project/occupier/tenant staff and contractors clearly understand the requirements of the EMP and ensure that compliance with the EMP is a condition of any agreement with these parties. • Update the EMP if the condition of the site is changed, and, if necessary, inform other parties, including tenants, of the changes. • Ensure that the site is maintained in accordance with the EMP. • Provide the EMP for inclusion on the relevant records maintained by site supervisor/owner/tenant. • Ensure all non-conformance and/or complaints are recorded in accordance with the procedures identified in Appendix A.
Supervisor or person-in-charge of works (occupier/tenant/contractors/ sub-contractors)	<ul style="list-style-type: none"> • Implement the EMP to ensure compliance. • Complete the registers, databases and records required by the EMP. • Ensure that applicable environmental measures are in-place and are functioning correctly during the works and after completion of the works, if required. • Notify Site Occupier and Site Owner if evidence of contaminated materials, such as ACM is observed during works on the site. <p>Complete non-conformance and corrective action reports as required and undertake follow-up corrective actions, as required.</p> <ul style="list-style-type: none"> • Undertake audits of activities in accordance with the requirements of the EMP. • Ensure non-conformance and/or complaints are reported to the Site Occupier and Site Owner. • Undertake corrective actions in response to requests made by the Site Occupier or Site Owner regarding specific environmental or safety issues. • Ensure all works comply with relevant regulatory requirements. • Inform Site Occupier and Site Owner if conditions are significantly different from those documented in the EMP.



1.5 Notifications

GHD understands that an EMP is required as a condition of the non-statutory Site Audit Statement (SAS) to be prepared by the NSW EPA Accredited Site Auditor. The Site Owner will comply with *Section 52(A) of the Conveyancing Act*, by disclosing all available information regarding contamination at the site.

There must be appropriate notification of the restrictions applying to the site to ensure that current and future site owners and occupiers are aware of the details of this EMP.

The Site Owner is required to maintain a membership with Dial-Before-You-Dig, such that any future occupant will be notified of the site contamination (including asbestos and UXO) in certain areas of the site prior to completing intrusive work.

1.6 Timeframes

This EMP is applied to the site for the time of issue (July 2016), and so long as it continues to be used for the designated use and layout as an industrial and commercial property (surrounded by a security fence).

The EMP has been prepared to reflect current site activities and may be amended from time to time as detailed in **Procedures 01 to 07**.

This EMP will expire and will require amendment should the site use change at any time, including increased frequency of surveys, redevelopment, changes in land use or additional site assessments.

1.7 Limitations

GHD limitations in relation to the validation programme are provided in **Section 6**.

2. Site setting

2.1 Site identification

The site is located approximately 30 km south-west of the Sydney CBD, approximately 500 metres east of the Georges River. A summary of site details is provided in **Table 2**. The site location is shown on **Figure 1**.

Table 2 Site details summary

Information	Details
Street Address	Former DNSDC site, Moorebank Ave, Moorebank NSW 2170
Lot and DP	Part of Lot 1 in DP 1048263
Site Area	Approximately 80,210 square metres
Local Government Area (LGA)	Liverpool City Council
Current Land Use Zoning	IN1 General Industrial (Liverpool Local Environmental Plan (LEP) 2008)
Former Land Use Zoning	Defence 5(a) (Liverpool Local Environmental Plan (LEP) 1997)

2.2 Site description summary

A summary of each of the buildings / areas is provided below, along with supplemental details of observations pertinent to the condition of the site. Building numbers and locations are shown on **Figures 3A to 3D**.

- Building 006: Storehouse Camp Earmark
 - Wastewater underground storage tank (UST) located on the northern side of the building.
- Buildings 015 and 016: Flammable Storage and Treatment and Preservation
 - Aboveground storage tanks (ASTs) located in a basement identified as area of concern
- Building 023: Dangerous Goods POL #2 Store
 - Potential spills from chemical storage to unsealed area around the perimeter of the building
- Building 024: Dangerous Goods Storehouse
 - Potential spill around a path of dead grass around a drain on the southwest corner of the building
- Building 026: Dangerous Goods Gas Storehouse No 2
 - AFFF cylinders present in the adjacent building (photograph 6)
- Building 032: Former explosives store
 - Potential chemical spills
- Building 037: Artisans Workshop Carpenter Facility
 - Potential chemical spills
- Building 040: Storehouse Returns



- Building 049: Battery Shop Mechanical Coy
 - Waste water UST located on the western side of the building.
- Building 053: Storehouse Bulk
 - Minor acid staining. Septic UST located on the southern side of the building.
- Building 067: WSRF (Weapons)
 - Waste UST from weapon degreasing pits and firing range sand pits (Photograph 8).
- Building 073: Storehouse (Mechanical)
 - Potential spills
- Building 079: Testing Shed (Generators) GE
- Building 080: Repair Facility (General Engineering)
 - Waste oil UST and trade waste UST (Photograph 9).
- Building 082: Storehouse
 - Waste water UST located on the eastern side of building.
- Building 083: Paint Shop
 - Potential maintenance spills
- Building 088: Wash Point
 - Vehicle parking area and loading platform
- Southern burial pits (predominantly off site to the south)
- Rail Spur in south of site
- Sediments in stormwater drain
- Former storage of radioactive materials – Building 27





Investigation Locations (GHD, 2015)

- Groundwater Well Location (GHD, 2015)
- Groundwater Extraction Well Location (GHD, 2015)
- Soil Borehole Location (GHD, 2015)
- Hand Auger Location (GHD, 2015)
- Test Pit Location (GHD, 2015)
- Sediment Sampling Location (GHD, 2015)

0 20 40 60 80
Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

- Site Boundary (Approximate)
- Petroleum / Waste Oil UST
- Waste Water / Septic UST
- Chemical / Fuel AST
- Observed Existing Groundwater Wells
- Building number

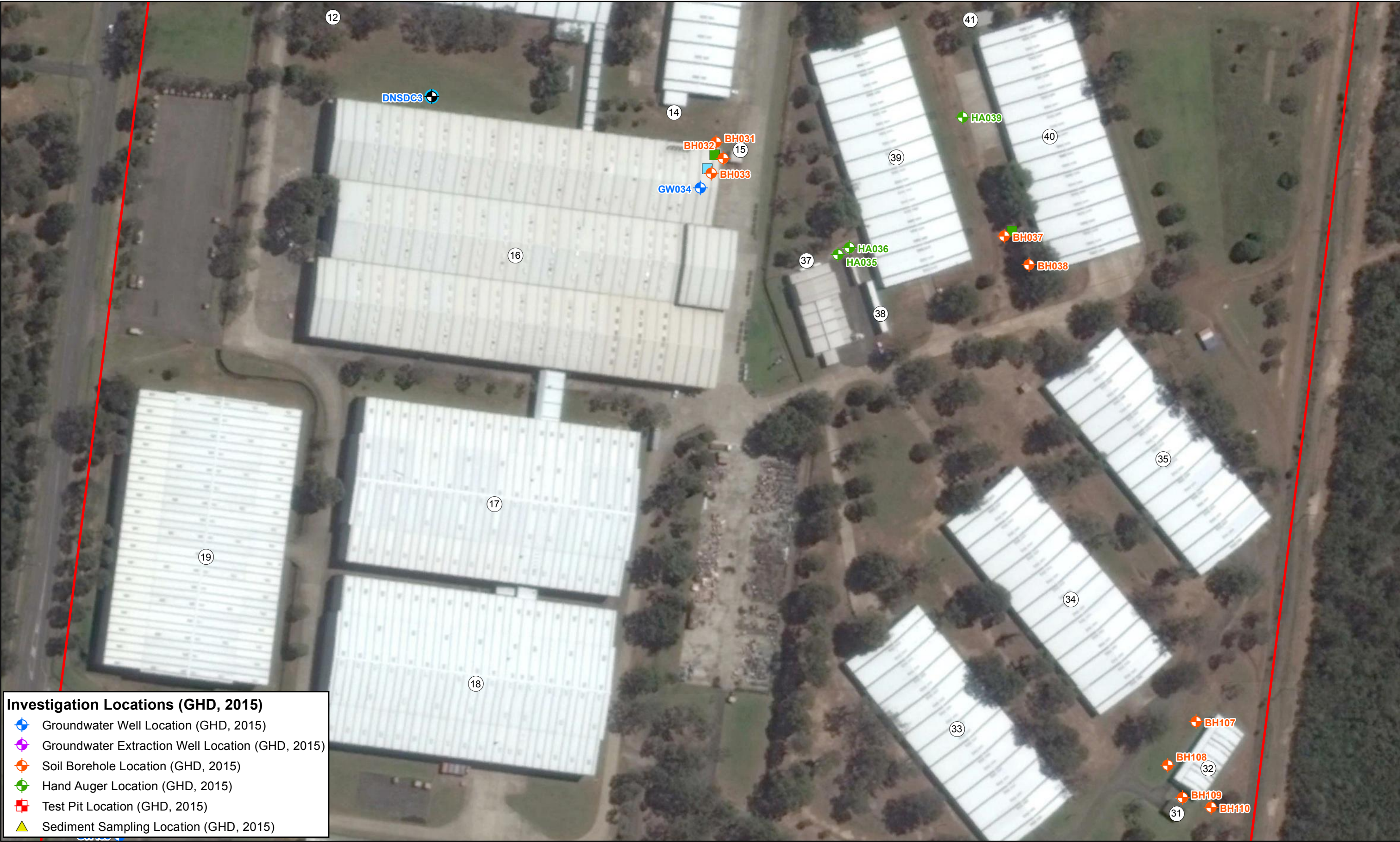
GHD

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Revision | A
Date | 29 Jun 2016

GHD Investigation Locations

Figure 3B



Investigation Locations (GHD, 2015)

- Groundwater Well Location (GHD, 2015)
- Groundwater Extraction Well Location (GHD, 2015)
- Soil Borehole Location (GHD, 2015)
- Hand Auger Location (GHD, 2015)
- Test Pit Location (GHD, 2015)
- Sediment Sampling Location (GHD, 2015)

0 20 40 60 80
Metres

Map Projection: Transverse Mercator
Horizontal Datum: Geocentric Datum of Australia (GDA)
Grid: Map Grid of Australia 1994, Zone 56

N

LEGEND

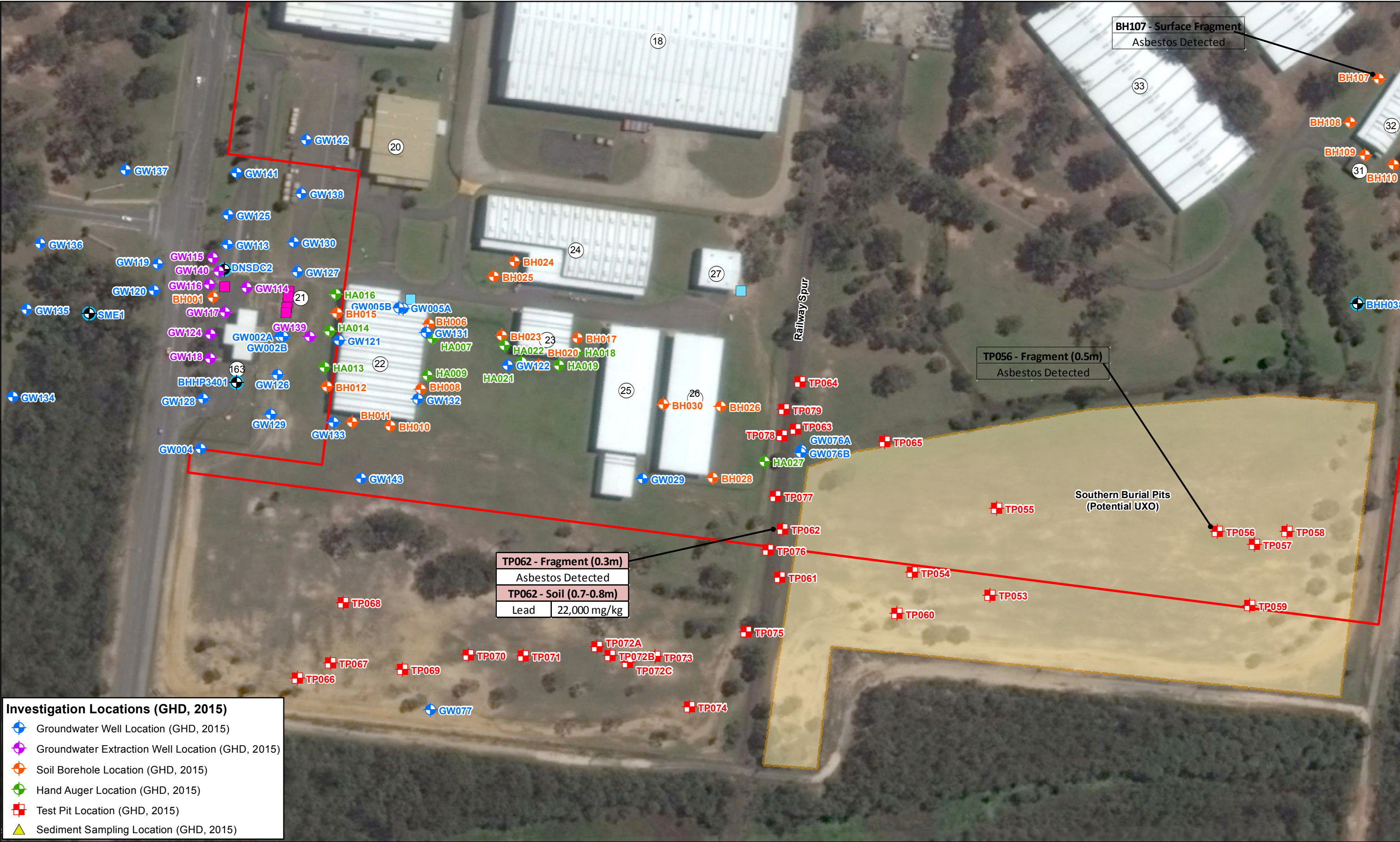
- Site Boundary (Approximate)
- Petroleum / Waste Oil UST
- Waste Water / Septic UST
- Chemical / Fuel AST
- Observed Existing Groundwater Wells
- Building number

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Date 29 Jun 2016

GHD Investigation Locations

Figure 3C



2.3 Surrounding land use

The following land uses surround the entirety of the site:

- North: Defence land comprising hardstand used for storage and maintenance of vehicles, with Anzac Road beyond.
- South: Former defence land which is vegetated and undeveloped. The southern portion of Lot 1 in DP 1048263 which is referred as the Butcher's Knife, with an area referred to as the Boot Land farther to the south, and the East Hills railway line beyond.
- East: Defence land which were formerly used for ammunition storage. Part of the land is vegetated and undeveloped. Residential housing is beyond.
- West: Moorebank Avenue is immediately west of the site, with former Defence land part of which is occupied by the former School of Military Engineering (SME). The Georges River is beyond and forms the western perimeter of SME.

2.4 Environmental setting

A summary of key information relating to the environmental setting of the site (as recorded in the Data Gap Analysis Report) is presented in **Table 3**.

Table 3 Environmental setting summary

Topography	The site lies at approximately 10 to 20 m Australian Height Datum (AHD) and is generally flat to gently undulating. The high point lies in the central-eastern portion of the site and with gentle slope down to the east, west and south.
Soils	<p>General Profile</p> <p>Based on previous investigations undertaken on the site, soils were generally expected to comprise a thin layer of fill material overlying residual silty stiff clays. Fill materials comprised of silty sand with gravels. Ash and slag were observed during previous investigations at two locations in the northern portion of the site along with other waste materials noted sporadically. The average depth of fill was approximately one metre depth, with the deepest encountered in the southern portion of the site (up to 2.2 metres depth).</p> <p>In the western portion of the site (closest to the Georges River), alluvium was encountered beneath the fill materials.</p> <p>Acid Sulfate Soils</p> <p>The <i>Acid Sulfate Soils Map</i> (sheet ASS-013) published in the Liverpool City Council LEP (2008) indicates the site is not expected to contain Acid Sulfate Soils (ASS). Further, owing to the elevation of the site, the presence of ASS would not be expected.</p> <p>Land within approximately 500 metres of the Georges River (i.e. land located to the west of the site) could comprise of soils that may be ASS.</p>
Hydrology	The site is located approximately 500 to 600 metres east of the Georges River. Surface water from the site is expected to be directed into an open drain that flows west from the site, discharging into the Georges River. An ephemeral tributary of the Georges River (Anzac Creek) flows through the east of the site following significant rainfall, along with other surface water bodies located approximately 800 metres east of the site.
Geology	The regional geology consists of Tertiary aged fluvial deposits of clayey quartzose sand clay overlying a thin band of Middle Triassic ages Ashfield Shale of the Wianamatta Group overlying Hawkesbury Sandstone.

	<p>Previous investigations identified shale bedrock in the western portion of the site whilst weathered sandstone bedrock was encountered on the southern portion of the site.</p>
Hydrogeology	<p>Groundwater risk map</p> <p>The 1:2,000,000 <i>Groundwater in New South Wales, Assessment of Pollution Risk Map</i> (1987) indicates that the site is likely to be underlain by sandstone and alluvial materials, classified as having moderate to high potential for groundwater movement. Groundwater salinity is likely to be less than 1,000 mg/L, rendering it suitable for stock, domestic and some irrigation purposes.</p> <p>Existing groundwater bore search</p> <p>Previous investigations at the site intercepted groundwater at varying depths, though generally between 8 to 10 metres bgl. Groundwater was noted within a number of geological units including the fill material, shale and sandy clays. Groundwater flows in a westerly or north-westerly direction towards the Georges River.</p> <p>GHD conducted a review of existing groundwater borehole records using the NSW Water Information Database on 3 November 2014. No registered bores were identified within an approximate one kilometre radius of the site.</p>
Council mapped information	<p>The Liverpool City Council publishes a range of information under it's LEP (2008). A review of pertinent maps was undertaken by GHD on 7 April 2015 and is summarised below:</p> <ul style="list-style-type: none"> - Heritage map (sheet HER-013) indicates the site is not listed as a heritage or conservation item. However, land in the immediate vicinity of the site in all directions is classified as a general heritage item. - Environmentally significant land map (sheet ESL-013) indicates the site is not classified as environmentally significant land. Some portions of land to the immediate east, south and west of the site are however classified as being environmentally significant. - Flood planning area map (sheet FLD-013) indicates the southern portion of the site (approximately 15% of the site area) is classed as flood prone land. The land isn't however covered under the flood planning area.

3. Basis of assessment

3.1 Relevant guidelines

The primary guidance document that is used to the assessment and management of contaminated sites is the *National Environment Protection (Assessment of Site Contamination) Measure* (NEPM) 1999, as amended by the *National Environment Protection (Assessment of Site Contamination) Amendment Measure* 2013 (No. 1) (NEPC 2013).

Previous works including the detailed site investigation (DSI) have been developed in a manner consistent with guidelines “made or approved” by the NSW EPA under Section 105 of the *Contaminated Land Management Act, 1997*. These guidelines include the following:

- NSW EPA, *Contaminated Sites: Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997*, 2015.
- National Environmental Protection council (NEPC), *National Environment Protection (Assessment of Site Contamination) Measure (NEPM)*, 2013.
- NSW EPA, *Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites*, 2011.
- NSW EPA, *Contaminated Sites: Guidelines for NSW Site Auditor Scheme*; 2006.
- Australian and New Zealand Environment and conservation Council (ANZECC), *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, 2000.
- NSW EPA, *Contaminated Sites: Sampling Design Guidelines*, 1995.

3.2 Assessment criteria

The NEPM 1999 (Amendment 2013) includes a range of ecological investigation and screening levels, health investigation levels (HILs) and health screening levels (HSLs) for a range of contaminants and for a range of land use and exposure scenarios. The HILs are generic to all soil types. Site-specific conditions determine the depth to which HILs apply for land uses other than residential (generally to depth of three metres). The HSLs however are both soil type and depth specific.

The amended NEPM (Schedule B1, Section 2.1.2) states that investigation and screening levels are not clean-up or response levels nor are they desirable soil quality criteria. Investigation and screening levels are intended for assessing existing contamination and to trigger consideration of an appropriate site-specific risk-based approach or appropriate risk management options when they are exceeded.

The assessment criteria (investigation levels) against which the project analytical data have been compared have been taken from those guidelines made or approved by the National Environment Protection Council (NEPC). In addition, the United States Environmental Protection Agency (US EPA) Region 4 (2009) screening criteria have been adopted as soil investigation levels for the AFFF constituents Perfluorooctanesulfonic acid (PFOS) and Perfluorooctanoic acid (PFOA).

For this site, the initial approach to assess the significance of site contamination was through comparison of sampling data to NEPM 1999 (Amendment 2013) investigation levels. However, a site-specific risk assessment to derive site specific screening criteria based on the proposed land use (and the levels of exposure) may be appropriate, depending on the intended future site use.

3.2.1 Health based criteria

Given that the end use for the site is to be commercial land use with primarily hard stand and limited potential for exposure to unsealed soils, the following assessment criteria, which are sourced from Schedule B1 of the NEPM 1999 (Amendment 2013), have been considered:

- HIL/HSL D – Commercial / industrial.

For the assessment of constituents of AFFF, including PFOS and PFOA, reference is made to US EPA guidelines. In the absence of any Australian based guidance, these investigation levels have been used as a guideline for PFOS and PFOA.

3.2.2 Aesthetics

An assessment of aesthetic issues has been undertaken as outlined in Section 3.6 of Schedule B(1) of the NEPM (2013), which states that 'there are no specific 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 that were considered in relation to aesthetic issues 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.
- The need for, and practicality of, any long-term management of foreign material.

The NEPM notes that in some cases, documentation of the nature and distribution of the foreign material may be sufficient to address concerns relating to potential land use restrictions.

3.2.3 Summary of nominated criteria for soil

The ANZECC/ARMCANZ 2000 *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC 2000) are approved as guidelines under Section 105 of the Contaminated Land Management Act 1997 as of 6 December 2001.

ANZECC 2000 outlines the principles, objectives and philosophical basis underpinning the development and application of the guidelines. It also outlines the management framework recommended for applying the water quality guidelines to the natural and semi-natural marine and freshwater resources in Australia and New Zealand. The guidelines provide a risk-based decision framework where possible, to help refine trigger values for application at local and/or regional scales.

The NSW EPA recommends that when assessing contamination of surface water, consideration needs to be given to the impact of any contaminants to the beneficial uses or resources of the groundwater. The beneficial uses of groundwater may include providing recharge to rivers, lakes, bays, being a source of water for drinking, irrigation and industrial uses.

For the site, the receiving surface water ecosystem is likely to be the Georges River, which is considered fresh water. Given that there are no local biological effects data and the river would be subject to uncontrolled stormwater discharge, a protection of level of 95% was used for the assessment of water contamination and preparation of groundwater investigation levels (GILs).

4. Contamination status

4.1 Contamination status

The following section provides a summary of the contamination status of the site pre-remediation, as detailed in previous reports for the site (referenced in **Section 1.2**).

Investigation locations for soil and groundwater monitoring locations sampled during GHD's investigation (2015) are detailed on **Figures 3A to 3D**.

During the GHD investigation (2015) there were exceedances of the site criteria reported during the analysis of the soil and groundwater in samples analysed. These locations are shown on **Figures 3A to 3D**.

Table 4 provides an overview of the areas where soil contamination was confirmed during the GHD intrusive investigation (2015).

Table 4 Summary of soil contamination

Building	Key Infrastructure or Observations	Sources requiring remedial or risk management measures	
Southern burial pits	Hand grenades, filling plugs and fuse wells were identified.	Soils	Fragments of ACM were noted on the ground surface in some areas including TP068, TP072A, TP072B, TP073C, TP073, TP074, TP075 and TP076.
Rail Spur in south of site	HCB in soil was detected within TP013.	Soils	A waxy substance was identified in TP062 to depth of approximately 0.8 metres. Analytical results reported a concentration s of lead (22,000 mg/kg) and total PAH concentration of 150 mg/kg in corresponding sampling TP062_0.7-0.8. The concentration in the underlying soils collected from a depth of 1.9-2 metres reported a lead concentration of 12 mg/kg. Concentrations of all other COPC in this sample were less than the nominated investigation levels or below the laboratory PQL. Concentrations of COPC in all other samples were low or below the laboratory PQL in all other samples collected from the rail spur. A fragment of ACM was identified on the surface at TP076. ACM was encountered in shallow fill material (0.2-0.3 metres) in TP062.

The report identified that the identified metal, asbestos, UXO/EOW soil contamination could be managed under an EMP.

No further assessment of metal in groundwater was considered necessary as the concentrations were considered to be at background concentrations.

4.2 Asbestos contamination

The following table (**Table 5**) provides a summary of fill soils that has suspected asbestos containing materials (ACM) observed during the field works, and a summary of the asbestos sampling and analysis. The locations of the referenced sample locations are shown on **Figure 3**.



GHD completed targeted investigations in March/April 2015 which included 79 boreholes, 15 hand augers and 29 test pits. Asbestos analysis in the form of identification was completed on ten soil samples.

Subsurface conditions encountered across the site were generally consistent with those reported during previous investigations, typically comprising a mixture of sand, silty clay and gravel fill underlain by clay. Fill material generally was present as a thin veneer across the surface of the site, however extended to 1.4 metres in the southern portion of the site and greater than 2.5 metres around the railway spur (TP063 and TP064). The summary indicates very limited presence of building material present in the fill soils; which is considered to present a primary indicator for the potential presence of asbestos in soils.

GHD notes that all sample locations are within the southern burial pits (predominately outside of the site boundary).

Table 5 Summary of confirmed asbestos contamination

Borehole Location	Visual potential for asbestos	Analysed (Y/N)	Laboratory findings
BH107	Black/dark brown, topsoil	Yes	BH107_surface fragment – beige compressed fibre cement material – chrysotile asbestos detected. BH107 (0.1-0.2m, soil) – no asbestos detected
TP056 (0-1.2 mbgl)	Electrical conduit	Yes	TP056 (0.5m_fragment) - beige compressed fibre cement material – chrysotile asbestos detected TP056 (0.8-0.9m, soil) – no asbestos detected
TP062 (0-0.5 m bgl)	ACM fragment in fill soil	Yes	TP062 (0.3m_fragment) – grey compressed fibre cement material – chrysotile and amosite detected. TP062 (0.3-0.4m, soil) – no asbestos detected

GHD concluded that: *Fragments of asbestos containing material (ACM) were noted on the ground surface and shallow soils at several locations within the southern burial pits and adjacent to the rail spur within the southern area of the site. The potential for widespread presence of ACM on the surface across this portion of the site cannot be discounted.*

GHD have additionally reviewed historical aerial photographs presented in a GHD Phase I report (Ref. 21/22359, April 2013) for the boot land site adjacent to the east and south of the DSND. GHD note that the aerial photographs indicated limited demolition of buildings once they were constructed by the 1950s. The area in the south of the site was however notably disturbed and ties in with the location of the 'southern burial pits'; and therefore as the potential for fill materials.

GHD note that there has been limited sampling for asbestos in soils at the site; however, based on our investigation GHD concludes the following"

- GHD reported limited asbestos fragments across the site which were localised in the southern portion of the site; in the area of the 'southern burial pits'

- Fill soils recorded across the site have indicated limited potential for asbestos containing materials, with the exception of those in the southern portion of the site in the area of the 'southern burial pits'.
- GHD consider based on our findings that the majority of the site has been assessed in accordance with the guidelines detailed in the NEPM such as review of the potential sources such as demolition of pre-existing structures (pre 1990) or burials indicating limited potential source areas (other than in the area of the southern burial pits).

4.3 Environmental Management Strategy

The EMP has been developed to outline the procedures to mitigate potential risks that have been identified based on the evaluation of the contamination status of the site, potential pathways of exposure and linkages to receptors are present. The following sections outline the potential sources, pathways and receptors for contamination, which may be applicable to the site. Implementation of this EMP should disconnect any remaining potential linkages so to allow for continued use of the site.

The locations of areas where contaminants are present at concentrations greater than the nominated criteria and thus require management measures are presented on **Figures 3A to 3D**.

4.4 Sources

There are several potential sources of contamination were identified on the site which required further assessment in order to address Defence's obligations under the lease agreement and contract of sale. These included:

- Lead impacts in the soil.
- Asbestos fragments in the soil.
- Potential for buried materials and UXO and EOW within the southern burial pits.

4.5 Pathways

Potential pathways by which contamination could migrate towards an identified off site receptor (refer to **Section 4.4**) or present a potential exposure pathway to commercial/industrial site workers include:

- Direct contact.
- Inhalation of particulates.

4.6 Receptors

Defence is currently in the final stages of vacating the site and intends to terminate its current lease on the site in 2015. GHD understands the site will be developed in the future for use as an intermodal terminal (commercial / industrial land use). The potential receptors for contamination are considered to include:

- Current and future commercial workers on the site.
- Future construction and maintenance workers.

Given the identified potential for exposure of certain site users to the identified contamination at the site, a number of control measures are necessary to control this exposure. These are discussed in **Section 5**, in conjunction with the procedures outlined in **Appendix A**.



5. Environmental management procedures

A number of procedures have been provided to guide the implementation of this EMP. The key procedures are listed in **Table 6** and are detailed in **Appendix A**.

Table 6 EMP Procedure and responsibilities

Procedure Title	Procedure Number
Signage	01
Asbestos Containing Materials in southern portion of site	02
Unexploded Ordnance in southern portion of the site	03
Unexpected Finds	04
Record Keeping	05
Review of EMP Implementation	06
Review of EMP – Site and/or Land Ownership Changes	07



6. Limitations

This Environmental Management Plan is for the DNSDC, Moorebank, NSW ("Plan") and:

- *has been prepared by GHD Pty Ltd ("GHD") for the Department of Defence and Commonwealth of Australia for the purposes of the objectives stated in Section 1.3.*
- *may only be used and relied on in its entirety by the Department of Defence and Commonwealth of Australia;*
- *may be used, by other entities as required for the purpose as stated in Section 1 of the plan (and must not be used for any other purpose);*
- *other than the Department of Defence and Commonwealth of Australia, must only be relied on by any person with the prior written notification to GHD and subject always to the next paragraph;*
- *may only be used for the purpose as stated in Section 1 of the plan (and must not be used for any other purpose).*
- *must not be used to form or comprise of any study, business case, and/or feasibility, decision, dealing or otherwise arising out of or in connection with any commercial, financial, economic, business or other purpose or use of or for the site. This report has not been prepared for nor is it to be used (or relied upon), including Section 4 – Contamination Status, by any person for any such purpose(s) whatsoever.*

GHD and its servants, employees and officers otherwise expressly disclaim responsibility to any person other than the Department of Defence and Commonwealth of Australia arising from or in connection with this plan.

To the maximum extent permitted by law, all implied warranties and conditions in relation to the services provided by GHD and the Report are excluded unless they are expressly stated to apply in this plan.

The services undertaken by GHD in connection with preparing this plan:

- *were limited to those specifically detailed in section 1 of this plan.*
- *were undertaken in accordance with current professional practice and by reference to relevant environmental regulatory authority and industry standards, guidelines and assessment criteria in existence as at the date of this plan and any previous site investigation and assessment plan referred to in the plan.*

The opinions, conclusions and any recommendations in this plan are based on assumptions made by GHD when undertaking services and preparing the plan ("Assumptions"), as specified throughout this plan.

GHD expressly disclaims responsibility for any error in, or omission from, this plan arising from or in connection with any of the Assumptions being incorrect.

Subject to the paragraphs in this section of the plan, the opinions, conclusions and any recommendations in this plan are based on conditions encountered and information reviewed at the time of preparation of this plan and are relevant until such times as the site conditions or relevant legislations changes, at which time, GHD expressly disclaims responsibility for any error in, or omission from, this plan arising from or in connection with those opinions, conclusions and any recommendations."



This plan is based solely on the investigations and findings contained in the reports referred to in the plan and on the conditions encountered and information reviewed at the time of each report. This plan should be read in conjunction with the each report referred to.

The opinions, conclusions and any recommendations in this plan are based on information obtained from, and testing undertaken at or in connection with, specific sampling points and may not fully represent the conditions that may be encountered across the site at other than these locations. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this plan are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this plan.

GHD has considered and/or tested for only those chemicals specifically referred to in this plan and makes no statement or representation as to the existence (or otherwise) of any other chemicals.

Site conditions (including any the presence of hazardous substances and/or site contamination) may change after the date of this plan. GHD expressly disclaims responsibility:

- arising from, or in connection with, any change to the site conditions; and*
- to update this plan if the site conditions change.*

Except as otherwise expressly stated in this plan GHD makes no warranty or representation as to the presence or otherwise of asbestos and/or asbestos containing materials ("ACM") on the site. If fill material has been imported on to the site at any time, or if any buildings constructed prior to 1970 have been demolished on the site or material from such buildings disposed of on the site, the site may contain asbestos or ACM.

Subsurface conditions can vary across a particular site and cannot be exhaustively defined by the investigations carried out prior to this plan. As a result, it is unlikely that the results and estimations expressed or used to compile this plan will represent conditions at any location other than the specific points of sampling. A site that appears to be unaffected by contamination at the time of the reports attached to this plan may later, due to natural causes or human intervention, become contaminated.

These Disclaimers should be read in conjunction with the entire plan. This plan must be read in full and no excerpts are taken to be representative of the findings of this plan.

Appendices

Appendix A – Environmental Management Plans



Procedure 01. Signage

Area Effected:	Southern burial area and rail spur (see Figure 3D), and areas of unexpected finds
Responsibility:	Site Occupier or its nominee (including any nominated site manager) and Site Owner (including any future land owner).
Objective:	Appropriate signage, sufficient to control access to the areas of the identified contamination including possible UXO, asbestos containing materials, and lead and prevent access by unauthorised persons must be maintained.
Procedure:	<p>The area shall be designated as per Figure 3D. The signage must be maintained in key areas where persons are likely to enter the area, i.e.: walking tracks (if present), as well as at height of no higher than 1.5 metres above ground level, and away from vegetation (as far as reasonably practicable).</p> <p>Access gates to the general site should remain locked with a key; the keys should be held with the Site Occupier or their nominee (including any nominated site managers), and authorisation for access should be obtained from this source.</p> <p>The sites should continue only to be accessed by authorised personnel and a record of those with access keys should be maintained by the site occupier.</p> <p>Authorised personnel may include representatives of Site Owner or Occupier, environmental monitoring or surveys workers and maintenance works of service infrastructure easements.</p>
Inspection Frequency:	Annually
Inspection / Reporting:	The signage should be inspected annually and reported in accordance with Procedure 05 .
Actions:	If the signage has been damaged or degraded it should be reinstated to meet the requirements of this procedure, as soon as reasonably practicable.



Procedure 02. Asbestos Containing Material in southern portion of site

Area Affected:

Fragments of ACM were noted on the ground surface in some areas see **Figure 3D** (fragment of ACM was identified on the surface and in shallow fill material), in the southern portion of the site near the southern burial pits and railway line. ACM encountered in other areas of the site should be treated as an unexpected find and treated in accordance with **Procedure 04** in conjunction with this procedure.

Responsibility:

Site occupier or its nominee (including any nominated site manager) and site owner (including any future land owner).

Objective:

To ensure that a protocol has been provided should ACM be found at the site.

Procedure:

Due to the potential for asbestos, the risks in this portion of the site should be managed through the implementation of a 'dial before you dig' policy so to ensure workers in this area are aware of the potential risks. This area requires long-term management to verify that the area is not disturbed.

Where ACM has been identified, the Safe Work Australia How to Manage and Control Asbestos in the Workplace: Code of Practice 2011 provides for the establishment of an asbestos register to record information regarding identification of asbestos-containing materials, risk assessments and control measures.

The development of a contractor site induction is required to aid in the management of in-situ asbestos containing materials within the sites. The Site Owner or its nominee should incorporate the asbestos containing material issues identified at the site into any associated works contracts, designed to ensure any asbestos containing materials on, or in, the site are dealt with in an appropriate manner.

The inductions should be site specific and should include the asbestos risk present specific to each of the sites, access to the asbestos register, survey report should be provided to persons where interaction with known or possible ACM is likely.

The induction would be the responsibility of the Site Owner or the contractor in charge of works and include at least the following:

- Making all workers aware of the potential for contaminated soil to be encountered and the preparation of an asbestos management plan.
- Assignment of responsibilities.
- Discussion of current site conditions.
- Details of the work to be completed.
- Assessment of potential risks associated with identified hazards.

- Establishment of personnel protection standards and mandatory safety practices and procedures.
- Establishment of appropriate environmental management protocols.
- Evacuation procedures and emergency information.
- Incident reporting.

If ACM is identified, all works should be ceased and the Site Occupier or the future land owner should be contacted immediately. The component should not be touched, the location recorded and photographed if practicable and safe to do so.

The location, form, volume, and type will need to be assessed by an appropriately qualified person. Whilst this is being undertaken, the impacted area should not be disturbed. Access should be limited to authorised persons only.

The proposed strategy to address ACM should be implemented by an appropriately qualified person such as an Environmental Consultant. If latent ACM is identified, it should be assessed and dealt with in accordance with the legislation and guidance detailed in Section 3, and in accordance with NSW Health and Safety Regulations (2011).

Frequency:

Upon identification

Inspection / Reporting:

The ground surface in the southern portion of the site should be inspected by an appropriately qualified person such as an Environmental Consultant on an annual basis. Should asbestos be identified on the ground surface, then the appropriate procedures described above for asbestos should be implemented.

Should areas where asbestos is present or suspected to be present is to be disturbed, inspections of asbestos containing materials are to be conducted by a Competent Person (such as an occupational hygienist or licensed asbestos assessor). This will normally constitute a visual assessment and review of the condition and exposure rankings of the material, to ensure that the management strategy remains valid. Re-inspections will be performed on an annual basis (or as required with the WHS legislation) and where changes occur, the asbestos register shall be updated accordingly. Copies of previous reports documenting the presence of asbestos as well as any future investigation reports should be provided to the Site Occupier. In the event of a find, this EMP will need updating. Refer to **Procedure 05**.



Procedure 03. Unexploded Ordnance in southern portion of the site

Area Affected:	Southern burial area as shown on Figure 3D .
Responsibility:	Site Occupier or its nominee (including any nominated site manager) and Site Owner (including any future land owner).
Objective:	To protect the health and safety of workers if excavating in the southern burial area or if UXO are identified. This includes the discovery of unexploded ordnance anywhere on-site. All works are to comply with the NSW Work Health and Safety Act (2011).
Procedure:	<p>Prior to entry completing subsurface activities in the southern burial area, the engagement of a professional unexploded ordnance contractor is required to provide guidance and safeguarding prior to personnel entry. This may include but not limited to the using of metal detectors and clearance by the contractor.</p> <p>Prior to subsurface activities, appropriate personal protective equipment (PPE) must be worn include long sleeve shirts and pants, enclosed footwear and gloves. Removal of any soil in the area is only allowed with authorisation from the site owner. No excavation or transporting of soil to other areas on the site is permitted.</p> <p>If any suspected item are discovered during subsurface activities, including potential unexploded ordnance parts or complete grenades, the component should not be touched, the location recorded and photographed if practicable and safe to do so.</p> <p>The discovery must then be reported to the site owner, and disposed of by the Department of Defence; contact details: Joint Logistics Command Explosive Ordnance Disposal, Directorate of Explosive Ordnance NSW Region; Tel: 02 472 80019 Email: ORHATOEODWatchkeeper@defence.gov.au</p> <p>Defence should provide a disposal record.</p>
Frequency:	During environmental monitoring or survey works
Inspection / Reporting:	At the completion of any environmental works, inspection of the work area and reporting should be undertaken in accordance with the requirements of Procedures 05 and 06 .



Procedure 04. Unexpected Finds

Area Affected:	Entire site as shown in Figure 2 .
Responsibility:	Site Occupier or its nominee (including any nominated site manager) and Site Owner (including any future land owner).
Objective:	To ensure that a protocol has been provided should unexpected materials be found at the site.
Procedure:	<p>Unexpected situations may entail:</p> <ul style="list-style-type: none">• The uncovering of contamination than presently unknown; and• The discovery of surface contamination, including asbestos fragments, unexploded ordnance items, small arms ammunition items and soil contamination. <p>Details of the procedures that will be adopted in the event of these occurrences are defined below:</p> <p>If unexpected materials are identified, all works should be ceased and the Site Occupier or the future land owner should be contacted immediately.</p> <p>The location, form, volume, type and chemical characteristics of the material will need to be assessed by an appropriately qualified person.</p> <p>The proposed strategy to deal with the characterised material should be undertaken by an appropriate qualified person such as a professional unexploded ordnance contractor or Environmental Consultant. If latent contamination including asbestos or any other contaminant is identified it should be assessed and dealt with in accordance with the legislation and guidance detailed in Section 3, and in accordance with NSW Health and Safety Regulations (2011). If latent UXO or EOW are identified or suspected the engagement of a professional unexploded ordnance contractor is required to provide guidance on mitigation. If any suspected item is discovered the component should not be touched, the location recorded and photographed if practicable and safe to do so. The discovery must then be reported to the site owner, and disposed of by the Department of Defence. Defence should provide a disposal record.</p>
Frequency:	Upon identification
Inspection / Reporting:	Copies of all unexpected finds, assessment of finds and actions to deal with the finds should be reported and copies held by the Site Occupier, Site Owner or any future land owners. In the event of a find, this EMP will need updating.



Procedure 05. Record Keeping

Area Affected:	Entire site as shown on Figure 2 .
Responsibility:	Site Occupier or their nominee (including any nominated site manager) and the Site Owner (including any future land owner).
Objective:	Records of the implementation of the EMP are to be retained.
Procedure:	The Site Occupier shall be responsible for the maintenance of all documents relating to the implementation of the EMP. This shall include monitoring reports, additional assessments and any relevant correspondence between the Site Occupier and / or other parties (e.g. contractors, environmental consultant etc.).
Frequency:	Annually as a minimum, or as required.
Inspection / Reporting:	All records shall be retained by the Site Occupier and Site Owner, including any future land owners for a period of seven (7) years.



Procedure 06. Review of EMP Implementation

Area Affected:	Entire site as shown on Figure 2 .
Responsibility:	Site Occupier or their nominee (including any nominated site manager) and the Site Owner (including any future land owner).
Objective:	The implementation of the EMP requires revision by an appropriately qualified third party or a suitably qualified employee.
Procedure:	<p>The Site Occupier shall undertake a review of the implementation of the EMP. The review shall be undertaken by either a suitably qualified employee of the Site Occupier or a suitably qualified consultant who is recognised as being appropriately competent in the field of contaminated sites as per the criteria provided to <i>NEPC, National Environment Protection (Assessment of Site Contamination) Amendment Measure No 1, 2013</i>. Specific tasks that will be undertaken by the reviewer include:</p> <ul style="list-style-type: none">• Review of inspection reports generated by the Site Occupier and Site Owner to ensure these meet the intended scope of the EMP; and• Liaison with the Site Occupier and Site Owner as required in interpreting the requirements of the EMP. <p>The review / updates to the EMP should also include changes to the areas of known contamination.</p>
Frequency of Review:	<p>Annually.</p> <p>In addition, it should be reviewed and updated accordingly upon the completion of any of the following:</p> <ul style="list-style-type: none">• Change of land use• Additional investigations• Unexpected Finds (Procedure 04)• Vacation of site• Change in Site Occupier representative• As required to reflect changes in relevant legislation
Inspection / Reporting:	All EMP reviews shall be retained by the Site Occupier and Site Owner (including any other future land owner) for a period of seven years.



Procedure 07. Review of EMP – Site and/or Land Ownership Changes

Area Affected:	Entire site as shown in Figure 1 .
Responsibility:	Site Occupier (including any nominated site manager) and Site Owner (or any future land owner).
Objective:	The EMP requires review to ensure its continued appropriateness to be used on the site.
Procedure:	<p>The Site Occupier and Site Owner shall undertake a review of the EMP if a review is warranted (e.g. change in site ownership or site configuration). The review shall consider:</p> <ul style="list-style-type: none">• The frequency of inspections required;• Any non-compliance with the EMP that have been unable to be resolved;• Any changes in state or national environmental protection or occupational legislation or guidelines that impact any part of the EMP; or• Proposed changes in land use of the site or adjoining sites. <p>Where a review identifies items which require modification or addition to the EMP, then a revision of the EMP shall be published and made available.</p>
Frequency of Review:	If land use or land ownership changes.
Inspection / Reporting:	All EMP reviews or revisions shall be retained by Site Occupier and Site Owner (including any future land owners).



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Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
0	D Smith	H Milne		H Milne		01/07/16
1	D. Smith	H. Milne		H.Milne		15/09/16



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Appendix B

LAND PREPARATION WORKS STAGE 1 AND STAGE 2 –
REMEDIAL ACTION PLAN (GOLDER 2016C)



9 August 2016

MOOREBANK INTERMODAL COMPANY
PROPERTY WEST

Land Preparation Works Stage 1 and Stage 2 - Remediation Action Plan

REMEDIATION ACTION PLAN

Submitted to:
Tactical Group
Level 15
124 Walker Street
North Sydney NSW 2060

Report Number. 1651776-005-R-Rev0

Distribution:

Tactical Group - 1 electronic copy
EnviroView - 1 electronic copy





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MPW REMEDIATION ACTION PLAN - LAND PREPARATION WORKS

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Important Information Relating to this Report



1.0 INTRODUCTION

Tactical Group Pty Ltd (Tactical) commissioned Golder Associates Pty Ltd (Golder) to prepare a Remediation Action Plan (RAP) for the Moorebank Intermodal Terminal, located at Moorebank, NSW.

The Moorebank Intermodal Terminal project involves the construction and operation of an Intermodal terminal (IMT) facility and approximately 215,000 m² gross floor area (GFA) of warehousing. When completed the IMT facility will have the necessary infrastructure to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum.

Development of the IMT will be staged, with the remediation works included within the Moorebank Intermodal Terminal concept approval ([SSD 5066](#)¹) as “*Early Works (Stage 1)*”.

The remediation / management works generally include, the demolition and remediation of high risk infrastructure and contaminated hotspots, including:

- Underground storage tanks (USTs); and
- Contamination hotspots containing lead and hydrocarbons in soil and stockpiles containing asbestos in soils.

The remediation works will also require the implementation of management approaches to unexploded ordnance (UXO) and explosive ordnance waste (EOW) (if found) and asbestos in or on soils. The site wide approach to the management of UXO and asbestos in soils are presented in the following documents, respectively:

- “UXO Risk Review and Management Plan,” prepared by G-Tek (draft report dated 7 June 2016, reference number 14037GOLD, as amended);
- “Asbestos in Soils Management Plan,” prepared by Golder Associates (draft report dated 4 July 2016 reference number 1416224-035-R-RevA, as amended).

The Site is the subject of an environmental audit in accordance with Part 4 of the *Contaminated Land Management Act 1997*. An accredited Environmental Site Auditor, Mr Frank Mohen of AECOM Pty Ltd, has completed the review of the current site investigation documentation and prepared a Section B Site Audit Statement based on a preliminary RAP prepared by PB (2014b). For the proposed remediation activities, accredited Environmental Site Auditor, Mr James Davis of EnviroView Pty Ltd, has been appointed.

The site locality, property boundaries and an overview of the remediation areas are presented in Figures 1, 2, and 3 respectively (Appendix A), and described further in Section 2.

The remediation works are part of the wider land preparation works which are being completed in two stages, Stage 1 and Stage 2 with the Stage 1 works initially being completed within Priority Area 1 (PA1), followed by works within the remaining portions of the site, referred to as Priority Area 2 (PA2). Refer to Figure 1 in Appendix A for the PA1 and PA2 areas.

1.1 Remediation Objectives

Generally, the objectives of the remediation works is to remediate and/or manage contamination risks at the site, such that the site is suitable for the proposed commercial / industrial land use or conservation / open space land use.

1.2 RAP Purpose

The purpose of this RAP is to provide details of the remediation strategy and validation approach to render the site suitable for the proposed commercial/ industrial land use, as well facilitate the remediation required to establish a riparian conservation zone adjacent to the Georges River (ecological conservation zone).

¹ http://www.majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5066



At this stage it is not clear if public access to the riparian zone will be allowed. Should public access be allowed the areas made available to the public will need to be re-considered as recreational/open space.

This RAP documents the proposed remediation and environmental validation works associated with land preparation works including:

- A site description, a summary of the site history, site conditions and surrounding environment;
- A description of the soil contamination that has been identified within the site and the extent of remediation required;
- Identification of regulatory compliance requirements and development permissions granted for the development of the IMT;
- Documenting the nominated remediation and/or management approaches for impacted materials located at the site; and
- Identifying the suitable validation protocols, including criteria, for the remediation works.

1.3 Overview of Project Documentation

The development of the site is progressing through the statutory approvals process under both the Commonwealth and NSW Government processes. Under the Commonwealth process the project is a 'controlled action' under the Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999 (EPBC Act)* and requires approval from the Commonwealth Minister for the Environment. A final Environmental Impact Statement (EIS) has been prepared and is currently undergoing assessment (refer to <http://www.micl.com.au/environment/view-the-final-environmental-impact-statement.aspx> viewed on 04 July 2016). Under the NSW Government process a staged development approval is required. On Friday 3 June 2016, the NSW Planning and Assessment Commission approved MIC's Stage 1 State Significant Development (SSD) Concept Approval for an intermodal terminal on the MIC land at Moorebank (refer to <http://www.micl.com.au/environment/mics-concept-approval.aspx> viewed on 04 July 2016).

To satisfy the requirements of the approvals processes, Parsons Brinckerhoff Australia (PB) prepared a Phase 2 Environmental Site Assessment (ESA) report (PB, 2014a) and a Preliminary Remediation Action Plan (RAP) (PB, 2014b) for inclusion within the EIS. NSW EPA accredited Site Auditor Frank Mohen, reviewed the PB ESA and Preliminary RAP, and prepared a Section B Site Audit Statement (2012) and Site Audit Report (update in 2014). The Site Audit Statement declares that the RAP is appropriate and the IMT site can be made suitable for the proposed (commercial/ industrial) land use if the site is remediated / managed in accordance with the Preliminary Remediation Action Plan (PB, 2014b).

The overall remediation strategy presented within the Preliminary RAP (PB, 2014b), i.e. a strategy to address the identified risks while providing opportunity for containment and beneficial reuse of material on the site, was considered appropriate. However, the Preliminary RAP (2014b) presented generic approaches to remediation and validation, and if implemented (without amendment) was unlikely to efficiently achieve the overall remediation objective. The Preliminary RAP (PB, 2014b) also recommended further investigation to augment the existing environmental data. The additional investigations were substantially completed as part of the Post Phase 2 ESA investigation works completed by Golder (2015a).

As the Preliminary RAP was included within the EIS and was also subject of the Section B Site Audit Statement, it was agreed with the Auditor to retain the Preliminary RAP (PB, 2014b) in its current form and to supplement the Preliminary RAP with an additional document the Validation Plan – Principles (Golder, 2015c). The Validation Plan - Principles (Golder, 2015c) sets out the principles for validation and provides guidance for the validation strategy appropriate to support the successful completion of remediation works during specific stages of the site development.

The Validation Plan – Principles (Golder, 2015c) and Preliminary RAP (PB, 2014b) indicated that stage specific RAPs were going to be required to facilitate the staged development of the site. Subsequent to the preparation of these documents, it has been determined that the remediation works will be completed in two primary stages, with the majority of the remediation works occurring during Stage 1. The Stage 1 works will



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initially being completed within Priority Area 1, followed by works within the remaining portions of the site, (referred to as Priority Area 2). The remediation Stages include:

- Stage 1- which includes the remediation activities approved within the Moorebank Intermodal Company (MIC) Concept Plan Approval ([SSD 5066](#)²) as Early Works; and
- Stage 2 – which includes the remediation activities proposed as part of the Moorebank Precinct West Stage 2 Proposal (application number pending).

As such, there was limited benefit in preparing multiple stage specific RAPs, and an overall Land Preparation Works RAP has been prepared (*this report*).

The Validation Plan – Principles (Golder, 2015c) included an outline of additional documents expected to be either developed and /or implemented to facilitate the progression of the remediation and redevelopment of the site. The site wide documents which will require implementation include:

- Site Wide EOW and UXO Management Plan – a site wide, EOW/UXO Management Plan has been developed to ensure a safe working environment is established during the remediation and development earthworks. These are detailed in the **“UXO Risk Review and Management Plan,”** prepared by G-Tek (draft report dated 7 June 2016, reference number 14037GOLD, as amended). The UXO Management Plan also includes protocols for un-expected finds of UXO / EOW during future development earth works. It is expected that where warranted the UXO / EOW will be updated based on experience/learnings from earlier stages and reissued as each stage of development is completed. *Subsequently, reference should be made to UXO / EOW for the preferred approaches to the management of UXO / EOW, and actions associated with the management of UXO / EOW have been excluded from this RAP.*
- Site Wide Asbestos in Soils Management Plan (AMP) – a site wide plan has been developed to ensure a safe working environment is established during the remediation and development earth works **“Asbestos in Soils Management Plan,”** prepared by Golder Associates (draft report dated 4 July 2016 reference number 1416224-035-R-RevA, as amended). The AMP presents the most up to date information available on asbestos in or on soils across the site, and defines the actions, roles and responsibilities associated with the remediation and management of asbestos in or on soils during the proposed development works. The AMP includes consultation requirements, licencing requirements, health monitoring and air monitoring requirements. The AMP also includes protocols for un-expected finds of asbestos during future development earth works. It is expected that where warranted the AMP will be updated based on experience/learnings from earlier stages and reissued as each stage of development is completed. *Subsequently, reference should be made to the AMP for the preferred approaches to the remediation and or management of asbestos in soils, and actions associated with the remediation of asbestos in soils have been excluded from this RAP. Notwithstanding this, the remediation and management required in the AMP are considered to be remediation tasks required to be completed and validated, prior to a Site Audit statement being prepared, i.e. consistent with the other remediation/management tasks nominated within this RAP.*
- Earthworks Specification – a site wide earth works specification has been developed to define the geotechnical requirements of any earthworks on the site such that an imported fill platform (The Earthworks Platform) is established to facilitate the proposed commercial / industrial development of the site. These are detailed in the **“MIC Stage 2 – Earthworks Specification,”** prepared by Golder Associates (draft report dated 29 June 2016, reference number 1416224-034-R-RevA). *Subsequently, while general reference is included in this RAP with regards to the verification of imported materials, requirements associated with the geotechnical management of remediation earthworks have been excluded from this RAP.*

The documents which will require development and implementation include:

² http://www.majorprojects.planning.nsw.gov.au/index.pl?action=view_job&job_id=5066



- Construction Environmental Management Plan (CEMP) – a CEMP will need to be developed by the Principal Contractor specific to each stage of remediation and or development. Where required the CEMP will draw on the processes described in the Preliminary RAP (PB, 2014a), the Validation Plan - Principles and the Remediation Specification (Golder 2015c), as well as this Land Preparation Works RAP. Furthermore the CEMP will need to follow the requirements of the site wide EOW/UXO and Asbestos in Soils management plans. The CEMP must also stipulate the actions to be taken should additional contamination be identified during the development of the site (i.e. an unexpected finds protocol) and must include a waste management plan and materials tracking plan.
- Stage specific Remediation and Validation Reports (RVR) – at the appropriate time, a RVR will be prepared for a development area. These reports will document the remediation and validation activities completed within a specific area or across the site. These reports will facilitate the Auditor's review of the remediation and validation activities;
- Long Term Environmental Management Plan (LTEMP) – a site wide LTEMP will need to be developed for any remedial or mitigation measures implemented during the remediation that requires ongoing maintenance/monitoring. The LTEMP will also stipulate the actions to be taken should additional contamination be identified during the post development occupation of the site (i.e. an unexpected finds protocol and UXO/EOW response plan). It is expected that where warranted the LTEMP will be updated and reissued as each stage of development is completed.



2.0 BACKGROUND

2.1 Site Identification

Table 1 summarises the site identification information, the site and the associated property boundaries are shown on Figure 2

Table 1: Site Identification

Item	Details
Address	Moorebank Avenue, Moorebank, NSW
Title Identification Details/ Legal Description	Portion of Lot 1, DP1197707, MIC Property West (MPW) and Lot 100 and Lot 101 DP1049508, Northern Commonwealth Land.
Local Government Authority (LGA)	Liverpool
Total IMT Site area	Approximately 230 hectares

2.2 Site Description

The site is generally bounded by the Georges River to the west, Moorebank Avenue to the east, the East Hills Railway Line to the south and the M5 Motorway, and industrial properties to the north. It is located on Moorebank Avenue, Moorebank and forms portion of Lot 1 in Deposited Plan (DP) 1197707, which is leased from the Commonwealth by the MIC. The site also contains Lots 100 and 101 DP1049508, which are located north of Bapaume Road and west of Moorebank Avenue.

The key existing features of the site are:

- Relatively flat topography, with the western edge flowing down towards the Georges River, which forms the western boundary to the MPW site;
- A number of linked ponds in the south-west corner of the site, within the existing golf course, that link to Anzac Creek, which is an ephemeral tributary of the Georges River;
- An existing stormwater system comprising pits, pipes and open channels;
- Direct frontage to Moorebank Avenue, which is a publicly used private road, south of Anzac Road and a publicly owned and used road north of Anzac Road;
- The majority of the site has been developed and comprises low-rise buildings, including warehouses, administrative offices, operative buildings, residential buildings, access roads, open areas, landscaped fields for the former School of Military Engineering (SME) and the Royal Australian Engineers (RAE) Golf Course and Club. Defence has since now vacated the site. All buildings on the site are currently unoccupied and will be removed during the Stage 1 works;
- Native vegetation is scattered across the site and borders the majority of the western edge of the site; and
- The riparian area of the Georges River lies to the west of the site and contains a substantial corridor of native and introduced vegetation. The riparian vegetation corridor (generally 25 metres wide) provides a wildlife corridor and a buffer for the protection of soil stability, water quality and aquatic habitats. This area has been defined as a conservation area as part of the MPW Concept Plan Approval (refer to Figure 2).

As stated above, the majority of the site has been developed, however heritage and biodiversity values still remain on the site;

- A strip of land (up to approximately 250 metres wide) along the western edge of the MPW site lies below the 1% annual exceedance probability (AEP) flood level; and



- The site is leased from the Commonwealth by the MIC and subleased by SIMTA. The site has previously been occupied by the Department of Defence, comprising the SME and other minor Defence units. These have been relocated as part of the Moorebank Units Relocation project, with the SME relocated to Holsworthy Barracks.

A number of residential suburbs are located in proximity to the site, including:

- Wattle Grove, located approximately 1,000 m from the site to the east. The Rail link, which will be used during operation of the Proposal is 1,260 m to the west of Wattle Grove at its closest point
- Moorebank, located approximately 630 m to the north.
- Casula, located approximately 330 m from the site to the west.
- Glenfield, located approximately 820 metres from site to the south-west.

2.3 Site History

A detailed history of the site is presented in the Phase 1 Environmental Assessment complete by PB (PB, 2014a), which is augmented with additional investigations completed by Golder in 2015 (Golder, 2015a).

In summary the earliest available aerial photographs, from the 1930's, show the land to be cleared bushland and fields up to the edge of the Georges River. There are small tracks and paths across the site and meandering streams cross the IMT site, with Moorebank Avenue is present in the photograph. By 1956, the military facility had been developed, comprising Steele Barracks and the Defence National Storage Distribution Centre (DNSDC) on the eastern side of Moorebank Avenue.

In the period between 1956 and approximately 1995 the site was predominately used for military training purposes, as the School of Military Engineering (SME). The activities on the base included various schools, and training facilities. These included;

- Heavy vehicle training (including maintenance and operation);
- Bridge building and waterman ship training;
- Explosive detection and disposal training including dog training and handling facilities; and
- Firefighting training activities.

Over the period of use the site included several stages of redevelopment with the most recent completed in the 1990's. As of April 2015, the military units on the SME site had vacated the site relocating to new facilities at Holsworthy in preparation for the proposed change in land use from a military facility to the proposed intermodal terminal.

2.4 Surrounding Environment

The adjoining land uses are as follows:

- North: Commercial / industrial land use, including ABB Australia Pty Limited and park land including Rifle Range Park.
- South: East Hills Railway Line followed by Defence land.
- East: Moorebank Avenue followed by the former Defence National Storage and Distribution Centre (DNSDC), which is owned by SIMTA. This area will be included within the wider IMT precinct development.
- West: Georges River followed by a variety of land uses including park land (Leacock Regional Park), Casula Powerhouse, Casula train station, a railway line and Glenfield Landfill.



2.5 Geology

The published 1:100,000 Penrith Geological Map (NSW Department of Minerals, 1991) indicates that the site is underlain by Tertiary fluvial (river) deposits (Ta) of Pliocene age with terraces of more recent Quarternary (Holocene) age (<10,000 years) fluvial and estuarine deposits (Qha) adjacent to the Georges River. The geological map indicates that the underlying rock conditions in the area are either Triassic Hawkesbury Sandstone (Rh) or Ashfield Shale (Rwa). In general, the Ashfield Shale occurs in areas of higher elevation, where it forms a cap over the Hawkesbury Sandstone. Geological conditions at the IMT site are discussed in further detail in the Geotechnical Interpretive Report (doc ref. 147623070-011-R-RevA, Golder 2014).

2.6 Hydrogeology

There are two main aquifer systems on the site, a shallow system within alluvial soils and a deeper regional aquifer within the bedrock. Based on contouring of the gauging results from previous groundwater monitoring events undertaken on the IMT site (PB, 2014a), groundwater in the shallow alluvial aquifer generally flows towards the Georges River. Groundwater levels in the shallow aquifer have historically been between approximately 2 m Australian Height Datum (mAHD) nearest to the Georges River and 6 mAHD on the terrace in the eastern portion of the IMT site.

2.7 Surface Water

The dominant water feature of the area is the Georges River which is adjacent to the western boundary of the Project site.

Within the Project site there is a small creek (Anzac Creek) which flows through the golf course to the north east away from the Georges River (east), prior to re-joining the river at Lake Moore, located approximately 1.8 km north east of the Project site. There are also some small dams in the northern part of the Project site including Lake Sisinyak and dams which form part of the golf course in the southern part of the site. A number of drainage systems in the northern part of the Project site drain west towards Georges River including a concrete lined channel.

2.8 Acid Sulfate Soils

The Australian Soil Resource Information System (ASRIS) indicates that the majority of the IMT site has no known occurrence of Acid Sulfate Soils (ASS). A small western portion of the IMT site located on the flood plain and a small north-eastern portion of the IMT site both have a low probability of ASS, and the area immediate surrounding Georges River has a high probability of ASS.

It is noted that, based on the results of the PB (2014a) assessment, there is potential for acid sulphate soils to exist on the IMT site. These were investigated further during the Golder (2015a) investigation, and it was concluded that the acidic soils did not appear to be associated with the oxidation of sulphide minerals. The source of acidity was not known, however, the acidic soils will require management during construction. It is envisaged that the management of the acidic soils will be addressed within the Construction Environmental Management Plan.



3.0 REMEDIATION REGULATORY REQUIREMENTS

3.1 *Environmental Protection and Biodiversity Conservation Act, 1999 (EPBC Act)*

Under the Commonwealth process the wider development project (inclusive of the remediation activities) is a 'controlled action' under the Commonwealth *Environmental Protection and Biodiversity Conservation Act, 1999 (EPBC Act)* and requires approval from the Commonwealth Minister for the Environment. Under the NSW Government process and staged development approval will be sought under the NSW approvals process as a State Significant Development (SSD) under the *NSW Environmental Planning and Assessment Act 1979 (EP&A Act)*.

3.2 *Contaminated Land Management Act 1997*

In NSW, the management of contaminated land is shared by the NSW EPA, the NSW Department of Planning & Infrastructure (NSW DoPI) and planning consent authorities (usually local councils).

Under the *Contaminated Land Management Act (CLM Act) 1997*, the NSW EPA regulates contaminated sites where the contamination is Significant Enough to Warrant Regulation (SEWR). Contaminated sites that are not regulated by the NSW EPA are managed by local councils through land use planning processes (such as change of land use, or some remediation works).

The NSW EPA also administers the NSW Site Auditor scheme under Part 4 of the *CLM Act*. The NSW EPA accredits individuals under the Act as Site Auditors to provide independent review of work conducted by contaminated site consultants.

3.2.1 *Guidelines under the CLM Act*

Section 105 of the CLM Act allows the EPA to make or approve guidelines connected with the objectives of the CLM Act. These guidelines must be taken into consideration by the EPA and by accredited site auditors when conducting a site audit.

The current list of guidelines made or approved by the EPA under the CLM Act are available on the NSW EPA <http://www.epa.nsw.gov.au/clm/guidelines.htm>.

The NSW EPA approved guidelines include the national guidance on the assessment of contaminant concentrations on sites is presented in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 2013), herein referred to as the ASC NEPM (NEPC, 2013). The ASC NEPM (NEPC, 2013) present generic Tier 1 trigger values for contaminant concentrations in both soil and groundwater. These are derived based on exposure settings for particular land uses such as low and high density residential; recreational/open space; and commercial / industrial land uses.

As the site is proposed for commercial / industrial purposes it is considered appropriate to compare the results of soil analysis against the investigation levels for commercial / industrial land. The western portion of the site, immediately adjacent to the Georges River, will be retained and rehabilitated as a natural riparian conservation zone. At this stage it is understood public access to the riparian zone will be restricted. However, as a conservative approach, it has been assumed that public access may be allowed, as such the health investigation levels for the recreational/open space exposure setting will be applied. The adopted screening criteria are discussed in greater detail in Appendix C and proposed conservation zone where open / space land use is shown on Figure 3.

3.3 *Environmental Planning and Assessment Act 1979*

Under the NSW Government process and staged development approval will be sought under the NSW approvals process as a State Significant Development (SSD) under the *NSW Environmental Planning and Assessment Act 1979 (EP&A Act)*.



3.3.1 SEPP 55 – Remediation of Land

The *State Environmental Planning Policy No. 55 (SEPP 55) – Remediation of Land* under the *Environmental Planning and Assessment Act (EP&A Act) 1979* provides a state wide planning approach for the remediation of contaminated land. In particular, *SEPP 55* provides for Category 1 and Category 2 remediation. Projects classified as Category 1 require development consent.

On Friday 3 June 2016, the NSW Planning and Assessment Commission approved MIC's Stage 1 State Significant Development (SSD) Concept Approval for an intermodal terminal on the MIC land at Moorebank (refer to <http://www.micl.com.au/environment/mics-concept-approval.aspx>). As the works are included within a development for which requires development consent, the works are considered Category 1 remediation works, and the Stage 1 remediation was approved under the *Early works* component of the MIC SSD Concept Approval.

3.4 Protection of the Environment Operations Act 1997

The *Protection of the Environment Operations Act 1997 (NSW) (POEO Act)* is the key piece of environment protection legislation administered by the NSW EPA.

The POEO Act provides a single integrated licensing arrangement to control the air, noise, water and waste impacts of an activity. The NSW EPA is the regulatory authority for the licensing of activities specified under Schedule 1 of the *POEO Act* (scheduled activities) and in most cases councils are the regulatory authority for non-scheduled activities. Licences can also be issued to regulate water pollution from activities that are not in Schedule 1. Such licences can provide protection against prosecution for water pollution if the licence conditions are complied with.

An Environmental Protection Licence (EPL) is required for contaminated soil treatment where it treats contaminated soils originating exclusively on site and it has the capacity;

- To incinerate more than 1000 m³ per year of contaminated soils;
- To treat and store more than 30,000 m³ of contaminated soil; or
- To disturb more than an aggregate area of more than 3 ha of contaminated soil.

The total volume of “contaminated soils” associated with the USTs, and hotspots is expected to be less than the above mentioned volumes. However, an EPL will be required if the contamination assessment and treatment area (CATA) is used to process geotechnically unsuitable materials extracted from the anthropogenic fill areas and the stockpile areas, as the areas and volumes will exceed the above mentioned thresholds. The CATA will need to be licenced Schedule 1 parts 15 Contaminated Soil Treatment and part 16 Crushing, grinding and separating.

The *POEO Act* also provides the key mechanisms (including the issuing of three types of environment protection notices including: clean-up, prevention and prohibition notices) for protecting the environment. It also provides the regulatory regime for waste management under the *Protection of the Environment Operations (Waste) Regulation 2005 (Waste Regulation)*.

All remediation works completed at the site will be conducted in compliance with the relevant requirements of the *POEO Act*.

3.4.1 Protection of the Environment Operations (Waste) Regulation 2005

The following outlines the required documentation and approvals required for the handling, off site transport and disposal of waste during the remediation works in accordance with the *Protection of the Environment Operations (POEO) (Waste) Regulation 2005* and the *POEO Act 1997*.

The *POEO Act* defines **waste** as:

- a) any substance (whether solid, liquid or gaseous) that is discharged, emitted or deposited in the environment in such volume, constituency or manner as to cause an alteration in the environment, or



- b) any discarded, rejected, unwanted, surplus or abandoned substance, or
- c) any otherwise discarded, rejected, unwanted, surplus or abandoned substance intended for sale or for recycling, processing, recovery or purification by a separate operation from that which produced the substance, or
- d) any processed, recycled, re-used or recovered substance produced wholly or partly from waste that is applied to land, or used as fuel, but only in the circumstances prescribed by the regulations, or
- e) any substance prescribed by the regulations to be waste.

A substance is not precluded from being waste for the purposes of this Act merely because it is or may be processed, recycled, re-used or recovered.

Waste Classification

Wastes need to be characterised in accordance with the NSW EPA (DECCW, NSW, November 2014) *Waste Classification Guidelines, Part 1: Classifying Waste*. The following characteristics of the waste must also be determined:

- The form of the waste (the physical state e.g. solid);
- The waste code;
- The waste description; and
- The Dangerous Goods properties (if applicable).

Waste classification is a six step process, which includes answering the following questions:

- 1) *Is the waste special waste?* – This includes determining if the waste is asbestos waste, which are defined as “Any waste that contains asbestos,”
- 2) *Is the waste liquid waste?*
- 3) *Is the waste pre-classified?* – This includes waste [gazetted](#)³ by the NSW EPA in particular pre-classifications, such as building and demolition waste, and virgin excavated natural materials.
- 4) *Does the waste possess hazardous characteristics?* – Which stipulates a waste must be classified ‘hazardous waste’ if it is a dangerous good under the Transport of Dangerous Goods Code.
- 5) *Determine a waste classification using chemical assessment.*
- 6) *Is the waste putrescible or non-putrescible?*

If an immobilisation approval applies to a waste, a generator who complies with the terms of that approval may classify the waste as set out in the approval, rather than the Waste Classification Guidelines.

Where it can be demonstrated that a specific type of waste can safely be used for another purpose, rather than being disposed of in accordance with the waste regulations, the NSW EPA may grant permission for that waste to be used for the specific purpose, subject to strict conditions. In these cases, the NSW EPA will issue a [resource recovery order](#) and [resource recovery exemption](#)⁴. These are to be considered within the waste classification process.

Waste Transport Requirements

Under Schedule 1, Part 2 of the *POEO Act 1997* the transport of several classifications of waste in loads exceeding 200 kilograms is declared to be a scheduled activity for which a licence is required. As such the

³ <http://www.epa.nsw.gov.au/waste/types.htm>

⁴ <http://www.epa.nsw.gov.au/wasteregulation/orders-exemptions.htm>



proposed transport of the selected wastes from the site to off-site disposal facilities will require the use of licensed transporters.

Under the POEO (Waste) Regulations 2014 the proximity principle was introduced which makes it an offence to transport waste generated in NSW by motor vehicle for disposal more than 150 kilometres from the place of generation, unless the waste is transported to one of the two nearest lawful disposal facilities to the place of generation.

Waste Tracking Requirements

The *POEO (Waste) Regulation 2005* specifies requirements for the tracking of waste both within NSW and interstate. The wastes that must be tracked are listed in the Schedule 1 of the Regulation (this Schedule includes soil contaminated with waste oil/ water, hydrocarbons/ water mixtures or emulsions).

A NSW EPA on line tracking system is available to track waste that is transported within NSW or into NSW from other states or territories.

Waste Disposal Facilities Licences

Before wastes are transported from the site, it is necessary to confirm that the facility (e.g. landfill/ recycling facility) where the waste is being transported to is legally able to accept the waste. These include facilities licenced to receive and process soils.

Waste Records

If not using an approved on line tracking system records must be maintained of the waste transport certificates for at least four years. The use of the NSW EPA on line tracking system removes the requirement to maintain these records.

3.5 Work Health and Safety Act 2011

The *Work Health and Safety Act 2011* (NSW) (*WHS Act*) is the key piece of work safety legislation administered by SafeWork NSW, and provides the regulatory mechanism for the management of asbestos within NSW. Those specific to the management of asbestos include, but are not limited to:

- Work Health and Safety Act & Regulation 2011.
- SafeWork NSW Code of Practice – How to manage and control asbestos in the work place, 2011
- SafeWork NSW Code of Practice – How to safely remove asbestos, 2011
- SafeWork NSW Code of Practice – Work Health and Safety, Consultation, Co-operation and Co-ordination, 2011
- SafeWork NSW Guidelines – Managing asbestos in or on soil, 2014
- AS 1715 - 2009 Selection use and maintenance of respiratory protective devices;
- AS 1716 - 2012 respiratory protective devices;
- AS/NZS 2161.1:2000 Occupational protective gloves - Selection, use and maintenance.
- AS/NZS 2161.2:2005 Occupational protective gloves - General requirements
- Department of Environment, Climate Change (EPA 2014) and Waste Classification Guidelines Part 1: Classifying Waste.
- Western Australia Department of Health (WA DOH, 2009), *Guidelines for the assessment, remediation and management of asbestos contaminated sites in Western Australia*.

3.5.1 Asbestos Removal / Assessor Licensing

A person must hold the following to conduct asbestos removal works:



- Class A – to remove friable asbestos, which allows removal of friable asbestos, non-friable asbestos and any asbestos contaminated dust or debris (ACD).
- Class B – to remove non friable asbestos, which allows removal of non-friable asbestos, and only contaminated dust or debris (ACD) that is directly associated with the removal of non-friable asbestos.
- A person must hold an asbestos assessor licence to conduct the following: Air monitoring for Class A asbestos removal work
- Clearance inspections for Class A asbestos removal work
- Issuing clearance certificates in relation to Class A asbestos removal work.

3.5.2 Regulator Notification and Removal Control Plan

The regulator must be notified in writing at least five days before licensed asbestos removal work commences. It is the responsibility of the Licenced Asbestos Removal contractor to prepare the asbestos removal plan and submit the required removal notifications.



4.0 CONTAMINATION STATUS

4.1 Previous Investigations

A number of environmental investigations have been previously carried out at the site (refer to **Table 2**). Earth Tech (2006) included a comprehensive review of investigations completed prior to its 2006 Stage 2 investigation, and PB (2014a) included a detailed review of the Earth Tech investigation and partial reviews of other selected investigations completed prior to the Earth Tech (2006) report.

Table 2: Previous Investigations

Author	Report Title
Groundwater Technology (1994)	Environmental Site Assessment
Dames and Moore (1996)	Environmental Management Plan and Environmental Audit
CMPS&F, July (1998)	School of Military Engineering (SME) and adjoining areas, Preliminary Environmental Investigation
Egis Consulting Australia (2000)	Stage 1 Preliminary Site Investigation, Moorebank Defence Site
HLA Envirosciences (2002)	Soil & Groundwater Investigation Precinct H (DNSDC) Moorebank Defence Land
HLA (2003)	Preliminary Groundwater Study, Moorebank Defence Land (2003)
URS (2003)	Investigation of Potential Sources of TCE, North West Precinct of Moorebank Defence Lands
GHD (2003)	Asbestos Report and Register for the Liverpool Military Area, Updated Registers
GHD (2004a)	Estimated Asbestos Removal and Reinstatement Costs, Liverpool Military Area
GHD (2004b)	Groundwater Investigation of the North Western Portion of the Moorebank Defence Land
GHD (2005)	Proposed Intermodal Freight Hub, Moorebank, Summary of Environmental Planning Reports
HLA Envirosciences (2005)	AST and UST Management Plan, Volume 10, Sydney West Defence Region
Earth Tech (2006)	Stage 2 Environmental Investigation
ERM (2006)	Technical Advice Document, related to Earth Tech (2006) Stage 2 Environmental Investigation
HLA Envirosciences (2006)	Defence Integrated Distribution System (DIDS) Baseline Investigation
GHD (2006)	Proposed Inter-modal Freight Hub Moorebank – Summary of Environmental Planning Reports
G-tek (2011)	Explosive Ordnance Assessment and Safeguarding, Moorebank Intermodal Terminal – Post Activity Report
Parsons Brinckerhoff (2011)	Moorebank Intermodal Terminal - Geotechnical Investigation Report (document no. 2103829A_PR_036)**
Parsons Brinckerhoff (2013)	Steele Barracks Moorebank – Dust Bowl Asbestos Management Plan
Parsons Brinckerhoff (2014a)	Phase 2 Environmental Site Assessment, Moorebank Intermodal Terminal (document no. 2103829A-CLM-REP-1 Rev B)
Parsons Brinckerhoff (2014b)	Preliminary Remedial Action Plan (RAP), Moorebank Intermodal Terminal (document no. 2189293C-CLM-REP-2 Rev C) – <i>included within PB 2014a</i>



Author	Report Title
Parsons Brinckerhoff (2014c)	Phase 1 Environmental Site Assessment, Moorebank Intermodal Terminal (document no. 2103829C-CLM-REP-3321 Rev C) – <i>included within PB 2014a</i>
AECOM (2014)	Site Audit Report and Site Audit Statement, Moorebank Intermodal Terminal, Moorebank, NSW (document no. 60327260_SAR_10JUL2014)
Golder (2015a)	Post Phase 2 Environmental Site Assessment Moorebank Intermodal Terminal (document reference: 147623070-019-Rev0)
Golder (2015b)	Remediation and Demolition Specification Moorebank Intermodal Terminal (document reference: 147623070-023-Rev0)
Golder (2015c)	Validation Plan - Principles Moorebank Intermodal Terminal (document reference: 147623070-022-Rev1)
Golder (2015d)	Onsite Quantitative Human Health Risk Assessment Moorebank Intermodal Terminal (document reference: 147623070-043-R-Rev1)
Golder (2016b)	Preliminary Site Investigation – Moorebank Ave Moorebank Intermodal Terminal (document reference 147623070-50-R-Rev1)
Golder (2016c)	Moorebank Avenue Site Management Plan – Moorebank Intermodal Terminal (document reference 147623070-052-Rev0)

** - Includes soil data pertinent to geochemical assessment and contamination management.

4.2 Summary of Previous Investigations

Earth Tech (2006) completed intrusive investigations at 39 areas of interest, these areas were primarily based on the Egis (2000) Stage 1 Preliminary Site Investigations, however also included information from the other reports reviewed and information gathered during the investigations. Based on the results of the intrusive investigations, Earth Tech (2006) qualitatively assessed the risks associated with each area of interest using the Defence Contamination Risk Assessment Tool (C-RAT), and remedial or management actions were recommended for 12 areas of interest.

The PB (2014c) Phase 1 investigation identified 28 areas of potential concern, most of which were areas of interest or an amalgamation of areas of interest identified by Earth Tech (2006). PB (2014c) identified several additional areas of interest, however, the majority of these were considered low risk. The PB Phase 2 (2014a) also included several additional areas not identified during the PB Phase 1 (2014c) and additional investigation locations to assess offsite sources, or improve the general site assessment coverage.

The Golder 2015 Post Phase 2 investigations were focused on the key data gaps identified in the PB Preliminary RAP (PB, 2014b), as well as the requirement to acquire additional information for the Demolition and Remediation Specification. As part of the investigations, several data gaps additional to those identified in the Preliminary RAP (PB, 2014b) were identified, including the assessment of the former Viet Cong training village, the former Plant Roads and Airfield (PRA) yard, the assessment of potential fill areas in the northwest corner of the current parade ground, and a filled draining channel north of the museum storage area.

The Preliminary RAP (PB, 2014b) and the Golder Validation Plan Principles (Golder 2015c) included a critical review of the historical investigations with reference to the proposed land use, and identified the areas warranting direct remediation, which are discussed further within Section 5.1. This assessment included a review of the use of the riparian zone for public recreation, in particular a public path or walk way. The review completed by Golder (2015c) did not identify areas warranting direct remediation, with the exception of the hot spot identified in the northern portion of the dust bowl, which has been included within this RAP.

In 2016, Golder completed a preliminary site investigation (PSI) for the current Moorebank Avenue alignment (Golder, 2016), located along the eastern boundary of the site. The PSI identified the presence of Light Non Aqueous Phase Liquids (LNAPL) beneath Moorebank Avenue, and beneath the eastern portion of the site



down gradient of the former DNSDC refueling facility. The PSI included a review of reports prepared by GHD on behalf of the Department of Defence. The GHD investigations identified the former DNSDC refuelling facility as the source of hydrocarbon contamination in the area. The historic use of the facility for vehicle refuelling has resulted in the release of hydrocarbons into the underlying groundwater and the hydrocarbons have migrated beneath Moorebank Avenue and beneath the eastern portion of the MIC West property (near the former entrance to the SME). The primary contaminants of potential concern include the following (GHD, 2015a) and are associated with typical Australian petroleum mixtures:

- Total reportable hydrocarbons (TRH);
- Benzene, toluene, ethyl benzene, xylene (BTEX);
- Naphthalene;
- Lead; and
- Polycyclic Aromatic Hydrocarbons

The GHD investigations have determined that the LNAPL below Moorebank Avenue is likely to be associated with diesel fuels. The extent of the LNAPL plume has been delineated and includes the foot print of the former refuelling station, portions of the SIMTA property to the east of the refuelling station, a portion of Moorebank Avenue and a small portion of the MIC West property. Based on the Golder (2016b) investigations in 2016 (which were completed approximately eight months after the MPVE trials were completed in the area) the LNAPL was measured at approximately 1.76 m apparent thickness in monitoring well GW120 located near the former entrance to the SME (MIC Property West) at approximately 6.5 m depth below ground level (Golder, 2016).

Golder (2016b) reported that GHD had been commissioned by Defence, to undertake the remediation of the former DNSDC Refuelling Facility in accordance with the RAP prepared by GHD. These works are scheduled to be completed over a 12 - 18 month period commencing in June 2016. At the time the Golder (2016) report was prepared, it was understood there is no active remediation proposed within the Moorebank Avenue nor the MIC Property West (MPW), however, it was understood that this was going to be reviewed by GHD during the remediation activities. Golder (2016b) reported that, the proposed Multi Phase Vapour Extraction (MPVE) remediation activities will be extended to the off-site impacts (H. Milne, GHD 2016 *pers. Comm.* 28 April). It is also understood the remediation works will be reviewed by Accredited Contaminated Site Auditor (Andrew Lau from JBS&G), and that a Site Audit Statement will be prepared at the completion of the works.

Subsequently, Golder prepared a site management plan (SMP) for the portion of Moorebank Avenue above the LNAPL plume (Golder 2016c). The SMP provides controls to minimise to an acceptable level the human health risks associated with the LNAPL plume until such time that the remediation works being completed on behalf of Defence have been completed. The boundaries of the SMP are restricted to the Moorebank Avenue, and do not extend to the portion of the site underlain by LNAPL.

4.2.1 Previous investigation Study Boundaries

The Post Phase 2 ESA (Golder, 2014a) included several key data gaps that were considered outside the scope of this assessment, and subsequently not warranting further investigation at the time. These were relevant to the remediation activities but were considered to be subject to finalisation of detailed design or were to be addressed under separate cover as discussed below:

- *Surface water quality, to gather data to inform management of dewatering / discharges anticipated to be required to achieve the build design* – identified in the PB RAP (2014b)

The dewatering / discharge requirements (if any) to achieve the build design will be subject to the Precinct detailed design. It is not considered a remediation activity. Hence it is considered premature to complete additional surface water quality sampling as part of the remediation works, however will require consideration as part of the general redevelopment of the site;



■ *PFAS Investigations*

The previous investigations have identified PFAS as chemicals of concern on the site, particularly in the former fire training area and the southern dust bowl. PFAS chemicals are an emerging chemical of concern and the approach to assessment and remediation is still developing and Australian criteria are under discussion. Additional investigations of the use and distribution of PFAS chemicals is being completed under a separate cover, and where required, a routine monitoring regime will be established as part of the Long Term Environmental Management Plan (LTEMP).

4.3 Contaminants of Potential Concern Investigated

The contaminants of interest assessed during the previous investigations have included:

- Total Recoverable Hydrocarbons (TRH) and Total Petroleum Hydrocarbons (TPH), including light non-aqueous phase liquids (LNAPL);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX compounds);
- Heavy metals / metalloids (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Polycyclic aromatic hydrocarbons (PAHs);
- Polychlorinated biphenyls (PCBs);
- Volatile organic compounds (VOCs);
- Semi volatile organic compounds (SVOCs);
- Asbestos;
- Perfluoroalkyl and polyfluoroalkyl substances (PFAS), (associated with Aqueous film forming foams (AFFF));
- Organophosphate pesticides (OPPs) and organochlorine pesticides (OCPs);
- Explosives, including residues and un-exploded ordnance (UXO); and
- Formaldehyde.

4.4 Key Contamination Issues

A summary of key contamination issues identified on the site and their distribution in the various environmental media at the site is summarised in Table 3. Based on the current information, the following key contamination risks and data gaps warrant specific discussion. The extent of areas that have been identified for management or remediation are discussed in Section 5.1.

- **Buildings** - A restricted number of the samples were taken beneath the site buildings or associated underground services, and it is considered that the identified contamination may be an underestimate. Although a limited number of samples have been assessed within or beneath buildings, the majority of activities on the site had low risk activities. However, pits, pipes and soil associated with buildings used for higher risk activities (i.e. workshops, hazardous goods stores etc.) is potentially contaminated. Therefore, additional soil investigation or remediation / management with associated validation is warranted following demolition.
- **Underground Services** - There is limited information on underground services including drains, historic water pipes and electrical cables which have potential to be constructed with hazardous materials or were used to convey contaminated substances. Services may comprise asbestos, asbestos conduit or include contaminated substances or hazardous materials (i.e. PCB cable fluid, or hydrocarbon impacted water). Therefore, additional soil investigation are warranted and proposed following demolition of the infrastructure.



- **Anthropogenic fill materials** - The proposed land use is predominantly commercial and industrial, and the validation of the site involves soil sampling and the assessment of the chemical concentrations against guidelines appropriate for the intended use of the site. However, buried waste materials have been identified (referred to as anthropogenic fill materials, and are identifiable through the presence of waste materials, odour and discolouration), and these materials may be physically/structurally unsuitable to remain in their current location (i.e. may be geotechnically unsuitable), although they may represent a low, acceptable contamination risk. This may result in a large volume of materials requiring onsite management and possible geotechnical rectification. Nevertheless, due to the heterogeneous nature of the waste materials, additional contaminated materials may be identified during the management and geotechnical rectification process.
- **Asbestos in or on Soil** – Asbestos has been identified in the soil on the site, however, its' distribution does not appear to be related to particular areas, or particular activities on the site. The asbestos identified is predominately asbestos containing materials (ACM), and was detected in the shallow soils. Management of potential asbestos finds needs to address worker health and safety, and provide practical materials handling protocols. The potential for encountering previously identified asbestos in wastes and soil will be managed through the Asbestos in Soils Management Plan (AMP). The AMP (Golder 2016a) provides a detailed assessment the stockpiled materials. The AMP also includes detailed descriptions on the preferred approaches to the remediation and /or management of asbestos in soils at each of these areas. Subsequently, reference should be made to AMP for the preferred approaches to the remediation and or management of asbestos in soils, and actions associated with the remediation of asbestos in soils have been excluded from this RAP.
- **Perfluoroalkyl and polyfluoroalkyl substances (PFAS)** – PFAS have been identified in the groundwater. There is growing public and regulator awareness of the issues associated with PFAS and the regulatory approach to PFAS is currently in development. The impacts may require future management, and further assessment being completed under a separate cover to determine if the identified impacts warrant direct remediation or management. As such it is recommended that PFAS concentrations identified during the remediation works be assessed and where required, a routine monitoring regime be established as part of the Long Term Environmental Management Plan (LTEMP).
- **VOCs** - Trichloroethylene (TCE) and cis-1,2-dichloroethene (cis DCE) were identified in soil and groundwater in the north western portion of the site. The reported shallow soil concentrations were below the tier 1 screening criteria and therefore considered to be low and acceptable. Vapour intrusion modelling was undertaken to potential assess risks posed by volatile chemicals to the identified populations where a complete exposure pathway was identified (Golder, 2015d). Vapour modelling was carried out to evaluate the following scenarios:
 - **Commercial Worker:** inhalation outdoors from maximum on-site soil vapours concentrations, and the risks were considered low and acceptable for commercial workers.
 - **Intrusive Worker:** inhalation in a trench evaluated using maximum on-site soil vapour concentrations, and the risks were considered low and acceptable for intrusive maintenance workers.

A separate assessment of general public outdoors was not directly undertaken. However, the evaluation of inhalation for commercial workers and an intrusive maintenance worker is considered sufficiently conservative to also provide an assessment for members of the general public.

Overall the risks associated with the VOCs were considered low and acceptable for the proposed open space land use including roads, road verges and woodland/riparian conservation areas. The Tier 2 QRA was based on the assumption that impacted area is not going to become a permanent place of work (i.e. no buildings are to be constructed in the area). If the site layout or use changes to include the construction of buildings with or a permanent workspace then the risk assessment will need to be revised, and direct remediation or management actions undertaken.



- **Light Non Aqueous Phase Liquids** – The investigations have determined that LNAPL is present beneath Moorebank Avenue and the eastern portion of the site. The LNAPL is likely to be associated with diesel fuels and is sourced from the former DNSDC refuelling facility located on the SIMTA property. Based on the Golder (2016b) investigations in 2016 (which were completed approximately eight months after the MPVE trials were completed in the area) the LNAPL was measured at approximately 1.76 m apparent thickness in monitoring well GW120 located near the former entrance to the SME (MIC Property West) at approximately 6.5 m depth below ground (Golder, 2016). The source of the LNAPL is understood to be scheduled for remediation by Defence, however, the extent of offsite remediation actions is yet to be determined. Further assessments are required to determine what management and or remediation actions are required to facilitate the development of the site in the areas overlying the LNAPL plume.



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Table 3: Summary of Key Contamination Issues

Impacted Media	Key Contaminants								
	Explosives, UXO/ EOW	TRH, BTEXN	TCE ⁵	PAH	Other Organics	pH	Metals	Asbestos	Waste Materials / Aesthetics
Fill and Natural Soil	Explosive residues have not been detected in soil. Items of UXO threat - propellant/primes in small arms ammunition blank cartridge cases, likely within the surface to near surface (10mm) with the potential for unexpected finds at greater depths. ⁶	Present around the site. Primarily associated with petroleum storage infrastructure, vehicle maintenance areas, and tip sites.	Chlorinated compounds have been detected in soil, groundwater and soil vapour in a localised area in the north western corner of the site.	Present around the site at concentrations exceeding the ecological screening levels. However, was not reported above the health screening criteria.	OPP / OCPs (dieldrin) was detected beneath a building built in 1970's. Concentrations were below the adopted health screening criteria. PCBs are potentially present near high voltage electrical equipment, however have not been assessed.	Acidic soils have been identified on the site and will require management during construction.	Metals above the adopted health screening criteria were detected in the vicinity of the former grit blasting facility. Metals exceeding the EILs have been detected in the proposed riparian zone.	Present in many areas of the site at depths of up to 2m.	Waste, odour, discolouration. Aesthetics are unlikely to prevent the reuse of materials on a commercial / industrial site. Anthropogenic wastes may require management for geotechnical purposes.
Underground Services	Limited samples associated with services have been assessed and there is limited information on known services - sewers, drains, historic water pipes and electrical cables have potential to be constructed with hazardous materials. Services may comprise asbestos, asbestos conduit or include contaminated substances or hazardous materials (i.e. PCB cable fluid).								
Groundwater			Chlorinated hydrocarbons have been identified in groundwater. Localised to the north west corner of the site.		Perfluorinated chemicals have been detected in groundwater. The materiality of these impacts requires further assessment.	Generally low pH across the site.	Background concentrations of cadmium, copper, nickel and zinc. Localised concentrations of elevated zinc.		

⁵ Risks associated with the TCE impacts identified in the north western corner of the site have been assessed through a Tier 2 Quantitative Human Health Risk Assessment (refer to Golder 2016)

⁶ Conclusions are drawn from "UXO Risk Review and Management Plan," prepared by G-Tek (reference number 14037GOLD for future management requirements).



5.0 REMEDIATION STRATEGY

A general remediation strategy was presented in the Preliminary RAP (PB, 2014a). The approach was to initially remove the known sources of contamination (such as USTs and hotspots), and subsequently use a combination of techniques to manage potentially contaminated materials should they be encountered during subsequent site development stages. The Preliminary RAP (PB, 2014b) included the following remediation activities;

- Removal of underground petroleum storage infrastructure;
- Excavation and offsite disposal of fill materials known to be impacted by contamination “hotspots” based on previous investigation data;
- Additional investigations to augment the existing data related to potential acid sulphate soils, surface water quality, residual sediments, TCE impacted groundwater beneath the north west corner of the site (where warranted these were completed as part of the Post Phase 2 ESA, Golder (2015a)); and
- Continued site risk management and assessment of remediation options to maximise reuse of resources and minimise importation of materials.

Each of the above mentioned remediation actions is discussed in greater detail below.

5.1 Remediation Requirements and Extent

The proposed remediation and validation program is based on the identified contamination and the nature of the intended land use, i.e. intermodal facilities and warehousing involving substantial covering of the site with pavements and buildings, as well as a riparian conservation zone (potentially with a public walking track or pathway) adjacent to the Georges River.

An estimate of the remediation requirement at each area nominated as requiring remediation are presented Section 7, and an overview of these area shown on Figure 3.

In summary the ‘remediation areas’ include:

- **Fuel Infrastructure** - the known underground storage tanks (USTs), petroleum infrastructure and associated hydrocarbon impacted soils;
- **Hot Spots** - the known nominated areas of soil contamination (‘hotspots’) including;
 - soils impacted with lead, and
 - soil impacted with petroleum hydrocarbons (in addition to those associated with USTs).
- **Asbestos in soils** - There are also several areas on the site which include soil known to be impacted with asbestos, including
 - known stockpiles of ACM impacted soils;
 - building demolition wastes; and
 - areas where anthropogenic fill materials have been placed and the soils are known to (or suspected) of containing asbestos.

The AMP (Golder 2016a) provides a detailed assessment the asbestos in soils on the site including the stockpiles demolition and anthropogenic fill materials. The AMP also includes detailed descriptions on the preferred approaches to the remediation and /or management of asbestos in soils at each of these areas. As the remediation and management, including requirements for validation for asbestos in or on soils is described in detail within the AMP, the remediation and management of asbestos is not repeated within this RAP. Notwithstanding this, the remediation and management required in the AMP are considered to be remediation tasks required to be completed and validated, prior to a Site Audit



statement can be prepared, i.e. consistent with the remediation/management task nominated within this RAP.

The previous investigations on the site have also identified areas where foreign materials (wastes) have been buried (referred to as Anthropogenic Fill or Tip sites). These areas have been the subject of previous investigations, and the majority of the materials sampled reported chemical concentrations below the adopted investigation levels. Therefore they have not been nominated as areas requiring specific remediation. However, there is potential that previously unidentified contaminated materials are present within the identified tip sites and subsequently these have been nominated as 'high risk areas'. The location of the identified high risk areas are shown on Figure 3 (Appendix A).

5.1.1 Data Gaps

Limited assessment information is available and the following aspects should be assessed further as part of the remediation works;

- the assessment of materials beneath buildings suspected of housing PCBs or at buildings suspected of containing OCP impacted subgrade materials which were unable to be assessed while the site was operational;
- the assessment of underground utilities suspected as either being made of or suspected of containing hazardous or contaminated materials; and
- the management of LNAPL identified on the eastern portion of the site, which is sourced from the former DNSDC refuelling facility.

The areas requiring additional investigation have been nominated as 'investigation areas' and are shown on Figure 3 and detailed areas are shown in Figures 005A – 005I (Appendix A).

5.2 Remediation Options Appraisal

5.2.1 Regulatory Guidance

NSW EPA's preferred position on the selection of remediation options, as stated in the DEC, NSW (2006) *Auditor Guidelines*, specify the preferred order of options for site soil remediation and management to be as follows:

- On-site treatment of the soil so that the level of contaminant is either destroyed or the associated hazard is reduced to an acceptable level; and
- Off-site treatment of excavated soil, which, depending on the residual levels of contamination in the treated material is then returned to the site, removed to an approved waste disposal site or facility or used as fill for landfill.

Should it not be possible for either of these options to be implemented, the NSW EPA Auditor guidelines specify other options that should be considered as including:

- Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill (if needed);
- Isolation of the soil by covering with a properly designed barrier;
- Choosing less sensitive land use to minimise the need for remedial works which may include partial remediation; and
- Leaving contaminated material in situ providing there is no immediate danger to the environment or community and the site has appropriate controls in place.

The NSW EPA Auditor guidelines also emphasises that:

- The appropriateness of any particular option will vary depending on a range of local factors; and



- Acceptance of a specific option or mix of options in any particular set of circumstances is a matter for the responsible authority.

5.2.2 Sustainability

The preferred remediation option should preferably incorporate sustainability concepts and principles. In particular it should, to the extent practicable, minimise the requirement for off-site waste disposal. In NSW achieving a reduction in waste generation and turning waste into recoverable resources is a priority for NSW EPA. Waste avoidance and resource recovery is promoted under the Waste Avoidance and Resource Recovery (WARR) Act 2001. An option with a low energy requirement is also preferable.

In summary, an objective of the preferred remediation option should be a net environmental benefit. This should also include consideration of impacts on other segments of the environment and energy consumption, carbon emissions and the conservation of fossil fuels.

5.2.3 Site Specific Constraints

As stated under ANZECC & NHMRC (1992) the appropriateness of a particular option is likely to depend on a range of local factors. For the SITE the site-specific constraints are identified as those constraints primarily associated with working within a commercial / industrial land use and setting, in particular the requirement to minimise noise, air quality and traffic impacts from the proposed works.

5.2.4 Appraisal Methodology

The appropriate remedial strategy for the site should allow for remediation goals to be achieved. However, there are different options for the remediation area which may be feasible. To establish the most appropriate strategy, a decision making process is required to enable differentiation of different options. The following factors have been adopted to assess the relative merits of potential remedial options:

- Technical feasibility;
- Environmental impact;
- Relative cost benefit;
- Timeframe; and
- Ongoing maintenance requirements.

From assessment of these issues, qualitative comparative analysis has been carried out.

It is important to note that in discussion of remedial strategy, there may be some decisions which are made on the basis of a single parameter. For example, if there is only one technically feasible option then the other factors (such as environmental impact, relative cost benefit and ongoing maintenance) are inconsequential to the selection of remedial strategy. Consequently, not all of these parameters need be assessed in each instance. However, where multiple parameter decisions are required, the above list can be used as an appropriate guideline.

5.3 Possible Remediation Options

The following presents a qualitative review, with consideration to the adopted decision making parameters, of each of the broad remediation activities required on the site. A detailed review of remediation options for each remediation areas is presented in Table 4.

The remediation on the site will be required to either treat or manage the following:

- Hydrocarbon impacted soils;
- Soils impacted with heavy metals (lead); and
- Asbestos in or on soils, which are provided in detail in the AMP (Golder, 2016b); and



The preferred remediation option will aim to:

- Minimise the adverse impact on development opportunity by on-site management;
- Maximise the re-use potential of the site materials;
- Minimise long term liability issues associated with the managed material; and
- Remediate/manage in a cost effective manner, the remaining material that cannot be reused onsite.

5.3.1.1 Do Nothing

Within the areas containing hydrocarbon impacted soils and soils impacted with lead, the identified soil contamination concentrations exceed the adopted assessment criteria for the proposed future land use, therefore to achieve the remediation objectives a do nothing approach is not viable.

5.3.1.2 Excavation and On-Site Soil Treatment

Excavation and on-site treatment option is the preferred option of NSW EPA under the remediation hierarchy and subject to the availability of a suitable technology as it presents an opportunity to incorporate sustainability concepts and principles through minimisation of disposal to land fill and beneficial reuse of treated soils.

5.3.1.3 Excavation and Off-Site Soil Treatment

Off-site treatment options for the site petroleum hydrocarbons and lead are proven and commercially available in Australia. The offsite treatment of soils impacted with asbestos are not commercially available within NSW.

The offsite treatment of soils impacted with petroleum hydrocarbons would not allow on-site reuse and would require off-site disposal and as such offers no advantages over the excavation and on-site treatment option. Based on the expected volume of soil impacted with lead, the implementation of an off-site treatment option provides no cost benefit when compared with an off-site disposal option. This option should be re-considered if significant contamination (i.e. Hazardous Waste) is encountered.

5.3.1.4 Excavation and Off Site Disposal

Whilst this option does not satisfy the objective of waste avoidance and resource recovery it is an option which is technically feasible particularly in regards to the lead and asbestos contamination. The merits of this approach also need to be considered in relation to the cost benefits, and should be re-considered if significant contamination, which inhibits on-site treatment is encountered or where capping and containment presents significant imposition to the future development of the site.

5.3.1.5 Consolidation and Isolation of Contaminated Soils

Although this method would be feasible and would meet remediation objectives it may not meet stakeholder expectations. Contamination is not removed or destroyed. Indefinite ongoing environmental management would be required through the implementation of a LTEMP.

The merits of this approach need to be considered in relation to the cost benefits, the potential impacts on future redevelopment (i.e. restriction on land use) and the ability to enforce a LTEMP.



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Table 4: Assessment of Remediation Options

Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
Excavation and on site treatment.	<p>Technical feasibility</p> <p>On-site treatment options for petroleum hydrocarbon impacted soils are proven and commercially available.</p> <p>Landfarming / biopiling activities. Bioremediation will be completed in accordance with the EPA Best Practice Note: Landfarming (NSW EPA, 2014).</p> <p>Environmental impact</p> <p>The options maximises the re-use of materials on-site. The on-site treatment process will require management to reduce disruption to surrounding property owners/occupants, and environmental receptors.</p> <p>Relative cost benefit.</p> <p>This option is considered the most cost efficient.</p> <p>Timeframe;</p> <p>Treatment is likely to achieve the required project time frame. And there is sufficient space available on the site to complete ex-situ onsite treatment within an area of the site unlikely to impact on the immediate future works on site.</p> <p>Ongoing maintenance requirements.</p> <p>Subject to successful treatment, no further management is required.</p>	<p>Technical feasibility</p> <p>On-site treatment options soils impacted with lead are proven and commercially available.</p> <p>Opportunities may exist to use future concrete batching plants to effect an encapsulation approach for the impacted materials.</p> <p>The application of a treatment method will require further assessment, and possibly the implementation of a pilot trial.</p> <p>Environmental impact</p> <p>The options maximises the re-use of materials on-site.</p> <p>The on-site treatment process will require management to reduce disruption to surrounding property owners/occupants, and environmental receptors.</p> <p>Relative cost benefit.</p> <p>A stand alone treatment plant is considered the cost prohibitive for the expected volume of lead impacted soils.</p> <p>Opportunities may exist to use future concrete batching plants to effect an encapsulation approach.</p> <p>Timeframe;</p> <p>The method is unlikely to achieve the required project time frame, unless impacted soils are excavated and temporally stockpiled until a treatment method is proven.</p> <p>Ongoing maintenance requirements.</p>	<p>Yes – Hydrocarbon impacted soils</p> <p>Potential – Soils impacted with heavy metals (lead)</p>



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Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
Excavation and offsite treatment.	<p>Technical feasibility</p> <p>Off-site treatment options for petroleum hydrocarbon impacted soils are proven and commercially available.</p> <p>Environmental impact</p> <p>The option does not maximise the re-use of materials on-site, and will require offsite transport and disposal of materials reducing the sustainability of the project.</p> <p>Offsite treatment facilities will need to hold appropriate Environmental Protection Licences.</p> <p>Relative cost benefit.</p> <p>This option is considered the less cost efficient when compared with other options.</p> <p>Timeframe;</p> <p>Treatment is likely to achieve the required project time frame.</p> <p>Ongoing maintenance requirements.</p> <p>No further management is required.</p>	<p>Subject to successful treatment, no further management is required.</p> <p>Technical feasibility</p> <p>Offsite treatment options for soils impacted with lead are proven, however are not widely available. A specialised treatment process would need to be established at an existing treatment facility</p> <p>The application of a treatment method will require further assessment, and possibly the implementation of a pilot trial.</p> <p>Environmental impact</p> <p>The option does not maximise the re-use of materials on-site, and will require offsite transport and disposal of materials reducing the sustainability of the project.</p> <p>Offsite treatment facilities will need to hold appropriate Environmental Protection Licences.</p> <p>Relative cost benefit.</p> <p>This option is considered the cost prohibitive for the expected volume of lead impacted soils.</p> <p>Timeframe;</p> <p>Treatment is likely to achieve the required project time frame.</p> <p>Ongoing maintenance requirements.</p> <p>No further management is required.</p>	<p>No – Hydrocarbon impacted soils</p> <p>No – Soils impacted with heavy metals (lead)</p>



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Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
Excavation and offsite disposal.	<p>Technical feasibility</p> <p>Off-disposal options for petroleum hydrocarbon impacted soils are proven and commercially available.</p> <p>Environmental impact</p> <p>The option does not maximise the re-use of materials on-site, and will require offsite transport of materials reducing the sustainability of the project.</p> <p>The offsite disposal of materials is the least preferred approach of the NSW EPA.</p> <p>Disposal facilities will need to hold appropriate Environmental Protection Licences.</p> <p>Relative cost benefit.</p> <p>This option is considered the least cost efficient when compared with other options.</p> <p>Timeframe;</p> <p>Offsite disposal is likely to achieve the required project time frame.</p> <p>Ongoing maintenance requirements.</p> <p>No further management is required.</p>	<p>Technical feasibility</p> <p>Off-disposal options for lead impacted soils are proven and commercially available.</p> <p>Environmental impact</p> <p>The option does not maximise the re-use of materials on-site, and will require offsite transport of materials reducing the sustainability of the project.</p> <p>The offsite disposal of materials is the least preferred approach of the NSW EPA.</p> <p>Disposal facilities will need to hold appropriate Environmental Protection Licences.</p> <p>Relative cost benefit.</p> <p>This option is considered the a cost efficient method when compared with other options, particularly given the anticipated volumes of impacted materials.</p> <p>Timeframe;</p> <p>Offsite disposal is likely to achieve the required project time frame.</p> <p>Ongoing maintenance requirements.</p> <p>No further management is required.</p> <p>Technical feasibility</p> <p>An isolation strategy is only appropriate for contaminants which will not present a long term risk to offsite receptors through the migration of groundwater impacts. TCLP testing</p>	<p>No – Hydrocarbon impacted soils</p> <p>Yes – Soils impacted with heavy metals (lead)</p>
Consolidation and isolation.	<p>Technical feasibility</p> <p>An isolation strategy is only appropriate for contaminants which will not present a potential vapour risk to future site</p>	<p>Technical feasibility</p> <p>An isolation strategy is only appropriate for contaminants which will not present a long term risk to offsite receptors through the migration of groundwater impacts. TCLP testing</p>	<p>No – Hydrocarbon impacted soils</p> <p>Potential – Soils impacted with</p>



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Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
	<p>occupiers. This option is not suitable for soils impacted with soils impacted with volatile hydrocarbons.</p> <p>Environmental impact</p> <p>Not considered further due to technical constraints</p> <p>Relative cost benefit</p> <p>Not considered further due to technical constraints</p> <p>Timeframe</p> <p>Not considered further due to technical constraints</p> <p>Ongoing maintenance requirements</p> <p>Not considered further due to technical constraints</p>	<p>of the lead impacted soils indicated limited leachate generation.</p> <p>Further assessment is required to confirm if the materials present a risk through the migration of groundwater impacts. If so, engineering controls (i.e. engineered geo-liners and capping materials) would be required to prevent the generation and migration of leachate.</p> <p>Environmental impact</p> <p>The option minimises the requirement for offsite disposal increasing the sustainability of the project.</p> <p>Further assessment or engineering controls would be required to minimise risks through the migration of leachate.</p> <p>Relative cost benefit</p> <p>This option is considered the a relative cost efficient method when compared with other options, however, should engineering controls be required bases on the volume of impacted soils, costs to implement isolation would be less efficient.</p> <p>Timeframe</p> <p>Should further assessment demonstrate low and acceptable risks associated with leachate generation, this method will likely achieve the project requirements.</p> <p>Should engineering controls be required the method is unlikely to achieve the required project time frame, unless impacted soils are excavated and temporally stockpiled until an insolation areas is designed and installed.</p>	heavy metals (lead)



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Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead) <i>Ongoing maintenance requirements.</i>	Preferred Option?
		The isolation strategy will need to consider the potential impacts on future redevelopment (i.e. restriction on land use) and the ability to enforce a LTEMP.	



6.0 ASSESSMENT AND VALIDATION CRITERIA

The preliminary RAP (PB, 2014b) included assessment criteria for soil, groundwater and sediments. These criteria were generally adopted as the assessment criteria for the investigation works undertaken by Golder in 2014 (Golder, 2015a), and were used to determine where remediation or management actions were warranted.

It is noted that the exceedance of an assessment criteria does not indicate that remediation and/or management is necessarily required. Where an exceedance occurs, further investigation and evaluation of conditions is warranted, and these may include undertaking a qualitative assessment of the risks posed by the exceedance, undertaking statistical analysis or undertaking a Tier 2 Quantitative Risk Assessment.

Subsequently, a staged approach will be used in the application of generic Tier 1 Soil and Groundwater criteria as validation criteria:

- 1) Analytical Results will be screened against the Tier 1 criteria applicable for the intended future land use;
- 2) Exceedances of the Tier 1 criteria will be qualitatively assessed taking into consideration the risk the exceedance may pose of the future land use (i.e. consideration of an exceedance of an ecological screening criteria for soils positioned within the proposed commercial / industrial development foot print);
- 3) Exceedances of the Tier 1 criteria will be examined using a range of summary statistics to ensure the analytical data set appropriately represents the source being considered and the exposure being evaluated (refer to Section 6.1);
- 4) Following the comparison of the analytical data against the generic Tier 1 criteria (including any adopted statistical analysis), a decision will be made in consultation with the Site Auditor as to whether there is value in completing a Tier 2 human health and / or ecological risk (refer to Section 6.2)

As a reference, generic Tier 1 Soil and Groundwater guidelines appropriate for the proposed land uses, and adopted during the site investigation stages, are presented in Appendix C.

6.1 Statistical Analysis

An exceedance of the Tier 1 assessment criteria indicates that there is an increased likelihood of an adverse impact on human health or ecological values, however, does not indicate that remediation and/or management is mandatory. The magnitude of the exceedance should be considered in the context of the potential exposure pathway and whether the exposure will result in harm. In accordance with the NEPM (NEPC, 2013), a qualitative risk assessment may be sufficient to evaluate the potential impact of minor exceedances of the Tier 1 assessment guidelines. The qualitative assessment of the classification or validation data would need to be supported by relevant statistical measurements.

The adopted statistical approach may examine a range of summary statistics including the contaminant range, median, arithmetic / geometric mean, standard deviation and 95% upper confidence limit (UCL). However, the adopted approach needs to ensure the metric appropriately represents the source being considered and it is appropriate for the exposure being evaluated (i.e. the statistic should be calculated for the relevant soil unit etc.).

As a minimum, when classifying or validating materials the maximum and 95% UCL of the arithmetic mean contaminant concentration is to be compared to the Tier 1 criteria. However, where there is sufficient data available, and it is appropriate, the arithmetic mean can also be compared with the adopted Tier 1 criteria (NEPC, 2013).

The implications of localised hotspots (i.e. elevated values relative to surrounding data) also need to be considered. To determine whether a hot spot does not exist and the results meet the following criteria (i.e. should the following not be met, a hot spot may be present):

- The standard deviation of the results are less than 50% of the relevant investigation or screening level; and



- No single value exceeds 250% of the relevant criteria.

6.2 Tier 2 Human Health Risk Assessment

Following the comparison of the analytical data against the generic Tier 1 criteria (including any adopted statistical analysis), a decision will be made in consultation with the Site Auditor as to whether there is value in completing a Tier 2 human health and / or ecological risk assessment or if the exceedances warrant additional specific remediation / or management actions. In accordance with the NEPM (NEPC, 2013) the response will be determined on an area specific basis and will be proportional to the potential risk posed to human health and/or the environment. Where appropriate the Tier 2 human health risk assessment will include the derivation of site specific trigger values (SSTLs), which will be adopted as the Remediation and / or Validation Criteria.



7.0 REMEDIATION AND VALIDATION ACTIVITIES

We note that the terms of “remediation” and “management” in the context of this document refer to actions required to either treat material, remove it offsite or to isolate it on-site to provide an acceptable risk outcome for the proposed land uses. The context of “management” is also inclusive of administrative controls put in place during development and construction to ensure the risks posed by contamination are appropriately managed.

Further to this, site wide management approaches have been adopted for the management of EOW and UXO risks, and the management of asbestos in soils. This RAP is to be implemented in conjunction with these key documents:

- The “**UXO Risk Review and Management Plan**,” prepared by G-Tek (draft report dated 7 June 2016, reference number 14037GOLD, as amended).
- The “**Asbestos in Soils Management Plan**,” prepared by Golder Associates (draft report dated 4 July 2016 reference number 1416224-035-R-RevA, as amended).

7.1.1 Fuel Infrastructure Removal

The fuel infrastructure identified on the site includes underground storage tanks [USTs], fuel lines, bowsers, POLs and other petroleum related infrastructure is to be removed and the associated soil contamination remediated as part of the remediation works.

Removal works will be undertaken by an experienced licensed subcontractor. The USTs and associated infrastructure shall be decommissioned and removed, and shall be undertaken (as appropriate) in accordance with the following guidance documents:

- SafeWork NSW Factsheet 3_1 Dangerous Goods Abandoning Disused Underground Tanks;
- Standards Australia (2008). AS4976-2008. The removal and disposal of underground petroleum storage tanks;
- Clause 204 (2) of the *Work Health and Safety Regulation 2011*: Control of risks arising from installation or commissioning; and
- UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS.

The location and nature of the identified underground storage infrastructure are summarised in **Error! Reference source not found.** and are shown on Figures 004- A to 004-M (Appendix A). The underground storage infrastructure nominated for remediation is associated with fuel or waste oil infrastructure and does not include septic tanks associated with general ablutions.

The following is to be implemented at each location:

- 1) The USTs, pipe work and above ground infrastructure are to be emptied (if required), degassed and removed for off-site disposal for recycling to an appropriately licensed facility.
- 2) Where USTs and/or pipework cannot be removed immediately off-site, they will be temporarily placed on hardstand or plastic sheeting to mitigate the potential risk of contamination.
- 3) Photographic records of the condition of each of the tanks and fuel lines or pipe work are to be collected by the Environmental Consultant to assist in identifying potential contaminant sources within the area.
- 4) Soils will be excavated to facilitate the removal of the underground fuel infrastructure. Soil excavation works will be guided by the Environmental Consultant and excavated materials will be visually inspected and head space screened in the field with a portable photo-ionisation detector (PID) for the presence of volatile petroleum hydrocarbon contamination.
- 5) Upon removal of the fuel infrastructure the open excavations will be visually inspected and additional excavation of hydrocarbon impacted soils will be undertaken as required to the extent practicable.



Excavations will be extended until field observations (visual inspection and PID readings) indicate that contaminated soil above the adopted site remediation criteria (refer Appendix C) is likely to have been removed.

- 6) Excavation is generally anticipated to extent approximately 0.5m below the lowest depth of the tank. Grossly impacted soils observed to extend below this depth will be excavated to the extent practical, to mitigate potential risks to groundwater beneath the site.
- 7) The depth and extent of excavations will be continued until validated by the Environmental Consultant or until practicable limits of excavation are reached. The practicable limit of excavation will be evaluated by consideration of:
 - a. Geotechnical constraints associated with excavation safety and excavation stabilisation requirements (e.g. benching, shoring);
 - b. Geotechnical constraints associated with potential effects on nearby infrastructure; and
 - c. Structural constraints if the excavation extends to close proximity of roadways/footpaths, buildings, below ground services/conduits. This may be of particular concern if 'chasing out' contaminated materials extends towards adjoining buildings.
- 8) Excavated soils will be transported to a contamination assessment and treatment area (CATA), where soils will be stockpiled to enable classification (refer to Section 7.2).
- 9) Soils evaluated as being impacted with hydrocarbons and /or soils reporting concentrations of hydrocarbons above the remediation validation criteria (refer to Section 6.0 and Appendix C) will be treated onsite through bioremediation (refer to Section 7.2.4).
- 10) If excavated materials cannot be carted directly to the CATA, the materials will be placed in designated stockpile areas comprising a paved surface or plastic sheeting to provide a separation layer between potentially contaminated soils and surface soils. Stockpiles will be covered to mitigate generation of dust or impacted surface water runoff.
- 11) Excavations will be maintained in accordance with SafeWork NSW (March 2000) Excavation Work, Code of Practice.

7.1.1.1 Validation of UST Pits and Petroleum Infrastructure Excavations

Excavation validation soil sampling will be carried out to confirm that contaminated soil has been removed, or to assess residual concentrations. The walls and bases of the excavations will be validated through the collection of representative soil samples to identify the presence of residual contamination. The excavations will be left open and fenced to prevent access until analytical validation results have been obtained and confirm acceptable residual concentrations of contaminants of concern.

Validation samples will be collected in accordance with the EPA *Technical Note: Investigation of Service Station Sites*, and will include the following sampling requirements:

- UST Pit– minimum of two samples per tank, with samples collected from the each tank pit wall and floor, with samples recommended to be taken at or below the base of the tanks;
- UST Backfill Sands – minimum two samples;
- UST Pit water – minimum one sample;
- Dispensers – minimum one sample in backfill and one sample in natural soil;
- Fuel lines – minimum one sample every 5 lineal metres;
- Remote Fill Points – one sample per fill point (not expected to be required, as tanks observed on the site had direct fill points);



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- Above ground fuel storage (POL, and drum stores etc) – minimum one sample per 25m²; and
- Below ground waste oil/ wastewater tank – minimum two samples per tank.

Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the excavations will be considered to have been validated and nominated for backfilling. The validation sampling methods are described in Section 8.0.


Additional groundwater assessments will be undertaken at the completion of the tank removal works to verify that groundwater within the area does not present an unacceptable risk to future site users. Groundwater assessment will include the collection of samples from the existing groundwater monitoring wells available at each of the underground tanks. Groundwater samples will be collected in accordance with the method described in Section 8.0.

Upon receipt of groundwater sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the groundwater will be considered to have been validated and no further remediation works will be required.




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Table 5: Underground Storage Infrastructure Remediation Areas

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST 0367/B_UST _001 (Refer to Figure 4-G)	TRH detected in PB_MW05 between 1.8 to 1.9 m, and 5.8 to 6.0 m depth.	Vertical – no soil TRH impact at 0.2 m or 1.2 m depth. Reduced PID levels recorded from 2.2 to 7.0 m depth. Lateral – no soil impact in PB_MW03 located approximately 20m to the north east during sampling in 2011 (PB, 2014a).	Limited information on lateral delineation. Unknown Materials Stored	Single UST positively identified by GPR survey, est. 3.5m length, 0.5m depth to top of tank. Based on tank length, the estimated volume is 10 kL. The position of the UST during the Golder investigation is shown in the image below. 	All samples for: <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Lead Selected samples for <ul style="list-style-type: none"> ■ Asbestos – if observed ■ VOC / SVOCs – approx. 25% samples. 	Commercial / Industrial





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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST – Waste oil 3767S_UST_003 (Refer to Figure 004-D)	No impacts reported in soil in the Earthtech (2006) investigation locations completed in the vicinity of the UST.	A single in-ground concrete UST and associated in ground concrete triple interceptor trap (TIT). UST was identified adjacent to north eastern corner of Building 17.	An in ground concrete UST and associated TIT was identified during the Golder inspection (November 2014) on the north eastern corner of building 17.	<p>The Golder 2014 inspection identified a UST and TIT at the north eastern corner of Building 16 (refer to image below). This has been inferred as UST_003.</p> 	<p>All samples for:</p> <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs <p>Selected samples for</p> <ul style="list-style-type: none"> ■ Asbestos – if observed ■ PFAS – approx. 25% samples 	Commercial / Industrial




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<p>UST – Waste oil 3767S_UST_004, and associated infrastructure (Refer to Figure 004-C)</p>	<p>No impacts reported in soil in the Earthtech (2006) investigation locations completed in the vicinity of the UST.</p>	<p>A single in-ground concrete UST, an associated in-ground concrete TIT and an above ground pump and coalescing plate oil/water separator were observed on the south eastern corner of building 16. An in ground vehicle maintenance trench as observed within building 16.</p>	<p>The Golder 2014 inspection identified a UST and TIT at the north eastern corner of Building 16 (refer to image below). The Golder 2014 inspection identified a drain connecting the Building 16 workshop with the waste oil tank and an inspection trench was observed within Building 16 (refer to images below).</p>			<p>All samples for:</p> <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs <p>Selected samples for</p> <ul style="list-style-type: none"> ■ Asbestos – if observed 	<p>Commercial / Industrial</p>
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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST – Waste oil UST_009 Additional UST (Refer to Figure 004-D)	No data currently available on soil and groundwater conditions surrounding the tank.	A single in-ground concrete UST, an associated in-ground concrete TIT were observed in an open grass area approximately 15m east of Building 18.	No data currently available on soil and groundwater conditions surrounding the tank.	<p>The Golder 2014 inspection identified a UST and TIT approximately 15 east of Building 18 (refer to image below). This has been referred to as UST_009.</p> 	<p>All samples for:</p> <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs <p>Selected samples for</p> <ul style="list-style-type: none"> ■ Asbestos – if observed ■ PFAS – approx. 25% samples 	Commercial / Industrial
UST 3767S_UST_006 (Refer to Figure 004-E)	No impacts reported in soil in the PB (2014a) investigation locations completed in the vicinity of	Two in-ground concrete USTs are located on the western side of Building 358.	<p>Unknown Material Stored</p> <p>The associated oil storage area</p>	<p>The Golder 2014 inspection identified the two USTs (refer to image below).</p>	<p>All samples for:</p> <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN 	Commercial / Industrial





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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
	the UST (PB_MW06 and PB_MW07).		was not observed during Golder inspections (November 2014).		<ul style="list-style-type: none"> ■ Heavy metals / metalloids ■ VOCs ■ SVOCs <p>Selected samples for</p> <ul style="list-style-type: none"> ■ Asbestos – if observed ■ PFAS – approx. 25% samples 	
Interceptor Pit SWSS0285 (Refer to Figure 004-B)	No impacts reported in soil in the PB (2014a) investigation locations completed in the vicinity of the UST (PB_MW19 and MW076).	An in-ground concrete TIT is located on the western side of Building 20.	<p>The Golder GPR investigation did not identify a UST in the vicinity of Building 20.</p> <p>An in-ground concrete TIT was identified during the Golder inspection</p>	<p>The Golder 2014 inspection identified a TIT west of Building 20 (refer to image below).</p>	All samples for: <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs 	Commercial / Industrial




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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
			(November 2014). Unknown Material Stored		Selected samples for <ul style="list-style-type: none"> Asbestos – if observed PFAS – approx. 25% samples 	
UST – Diesel UST 44467 (Refer to Figure 004-A)	Hydrocarbon impacts were not identified in soil in the immediate vicinity of the tank and fuel infrastructure. Hydrocarbons were detected in soil bore SW0207 completed approximately	A single UST and pipe work associated with the adjacent bowser was confirmed during the GPR investigation. Based on the tank length, the tank volume is estimated at 25 kL.	Limited information on lateral delineation and limited information on soil concentrations in the immediate vicinity of the infrastructure. Low level hydrocarbon impacts in groundwater	The image below shows the area during the Golder 2014 inspection. 	All samples for: <ul style="list-style-type: none"> TRH and TPH BTEXN PAHs Phenols Selected samples for <ul style="list-style-type: none"> Asbestos – if observed 	Commercial / Industrial




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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
	y 15 m south of the bowers. These impacts are discussed further under "Vehicle Storage" below.		suggest releases may have occurred, however the concentrations do not suggest releases are significant.			
UST – Waste Oil UST_005 (Refer to Figure 004-F)	Hydrocarbon impacts were not identified in soil in the immediate vicinity of fuel infrastructure. Low level hydrocarbon s were detected in soil bore SB097 completed approximately 15 m north west of the USTs.	Four in-ground concrete USTs, an associated in-ground concrete TIT and an above ground pump and coalescing plate oil/water separator were observed on the western side of Building 192.	Limited information on soil concentrations in the immediate vicinity of the infrastructure.	The image below shows the area during the Golder 2014 inspection. 	All samples for: <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for <ul style="list-style-type: none"> ■ Asbestos – if observed 	Commercial / Industrial



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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST – Waste Oil 03767_UST_010 (Refer to Figure 004-A)	Hydrocarbon impacts were not identified in soil in the immediate vicinity of fuel infrastructure.	A single in-ground concrete UST, with several associated in-ground concrete separator pits were observed on the western side of vehicle wash down bays located at the northern end of the PRA yard.	Limited information on soil concentrations in the immediate vicinity of the infrastructure.	The image below shows the area during the Golder 2014 inspection. 	<ul style="list-style-type: none"> ■ PFAS – approx. 25% samples 	Commercial / Industrial
USTs – Diesel	Low level TRH detected in groundwater	Unknown	Unknown if infrastructure is present.	D&M (1996) identified two disused 10 KL diesel USTs associated with former PRA yard.	All samples for: <ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for <ul style="list-style-type: none"> ■ Asbestos – if observed ■ PFAS – approx. 25% samples 	Commercial / Industrial



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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST-0367S_UST_008. Former PRA Yard. (Refer to Figure 004-J)	by PB (2014). A GPR survey did not identify the USTs, and intrusive investigation undertaken in the vicinity of the Former PRA Yard did not identify significant hydrocarbon contamination in soil (Golder, 2015).			<p>The USTs were not located during CMPS&F (1998) GPR investigation and HLA (2005) reported the USTs as decommissioned, however, provided no supporting evidence.</p> <p>The former PRA yard is evident in the 1965, 1970 and 1978 aerial photographs, then appears in its current location in the 1989 aerial photograph. The former PRA yard was located to the west of Building 135, and appears to have occupied the area where Building 10 is currently positioned. Activities are inferred to be similar to the current PRA yard activities, and would have included heavy vehicle and plant storage and maintenance.</p> <p>A GPR survey of the area did not identify the USTs, and intrusive investigations undertaken in the vicinity of the Former PRA Yard did not identify significant hydrocarbon contamination in soil (Golder, 2015).</p> <p>The Contractor is to be aware of the potential for USTs to be present in the area, and a protocol for dealing with the discovery and remediation of previously unidentified USTs (and associated pipework) is to be included in the Contractors Environmental Management Plan.</p> <p>The Contractor is to provide support as required to the Environmental Consultant in the subsequent assessment of the area to determine if an</p>	<ul style="list-style-type: none"> ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed ■ PFAS – approx. 25% samples 	



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ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
				unidentified UST is present. It is expected that the Environmental Consultant will completed additional test pitting and GPR investigations at the completion of the nominated demolition works.		



7.1.2 Hot Spot Remediation

The location and nature of the identified contamination hotspots requiring direct remediation are summarised in Table 6 and are shown on Figure 3 (Appendix A). The hot spots of soil contamination will be excavated and the subsequent excavation validated. The following is to be implemented at each location:

- 1) Impacted soils will be excavated and excavation works will be guided by the Environmental Consultant and excavated materials will be visually inspected and head space screened in the field with a portable photo-ionisation detector (PID) for the presence of volatile petroleum hydrocarbon contamination and or an x-ray fluorescence (XRF) detector for the heavy metal concentrations.
- 2) Excavations will be extended until field observations (visual inspection and PID / XRF readings) indicate that contaminated soil above the adopted site remediation criteria (refer Appendix C) is likely to have been removed.
- 3) The depth and extent of excavations will be continued until validated by the Environmental Consultant or until practicable limits of excavation are reached. The practicable limit of excavation will be evaluated by consideration of:
 - a. Geotechnical constraints associated with excavation safety and excavation stabilisation requirements (e.g. benching, shoring);
 - b. Geotechnical constraints associated with potential effects on nearby infrastructure; and
 - c. Structural constraints if the excavation extends to close proximity of roadways/footpaths, buildings, below ground services/conduits. This may be of particular concern if 'chasing out' contaminated materials extends towards adjoining buildings.
- 4) Excavated soils will be transported to a contamination assessment and treatment area (CATA), where soils will be stockpiled to enable classification (refer to Section 7.2).
- 5) Soils evaluated as being impacted with hydrocarbons and /or soils reporting concentrations of hydrocarbons above the remediation validation criteria (refer to Appendix C) will be treated onsite through bioremediation (refer to Section 7.2.4).
- 6) Soil evaluated as being impacted with lead will be nominated for offsite disposal at an appropriately licensed waste facility. As contingency, and if technically feasible the impacted soils could be treated and contained onsite within either fixation or encapsulation. Should onsite treatment of lead impacted soils be considered further, a detail assessment of the treatment method will need to be undertaken and the preferred method developed in consultation with the Site Auditor.
- 7) If excavated materials can-not be carted directly to the CATA for temporary stockpiling or directly offsite for disposal, the materials will be placed in designated stockpile areas comprising a paved surface or plastic sheeting to provide a separation layer between potentially contaminated soils and surface soils. Stockpiles will be covered to mitigate generation of dust or impacted surface water runoff.
- 8) Excavations will be maintained in accordance with SafeWork NSW (March 2000) Excavation Work, Code of Practice.

7.1.2.1 Validation of Hotspot Excavations

Excavation validation soil sampling will be carried out to confirm that contaminated soil has been removed, or to assess residual concentrations. The walls and bases of the excavations will be validated through the collection of representative soil samples to identify the presence of residual contamination. The excavations will be left open and fenced to prevent access until analytical validation results have been obtained and confirm acceptable residual concentrations of contaminants of concern.

Validation of the resulting excavation will be undertaken as follows:



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- Validation soil sampling of the base of the excavations will be undertaken at a minimum of two samples and on a 10 m by 10 m grid with additional targeted sampling in areas of known or potential environmental concern for larger excavations;
- Validation soil samples from the walls of excavations will be applied to each depth unit within each excavation with a minimum of one validation sample per exposed face or per 10 m length of exposed face for every one metre depth of each depth unit will be collected.
- Validation soil samples will be submitted for laboratory analysis for contaminants identified as exceeding the relevant criteria during the assessment phase (i.e. those contaminants triggering the remediation) and those contaminants identified as being of concern through site observation and/or site history review.

Excavations known or suspected to be impacted with asbestos will be classified or validated using the gravimetric approach, as described within the ASC NEPM (NEPC, 2013), where the soil is tested using a representative number of individual 10 L samples. If materials are heterogeneous, then each individual 10 L samples will be considered representative of specific soil materials present within the stockpile. Should bonded ACM be identified in poor condition, additional laboratory analysis, in accordance with *AS4964 – 2004* may also be required to validate the stockpiled materials.

Where validation samples record results in excess of the adopted remediation criteria (refer to Section 6.0 and Appendix C), further excavation of the material will be undertaken followed by collection of additional validation samples, as described above. The extent of further excavations will be evaluated by the Environmental Consultant and presented on a plan defining the excavation extents by co-ordinates and depth. The excavation validation sampling methods are described in Section 8.0.

Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Appendix C), the excavations will be certified as validated and nominated for backfilling.

Additional groundwater assessments will be undertaken to at the completion of hotspot excavation works to verify that groundwater within the area does not present an unacceptable risk to future site users. Groundwater assessment will include the collection of samples from the existing groundwater monitoring wells available at each of the hot spot locations. Groundwater samples will be collected in accordance with the method described in Section 8.0.

Upon receipt of groundwater sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the groundwater will be considered to have been validated and no further remediation works will be required.

Where assessment, remediation and validation determine that contamination is likely to be extending off-site, it will be necessary to discuss implications with the Principal, the Contract Administrator, the Auditor and potentially the EPA.



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Table 6: Hot Spot Remediation Areas

Location / Source	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
Grit Blast Facility, located within Bridging Yard. (Refer to Figure 004-I)	Lead in samples SS01 (2,430 mg/kg), SS02 (3,390 mg/kg) and SS04 (4,560 mg/kg) which exceeded the HILs for commercial / industrial land use (1,500 mg/kg).	Vertical – no lead impacts at 0.6m depth. Lateral – impacts have been delineated laterally		Impacts associated with former grit blast facility. Impacts appear to be associated with past practice of grit blasting in semi confined area, using copper slag as grit.	All samples for: ■ Heavy metals / metalloids	Commercial / Industrial
Hotspot within Anthropogenic Fill (Confirmed) Dust Bowl – Northern Portion – buried waste and former burning ground. (Refer to Figure 004-H)	TRH detected in SW0195-TP067 at 1.7m depth (2006 mg/kg). Asbestos fragments reported in SW0195-TP069 at 0.5m depth. Impacts are associated with waste fill materials, and former burning ground.	Vertical – no TRH impacts at 1.0m depth and 1.8m depth. Lateral – no TRH or asbestos impact in surrounding locations completed within 20 to 40 m. Estimated area of TRH impact: 500 – 1000 m ² . Impacts are within wider area of waste fill materials with waste reported up to 1.8m depth.	Impacts are within a wider area of waste materials and pockets of unidentified impact may be present in the remaining waste materials.	Impacts appear to be associated with anthropogenic fill, and past practice of burning trees and vegetation waste at the northern end of the dust bowl area. TRH impacts were described as tar-like substance combined with timber mulch. TRH concentrations exceed 2.5 times the NEPM Management Limits. TRH and xylene exceed 2.5 times ESLs.	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs ■ Asbestos ■ PFAS	Open Space / Recreational



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Location / Source	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
				Asbestos fragments will require management during remediation. Estimated area of hot spot is 1340m ² .		



7.1.3 Stockpiles with Asbestos in Soils (Demolition Wastes)

The previous investigations on the site have identified areas where stockpiles of asbestos impacted soils and / or demolition wastes have been identified. An overview of the locations of the identified stockpiles are shown on Figure 3 and detailed locations of the stockpiles are shown on Figures 004-K, 004-L, and 004-M (Appendix A).

The AMP (Golder 2016a) provides a detailed assessment the stockpiled materials. The AMP also includes detailed descriptions on the preferred approaches to the remediation and /or management of asbestos in soils at each of these areas. Subsequently, reference should be made to AMP for the preferred approaches to the remediation and or management of the stockpiles containing asbestos impacted soils and / or demolitions wastes. To avoid duplication, the actions associated with the remediation of asbestos in soils have been excluded from this RAP.

7.1.4 Anthropogenic Fill (Wastes)

The previous investigations on the site have identified areas where foreign materials (wastes) have been buried (referred to as Anthropogenic Fill or Tip sites). An overview of the location of the identified tip sites are shown on Figure 3 and detailed locations are presented on Figures 006-A to 006-I (Appendix A). It is understood that materials within the tip sites are considered geotechnically unsuitable and rectification works are required for tip sites located within the foot print of the proposed development (i.e. outside of the proposed conservation zone). The geotechnical rectification activities are detailed in the Earth works specification (Golder, 2016b).

These areas have been the subject of previous investigations, and the majority of the materials sampled reported chemical concentrations below the adopted investigation levels, and therefore have not been nominated as areas requiring specific remediation. However, there is potential that previously unidentified contaminated materials are present within the identified tip sites, subsequently these have been nominated as 'high risk areas'. Should these be encountered the unexpected finds protocol should be implemented (refer to Section 10.4).

There is also potential that the materials included in the anthropogenic fill areas include aesthetic concerns. Within the proposed commercial / industrial land use areas of the site (i.e. outside of the proposed conservation area) the aesthetic issues do not form a driver for remediation, nor would they necessitate the need to validate these areas of the site. However, for recreational open space land use aesthetic issues must be considered.

There are four anthropogenic fill areas within (or partly within) the proposed conservation zone (refer to Figure 006-B, 006-D, 006-G and 006-H, and based on the inspections of these areas during the previous investigations (Golder, 2015a and PB, 2014a) the areas in their current form do not present potential aesthetic concerns as the deleterious materials are suitably buried. Subsequently in their current form additional remediation works are not warranted within these areas as it is assumed the rehabilitation of these areas will not require to disturbance of these areas and appropriate cover will be maintained following the rehabilitation of the area.

If a previously unidentified tip site is encountered and there is a requirement for the materials to be excavated, and / or if adverse conditions are observed within a known tip site, then an assessment and validation process appropriate for the volume and character of the materials observed will be implemented. The implementation of an assessment and validation process will be undertaken in consultation with the Site Auditor (refer to Section 7.1.4.1).

The adverse conditions which may warrant additional assessment and validation include;

- highly malodours soils or seepage water (e.g. strong residual petroleum odours);
- hydrocarbon sheen on surface water;
- discoloured chemical deposits or soil staining with chemical waste other than of a minor nature;
- large monolithic deposits of materials (e.g. gypsum as powder, or plaster board);



- presence of putrescible refuse including material that may generate hazardous levels of ground gases (e.g. methane) such as large quantities of green waste or timber waste; and
- presence of objects which may indicate the presence of chemical contamination, such as drums, tanks or other such storage items.

To assist in this consideration, observations related to aesthetics including discolouration, odour and the presence of waste will be shown on the GIS Interface. Where warranted, such observations will also be supported by appropriate analytical testing. Observations will be made in accordance with the ranking shown in

Table 7: Ranking for Aesthetic Issues in Soil

Visible Contamination		Odourous Soil	
Rank	Description	Rank	Description
0	No visible evidence of contamination	A	No odour
1	Slight evidence of visual contamination (trace quantities)	B	Slightly offensive odour
2	Visible contamination (more than trace quantities)	C	Moderately offensive odour
3	Obviously contaminated (significant colour staining or sheen)	D	Strongly offensive odour

The ASC NEPM (NEPC, 2013) notes that geotechnical issues should be considered separately to contamination issues. It is expected that the geotechnical preparation of the site will require the placing engineering fill materials to raise the site to the proposed finished level. The geotechnical verification that an area has achieved the required geotechnical characteristics to allow filling, is also considered to provide sufficient evidence that the site area does not include significant volumes of anthropogenic fill (waste). Records of geotechnical testing and any improvement activities will be included within the Validation Report, and presented to the Site Auditor for review.

7.1.4.1 Assessment and/ or Validation of Anthropogenic Fill Excavations

If adverse conditions, as described above are encountered within the anthropogenic tip sites, the following assessment and validation process will be implemented. The implementation of the following will be undertaken in consultation with the Site Auditor.

Excavation assessment and validation soil sampling will be carried out to confirm that contaminated soil has been removed, or to assess residual concentrations. The walls and bases of the excavations will be validated through the collection of representative soil samples to identify the presence of residual contamination. The excavations will be left open and fenced to prevent access until analytical results have been obtained and confirm acceptable concentrations of contaminants of concern.

Assessment and /or validation of the resulting excavation will be undertaken as follows:

- Soil sampling of the base of the excavations will be undertaken at a minimum of two samples and on a 10 m by 10 m grid with additional targeted sampling in areas of known or potential environmental concern for larger excavations;
- Soil samples from the walls of excavations will be applied to each depth unit within each excavation with a minimum of one validation sample per exposed face or per 10 m length of exposed face for every one metre depth of each depth unit will be collected.
- Soil samples will be submitted for laboratory analysis for contaminants identified as being of concern through the above mentioned site observations. These will generally be the following, however, the specific contaminants of interest will be refined in consultation with the Site Auditor;
 - TRH and TPH;
 - BTEXN;



- Heavy metals / metalloids (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Speciated PAHs;
- Speciated phenols;
- VOCs;
- SVOCs;
- PFAS;
- OPPs / OCPs;
- PCBs; and
- Formaldehyde.
- The excavations will require an inspection by an occupational hygienist or competent person confirming no visible asbestos is remaining in place.
- Where validation samples record results in excess of the adopted remediation criteria (refer to Section 6.0 and Appendix C), further excavation of the material will be undertaken followed by collection of additional validation samples, as described above. The extent of further excavations will be evaluated by the Environmental Consultant and presented on a plan defining the excavation extents by co-ordinates and depth. The excavation validation sampling methods are described in Section 8.0.
- Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria as appropriate for the area of the site (refer to Section 6.0 to Appendix C), the excavations will be considered to have been validated and nominated for backfilling.
- Additional groundwater assessments will be undertaken at the completion of excavation works to verify that groundwater within the area does not present an unacceptable risk to future site users. Groundwater assessment will include the collection of samples from the existing groundwater monitoring wells available at each of the locations. If groundwater wells are not present, additional monitoring wells will be installed at the completion of the excavation works. Groundwater samples will be collected in accordance with the method described in Section 8.0.
- Upon receipt of groundwater sample results confirming that concentrations of residual contamination are below the adopted criteria as appropriate for the area of the site (refer to Section 6.0 and Appendix C), the groundwater will be considered to have been as validated and no further remediation works will be required.

7.2 Soil Classification and Treatment

As various small portions of the site are impacted it is proposed that one (or several) Contamination Assessment and Treatment Area (CATA) be established. The CATA will be capable of receiving, assessing, and subsequently treating impacted soils. This would include materials received from the fuel infrastructure removal excavations, the anthropogenic fill areas, the stockpiled demolition waste areas, hot spot areas and unexpected finds areas etc. The processes undertaken at the CATA will include:

- Stockpiling for initial materials classification (refer to Section 7.2.1);
- Sorting based on initial assessments;
- Treatment including:
 - Spreading, hand picking, and potentially screening for asbestos impacted soils (refer to AMP, Golder, 2016a);



- Bio-piling or landfarming for hydrocarbon impacted soils (refer to Section 7.2.4); and
- Fixation or encapsulation for lead impacted soils (if feasible, and if considered further details of the proposed method will be presented under a separate cover to this RAP)
- Dispatching materials classified for offsite disposal (refer to Section 7.2.6) or onsite isolation (refer to Section 7.2.5)

The material processed through the CATA can then be used on the site subject to being validated for onsite reuse. It is expected that the CATA will require an area of approximately 5000 m², and the nominated position of CATA are indicated on Figure 2.

7.2.1 Materials Tracking

A Materials Tracking Plan will be implemented during the works. The aim of the Materials Tracking Plan is to identify the source and destination of all material on the Site at any time and requires the following tasks:

- establish and maintain a nomenclature system for identification of all source and destination areas for soil both on and off the Site. This includes remediation excavations, stockpiles, soils for treatment or disposal (including final destination) and offsite sources of material;
- use appropriate signage to identify the soil class of the material (as defined by this RAP) and area number for each excavation prior to soil movement using the project documentation or in consultation with the Contract Administrator, prior to work being undertaken;
- complete a 'Record of Soil Movement' sheet identifying the source area number, class, volume and destination area of each load of material moved on or off-site;
- place the soil in an approved location for the material based on its soil class;
- maintain the location of the soil without mixing with other soil classes; and
- educate all operators in the requirements of the system.

7.2.2 Temporary Stockpiling

Materials delivered to the CATA will be stockpiled for classification, validation, and assessment for potential re-use and recycling.

7.2.2.1 Stockpile Storage Locations

The temporary stockpiling area will be defined within the CATA area with clear demarcation distinguishing the temporary stockpiling areas to other treatment areas.

7.2.2.2 Stockpile Surface Preparation

Prior to placement of a stockpile, the surface of any stockpile area will be prepared by:

- Establishing stormwater diversion around the stockpile areas as required by the CEMP;
- Establishing a leachate collection system for the stockpile areas as required by the CEMP.

Each stockpile must have a unique identifier and appropriate signage as part of the Materials Tracking Plan.

7.2.2.3 Stockpile Management

The stockpiles must be managed in accordance with the requirements of the approved CEMP and Materials Tracking Plan such that there is no unacceptable off-site impact as a result of stockpiling. As a minimum, the following will be implemented:

- Controls applied to minimise the generation of dust, unacceptable odours or vapours;
- Record the movement of all material into and out of the any stockpiles in accordance with the requirements of the Materials Tracking Plan;



- Manage all stormwater in the vicinity of any stockpiles to minimise the volume of water coming into contact with the stockpiles;
- Line all stockpiles suspected as Class 4 material (refer to Section 7.2.3) at the base and cover them with plastic sheeting or other approved material to minimise contamination of surface soils and leachate generation and dust generation;
- Manage and maintain stockpiles of different material types separately during the classification process;
- Manage runoff from any stockpiles in accordance with the CEMP; and
- Remove all stockpiled material to the satisfaction of the Superintendent.

7.2.2.4 Stockpile Classification

Classification testing will be undertaken by the Environmental Consultant in accordance with the following:

- Classification sampling will be undertaken by the Environmental Consultant;
- All stockpiles must be classified. Stockpiles of general fill may be classified visually based on their waste content and observations. All other stockpiles will be classified based on classification testing, with samples scheduled for laboratory analysis of the contaminants of concern commensurate with the source of the materials;
- Stockpiles must generally not be less than 200 m³ in volume and not greater than 2,500 m³ in volume. It is recognised that stockpiles from small excavation sources will be smaller than this;
- Classification testing will be undertaken by the Environmental Consultant, and classification samples will be collected from the stockpiles materials at the following sampling frequency:
 - One test per 25 m³ for soils assessed for volumes less than 200 m³; or
 - The use of the 95% UCL value for the data set from each stockpile, with a total number of samples of not less than 10 collected from each stockpile (e.g. for a maximum size stockpile of 2500m³, the sampling frequency of one test per 250m³ will be adopted).
 - Classification samples will be collected in accordance with the method described in Section 8.0.
- Laboratory analytical results will be compared to the adopted screening criteria for suitability for reuse or off-site disposal as applicable (refer to Section 6.0 and Appendix C).

7.2.3 Materials Classification

The following materials classification approach has been developed within the framework of the assessment, and remediation strategy adopted for the site, with the aim of providing the necessary criteria to maximise the potential reuse of materials on the site. However, site materials may also be constrained for reuse by their geotechnical properties and reference should be made to the Earthworks Specification (Golder, 2016b).

The geochemical classification of the materials comprises four general classes of materials as follows:

- **Class 1 – this material can be re-used on-site or off-site without restriction.**

This class includes materials which satisfy the definition of VENM provided in the *Protection of Environment Operations Act 1997* (POEO Act), which is:

“Natural material (such as clay, gravel, sand, soil or rock fines); that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues as a result of industrial, commercial, mining or agricultural activities; and that does not contain any sulfidic ores or soils or any other waste; and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice.”



- **Class 2 – this material can be re-used on-site without restriction (i.e. within open space and/or commercial / industrial areas), but may require additional assessment or management if taken off-site.**

This class includes materials with chemical concentrations below the adopted Tier 1 criteria (refer to Appendix C), however, due to the origin of the material (i.e. reworked natural fill materials) or the proximity of the materials to a historical site activity which has potentially caused contamination (i.e. fuel storage) do not satisfy the requirement of Class 1 materials. This would include materials which, following additional assessment, are likely to meet the NSW EPA classification of Excavated Natural Materials (ENM). However, the application of the NSW EPA ENM classification process is only applicable to materials scheduled to be taken offsite, materials proposed for re-used onsite do not need to satisfy the ENM classification process.

- **Class 3 – this material can be re-used onsite without restriction in commercial / industrial areas.**

This class includes materials with chemical concentrations below the adopted Tier 1 commercial / industrial criteria (refer to Section 6.0 and Appendix C), however reported chemical concentrations which exceed Tier 1 open space criteria (refer to Section 6.0 and Appendix C). It could require management or remediation, if re-used on-site within open space areas (i.e. within the riparian zone) and would also require management or further assessment if taken off-site.

- **Class 4 – this material is likely to require treatment or direct management before it can be re-used on-site or is required to be taken off-site.**

No criteria are needed for this class of soil as it is defined as soil that exceeds Class 3 criteria and will require treatment prior to reuse on site, or warrants consideration of potential offsite disposal. Refer to Section 6.0 and Appendix C for adopted assessment criteria.

7.2.4 Bioremediation / Landfarming

Bioremediation will be undertaken at the CATA, and the treatment process will be completed in accordance with the EPA *Best Practice Note: Landfarming* (NSW EPA, 2014). In general the process will involve spreading the materials in a thin layer, and stimulating the aerobic microbial activity within the soils through aeration and/or addition of nutrients and moisture.

The treatment process will be determined on a batch process, taking into consideration the baseline condition of the soils being treated. The initial assessments will include characterisation of

- the contaminant mass;
- the moisture content;
- the nutrient levels;
- the geochemical parameters including temperature, pH, oxygen etc

The initial assessment will then be used to determine how often the materials require aeration and whether there is a requirement for additional nutrients. The progress of the treatment process will be assessed with consideration of rate of carbon dioxide production, and biodegradation rates. Treated materials will then be validated in accordance with the validation criteria presented in Appendix C.

7.2.4.1 Landfarm Surface Preparation

Prior to placement of materials within a landfarm, the proposed treatment area will be prepared by:

- Establishing stormwater diversion around the landfarm areas as required by the CEMP;
- Establishing a leachate collection system for the landfarm areas as required by the CEMP.

Each landfarm must have a unique identifier and appropriate signage as part of the Materials Tracking Plan.



7.2.4.2 Landfarm Management

The treatment process will be managed in accordance with the requirements of the approved CEMP and Materials Tracking Plan such that there is no unacceptable off-site impact as a result of treatment process. As a minimum, this will include t:

- Generally create landfarms which are not less than 250 m³ in volume and not greater than 2,500 m³ in volume, with materials generally placed < 0.3 thick.
- Manage all landfarms to minimise the generation of dust, unacceptable odours or release of volatile emissions, control leachate and stormwater;
- Record the movement of all material into and out of the any landfarm in accordance with the requirements of the Materials Tracking Plan;
- Manage all stormwater in the vicinity of any landfarm to minimise the volume of water coming into contact with the stockpiles;
- Line all landfarms at the base and cover them with plastic sheeting or other approved material to minimise contamination of surface soils and leachate generation,
- Manage all volatile emissions using covers, structural enclosures, and abatement techniques to ensure emission present no health risks and achieve compliance with air quality standards;
- Manage and maintain landfarms of different material types separately during the classification process; and
- Manage leachate from any in accordance with the CEMP;

7.2.4.3 Landfarm Validation / Classification

Validation / Classification testing will be undertaken by the Environmental Consultant in accordance with the following:

- All landfarms must be validated;
- Classification / validation testing will be undertaken by the Environmental Consultant in accordance with validation sampling process presented in this RAP;
- Classification sampling will be collected from the land farm materials at the following sampling frequency:
 - One test per 25 m³ for soils assessed for volumes less than 200 m³; or
 - The use of the 95% UCL value for the data set from each stockpile, with a total number of samples of not less than 10 collected from each stockpile (e.g. for a maximum size stockpile of 2500m³, the sampling frequency of one test per 250m³ will be adopted).
- Classification samples will be collected in accordance with the method described in Section 8.0.
- Laboratory analytical results will be compared to the adopted screening criteria for suitability for reuse or off-site disposal as applicable (refer to Section 6.0 and Appendix C).

7.2.5 Consolidation / Isolation

The consolidation and isolation of asbestos impacted soils has been identified as a preferred approach for the management of asbestos impacted soils in the AMP (Golder, 2016a). However, an isolation strategy is only appropriate for contaminants which will not present a potential vapour risk to future site occupiers, and will not present a long term risk to offsite receptors through the migration of groundwater impacts.



As such, this may also be a feasible option for the management of the lead impacted soils, if it can be proven the materials will not present a long term risk to offsite receptors through the migration of groundwater impacts.

Where applied to the soils impacted with lead (or asbestos) the following conditions will need to be met:

- A nominally minimum cover of 0.5 m depth will be required, however, placement of materials at depths greater than 1.5 m is preferable to allow for the installation of future sub-surface utilities. Alternatively, the area is to be positioned in an area where the construction of future sub-surface utilities is excluded.
- In areas where the final design require less than 0.5 m of cover, the placement of a geo-textile barrier should be included to provide a warning of the presence of underlying soil contamination. The coverage should extent to 0.5 m beyond the internment area boundary, if practicable and parallel sheets to be fixed together to overlap by 0.2 m. Where applied the geo-textile barrier materials are to achieve the following criteria:
 - Water permeable
 - High Visibility
 - Rot proof and chemically inert; and
 - High tensile strength
- The capping materials should consist of fill materials proven to be free of contamination.

The final location of a containment area needs to be identified by the Head lessee (MIC) and the Principal's Representative (SIMTA). When considering the placement of an isolation area several key aspects need to be considered, and the proposed position will need to be nominated in consultation with the appointed Site Auditor. There is advantage in positioning an isolation area within an existing contaminated area where possible, however, this may not be feasible. Key considerations when positioning an isolation area include:

- Geotechnical suitability of the materials positioned beneath any proposed future structures, and reference should be made to the Earthworks Specification and / or any specific design requirements; and
- A position which will present a minimal impact to the proposed development and will minimise the potential for disturbance during the future operation of the site, such as beneath open space area, road ways or areas of permanent hardstand.

While the investigations completed across the site provide an indication of the potential volume of impacted materials, the final volume is not yet known. Furthermore, the detailed design of the proposed development is currently being developed. Therefore it is not yet possible to identify a suitable isolation area on the site. Planning for a consolidation and isolation location will need to also provide contingency for increased volumes, through either increasing the isolation area (if possible) or commencing off-site disposal.

As the final volume of materials requiring isolation is not yet known, a staged approach is proposed for the application of an isolation strategy across the site, with materials placed within a temporary stockpiling area (refer to Section 7.2.2) until an appropriate internment area can be established as part of the future development of the site.

7.2.5.1 Onsite Consolidation and Isolation Area Validation

The consolidation and isolation of impacted soils will require verification / validation. Therefore, the placement and capping materials will need to be validated or verified by the Environmental Consultant and presented to the Site Auditor within the RVR. The verification information will comprise:

- A description of the materials placed into the internment area, including details on the source of the materials, and pre-treatment completed and validation results of indicating the materials will not present



a potential vapour risk to future site occupiers, and will not present a long term risk to offsite receptors through the migration of groundwater impacts;

- Detailed survey of the internment area, including the surface levels and excavation extents prior to filling;
- Details of the filling process, including details of lifts, and any geotechnical improvement methods applied during the filling process;
- Survey of the site area following filling and installation of the final Separation Layer to confirm the thickness of soil (or the placement of geotextiles etc., if used);
- Information relating to the materials used in the Separation Layers such as the soil types, geotextile materials etc. (if required);
- Observation (including photographic records) of the Separation Layer installation works;
- Liaison with the Auditor for inspection of the Separation Layer works;
- Compilation of an as-constructed plan of the site showing the locations, depths and materials of the Separation Layers installed at the site for inclusion within the LTEMP.

7.2.6 Off Site Disposal

Whilst this option does not satisfy the objective of waste avoidance and resource recovery it is an option which is technically feasible particularly in regards to contamination. The merits of this approach also need to be considered in relation to the cost benefits, and should be considered if significant contamination, which inhibits on-site treatment is encountered or where capping and isolation presents a significant imposition to the future development of the site.

The following outlines the required documentation and approvals required for the handling, off site transport and disposal of waste in accordance with the *Protection of the Environment Operations (POEO) (Waste) Regulation 2005* and the *POEO Act 1997*.

7.2.6.1 Waste Transporter Requirements

Under Schedule 1, Part 2 of the *POEO Act 1997* the transport of several classifications of waste in loads exceeding 200 kilograms is declared to be a scheduled activity for which a licence is required. As such the proposed transport of the selected wastes from the site to off-site disposal facilities will require the use of licensed transporters.

7.2.6.2 Waste Tracking Requirements

The *POEO (Waste) Regulation 2005* specifies requirements for the tracking of waste both within NSW and interstate. The wastes that must be tracked are listed in the Schedule 1 of the Regulation (this Schedule includes soil contaminated with waste oil/ water, hydrocarbons/ water mixtures or emulsions).

Wastes that need to be tracked need to be characterised in accordance with the NSW EPA (DECCW, NSW, 2009) *Waste Classification Guidelines, Part 1: Classifying Waste*. The following characteristics of the waste must also be determined:

- The form of the waste (the physical state e.g. solid);
- The waste code;
- The waste description; and
- The Dangerous Goods properties (if applicable).

Waste classification sampling will be undertaken by the Environmental Consultant in accordance with Section 7.2.2, with samples scheduled for contaminants of interest commensurate to the source of the materials being considered for offsite disposal.



A NSW EPA on line tracking system is available to track waste that is transported within NSW or into NSW from other states or territories.

7.2.6.3 Waste Disposal Facilities

Before wastes are transported from the site, it is necessary to confirm that the facility (e.g. landfill/ recycling facility) where the waste is being transported to is legally able to accept the waste.

7.2.6.4 Waste Records

If not using an approved on line tracking system records must be maintained of the waste transport certificates for at least four years. The use of the NSW EPA on line tracking system removes the requirement to maintain these records.

7.2.7 Reinstatement of CATA

Upon completion of the use of the CATA the area will be reinstated, which will include:

- Remove all remaining stockpiled material for reuse or disposal in accordance with this RAP;
- Installation of appropriate drainage, grading and other controls to leave the CATA footprint surfaces in a free-draining state; and
- The Environmental Consultant will then undertake all necessary inspections or validation testing of the CATA footprint and request any additional reinstatement work to be undertaken. The validation inspections and sampling will include the following:
 - Inspection by an occupational hygienist or competent person confirming no visible asbestos is remaining in place.
 - Validation sampling using the gravimetric approach, as described within the ASC NEPM (NEPC, 2013), where the soil is tested using a representative number of individual 10L samples. If the treated soils comprises heterogeneous materials, then each individual 10L sample will be considered representative of specific soil materials present within the treated area. Additional laboratory analysis, in accordance with *AS4964 – 2004* may also be required to validate the materials.
 - Validation sampling will be collected on a grid-based validation sampling approach in accordance with Table 2 of the Australian Standard AS4482.1-2005 (AS4482.1, 2005) which provides guidance on the minimum number of sampling points for site characterisation using a square grid.
 - Validation samples will be collected in accordance with the sampling methods described in Section 8.0.
 - Validation samples will be scheduled for analysis of:
 - TRH / TPH, BTEXN;
 - Heavy metals / metalloids (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
 - Speciated PAHs;
 - Speciated phenols;
 - VOCs;
 - SVOCs;
 - Asbestos;
 - PFAS;



- OPPs / OCPs;
 - PCBs; and
 - Formaldehyde.
- Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the footprint will be considered to have been validated.

7.3 Data Gap Assessments

7.3.1 Assessment / Validation of Demolished Buildings and Site Features

The additional assessment at buildings suspected of housing PCBs, buildings suspected as having OCP impacted subgrade materials, or buildings which require or have potential to require remediation (such as POLs, or vehicle workshops including within the PRA yard). The areas requiring additional investigation have been nominated as 'investigation areas' and are shown on Figure 3 and detailed areas are shown in Figures 005A – 005I (Appendix A).

The areas will be assessed using the following general methods:

- Following the demolition of the nominated building, samples of subgrade materials and underlying soils will be collected by the Environmental Consultant. The building foot print area must be subject to the assessment testing, including the side cast spoil from underground utilities removed from the area;
- The sampling will be used to determine the class of materials (refer to Section 7.2.3) and to determine what, if any, remedial action (such as additional excavation and validation) is required; and
- If further remedial action is required, then the excavation will be considered a remediation excavation, and the remediation excavation and validation testing process will be repeated as necessary until the material in the base and walls of the excavation meets the relevant soil criteria (refer to Section 6.0 and Appendix C), the excavations will be considered to have been validated and nominated for backfilling.

The sampling densities for the building footprints will be in general accordance with the NSW EPA Sampling Design Guidelines (1995), with a minimum of 2 samples collected from buildings with small foot prints (i.e. <200 m²).

Samples will be collected in accordance with the methods described in Section 8.0.

Assessment soil samples will be submitted for laboratory analysis for contaminants identified as exceeding the relevant criteria during the assessment phase (i.e. those contaminants triggering the remediation) and those contaminants identified as being of concern through site observation and/or site history review.

7.3.2 Underground Services

The Validation Plan – Principles (Golder, 2015c) presented an overarching approach to the remediation high risk underground infrastructure present on the site and this has been adopted for the proposed remediation activities.

High risk underground services represent a potential risk associated with related contamination to the proposed development. As such there is the requirement for the high risk underground services on site to be excavated and validated as part of the remediation works. However, some could remain, for example beneath retained buildings, or those extending into the proposed conservation zones (i.e. the riparian zone).

The potential contamination issues associated with buried service lines are as follows:

- Release of contamination from the fabric of the material used to construct the conduit such as asbestos water pipes, hydrocarbons or polychlorinated biphenyls (PCBs) from telecommunication or power cables;



- Release of contaminants carried by each conduit such as effluent from process or discharge lines. The potential risk generated by this pathway is particularly important from areas where vehicle maintenance activities were undertaken on the site;
- Movement of contamination from other contaminant sources along the generally more permeable backfill around the service;
- Contamination of the backfill used to fill the service trench, such as backfilling with broken redundant asbestos conduit; and
- General contamination risk associated with the area through which they traverse.

Given these risks, it is impractical to reduce the contamination uncertainty through investigation. Instead it is proposed that the risk be reduced through active remediation and validation by removal of the redundant services. Therefore, the following underground utilities strategy is proposed:

Proposed Utilities to Be Removed

Only high risk utilities will be excavated and validated as part of active remediation. High risk utilities include:

- Effluent (i.e. wash down water, waste oil, dangerous good storage drains, triple interceptor traps, grease traps etc)
- Stormwater from heavy vehicle parking areas and open dangerous good storage areas; and
- Utilities constructed of ACM and other identified hazardous materials.

All other utilities are considered to be low risk and will remain in the ground unless removed through other excavations or found to be a conduit for contamination movement.

Asbestos Utilities

Identified utilities and pits, including those identified through the demolition process as containing asbestos (or other hazardous materials) will be removed by licensed contractors.

Identification of Utilities

Identification and verification of utilities will be as follows:

- High risk utilities associated with high risk buildings (such as those involving vehicle maintenance, chemical or explosive storage, or containing high voltage electrical equipment etc) will be inspected (prior to demolition, and when de-energised) to identify the location of these high risk utilities. These will be mapped for the position and likely route to facilitate removal;
- All utilities identified shall be recorded by a unique nomenclature system including the construction material and diameter and their point of identification and possible route surveyed.
- High risk utilities identified at the site will be mapped on the site GIS Interactive Map, and this mapping could support the ongoing remediation and development process.

Removal and Validation of High Risk Utilities

High risk underground utilities will be made safe and capped underground (where nominated by the Environmental Consultant and endorsed by the accredited Site Auditor), or removed using the following method:

- The narrowest practical trench to remove the utility will be excavated;
- The soil from the surface to the top of the utility must be excavated and side cast adjacent to the trench.
- Any fluids or liquids contained within the utility will be pumped off and disposed in accordance with the waste management plan and methodology;



- Pipes with ACM must be removed and disposed in accordance with the required procedures for handling and disposing of ACM by appropriate licenced contractors;
- As the length and direction of the ACM pipes are not known, the excavation will start excavation from a point where the ACM pipe is positively identified and will use a methodology that identifies the pipe direction to allow removal of the pipe in an efficient manner. Should pipe branches made of ACM be identified then these must be marked and excavated in a similar manner. Excavation must continue until known ACM pipe identified has been removed;
- Should the utility cross the Site boundary, the remaining pipe opening must be sealed with a minimum plug of 0.3 m³ of concrete; and
- The location of remaining pipes at the Site boundary are to be recorded by survey.

7.3.2.1 Validation of Service Trenches

Utility Trench Validation

The removal of high risk utilities shall be validated as follows:

- For stormwater and effluent lines the proposed validation approach is one sample per 50 m length of trench, with samples collected from the base of the trench and analysed for contaminants of interest for the utility.
- For smaller trench lengths, a minimum rate will be one sample per trench less than 10 m and two samples for trenches between 10 and 50 m length;
- Validation samples will be collected from the base only;
- Where visual or olfactory evidence of contamination is observed in trenches, further samples shall also be collected from the base of the trench or at the location of the contamination observed;
- As a minimum, validation samples will be submitted for analysis for the potential contaminants identified;
- For pipes made of ACM, validation is proposed via confirmation from an occupational hygienist that the trench is free of visible asbestos.
- Additional remediation and validation works will occur if observations or testing indicate areas of contamination.
- Should a high risk utility, asbestos pipe or pipe made of other hazardous materials be entering or exiting the site at the site boundary, the backfill around the pipe will be sampled for record by the collection and analysis of one sample for the contaminants of interest for the pipe. The location and level of the pipe at the site boundary shall be surveyed and recorded.
- The utility removal process will be documented through the GIS Interactive Map, the process for removal will include the following:
 - All utilities removed shall be recorded by a unique nomenclature system;
 - Details of each pipe shall be recorded including the construction material and diameter and their location surveyed for depth and location;
 - Utility removal will be observed so that intersecting utilities can be documented and identified for removal if required;
 - All identified utilities will be confirmed against the mapped utilities as having been removed.

Should contamination conditions be identified during the underground services excavation that require remediation, the remediation and resulting validation will be undertaken consistent with the process described for the remediation of the Hot Spots (refer to Section 7.1.2).



Classification and Reuse of Utility Trench Spoil

The risk profile for soil contamination in the fill or backfill associated with the underground utilities is considered to be similar to that of the general site fill. As such, unless the utility trench spoil contains indications of contamination such as asbestos, unacceptable waste, odour or discolouration or is suspected of being impacted by leakage from a utility, then the trench spoil will be reused to backfill the trench following utility removal, or reused as engineering fill following the required geotechnical treatment. No further classification testing is required.

7.3.3 Light Non Aqueous Phase Liquids

The previous investigations have determined that LNAPL is present below the eastern portion of the site in the vicinity of the former entrance to the SME. Based on the previous investigations the LNAPL is likely to be associated with diesel fuels and is sourced from the former DNSDC refuelling facility located on the SIMTA property. The source of the LNAPL is understood to be scheduled for remediation by Defence, however, the extent of offsite remediation actions is yet to be determined.

Further assessments are required as part of the remediation program to determine what management and/or remediation actions are required to facilitate the development of the site in the areas overlying the LNAPL plume.

The additional assessments will be determined following a detailed review of the outcomes of the remediation works completed by Defence, including any risk assessments undertaken in conjunction with the proposed remediation actions and the outcome of any offsite remediation or assessment works completed by Defence.

Subsequent to the outcome of the review of the Defence remediation actions, further assessments of the risks associated with residual LNAPL impacts may be required, particularly in relation to the detailed design of this portion of the site. Prior to commencing any additional investigations a Sampling Analysis and Quality Plan (SAQP) should be prepared in consultation with the Auditor. The SAQP is to be prepared in accordance with the Data Quality Objectives (DQO) process, as described in the NSW EAP Contaminated Site Auditor Guidelines (2997) and provide detail on the proposed investigation scope and the investigation methods. The SAQP is to consider the most appropriate investigation methods to achieve the objectives of the investigation.



7.4 Verification of Imported Soils

The verification of imported soils required to backfill remediation excavations will be based on a review by the Environmental Consultant of the information provided by the Remediation Contractor. Imported fill will meet specified geotechnical parameters as well as demonstration of the classification of imported soil by:

- A review of site use, history and material properties of the source of the material in order to assess potential for the presence of contaminants;
- Depending on the outcome of the review, soil samples may need to be collected if it cannot be established that the materials satisfy the definition of VENM (refer to Section 7.2.3). If required, sampling will be collected from the imported fill at the following sampling frequency and results screened against the adopted criteria suitable to classify the materials as Class 1 or Class 2 materials (refer to Section 7.2.3):
 - One test per 25 m³ for soils assessed for volumes less than 200 m³; or
 - The use of the 95% UCL value for the data set, with a total number of samples not less than 10 and a minimum sampling frequency of 1 per 500m³; and
 - Testing shall be for the analytes identified as potential contaminants of concern through the review of the site use, and history of the material source;
- An inspection of the material on arrival at the Site to ensure that the material is consistent with information provided by the Remediation Contractor.

It should be noted that natural soil intended for use as backfill may contain concentrations of contaminants above the adopted validation criteria. Any background concentrations of contaminants need to be less than the validation criteria (Refer to Section 6.0 and Appendix C), unless agreed with Environmental Consultant and the Auditor.



8.0 INVESTIGATION / VALIDATION METHODOLOGIES

The validation and investigation works will require the implementation of a range of field investigation methodologies. The following provides a description of the methodologies that will be implemented during the works.

8.1 Pre-site works / Surveying

The following works will be undertaken by the Environmental Consultant prior to the site works commencing:

- Site inductions, including attendance of the site inductions required by the principal contractor.
- Consultation with site stakeholders, as required.
- Initial remediation area survey using a Trimble GPS and pre-marking the proposed remediation area locations will be undertaken in consultation with the Principal Contractor. The Principal Contractor will be responsible for the identification and isolation of underground services within each remediation area.

8.2 Excavation Sampling

The following works will be undertaken for excavation sampling:

- Excavation walls and materials excavated from remediation areas shall be logged in detail including the description of fill materials, soil types and the presence of absence or indicators of contamination (such as staining, odour, unusual colours, or ACM) and photographed with a linear scale indicating depth.
- Field screening of collected samples utilising a photo ionisation detector (PID). The PID will be calibrated daily, in accordance with the manufactures instructions. PID samples will comprise of an approximately equal volume of soil, placed in individual a 'zip lock' plastic bags and will be allowed to equilibrate to ambient temperature before being screened. Water vapour filters will be used, and the presence of moisture in the sample bag noted during sampling.
- Samples will be collected directly from the bucket of the excavator. Soil samples from the walls of excavations will be applied to each depth unit within each excavation with a minimum of one validation sample per exposed face or per 10 m length of exposed face for every one metre depth of each depth unit will be collected.
- Where a change in geological profile, subjective impacts or PID field screening reports potential volatile organic compounds additional samples will be collected, if possible.
- Where required, asbestos samples will be collected in accordance with the ASC NEPM (2013) and Western Australian Department of Health (WA DOH) *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia* (WA DoH, 2009):
 - Where ACM or Asbestos Fines (FA) are suspected or present – collection of at least one wetted 10 L sample from each relevant stratum (or 1 per 1 m depth) for screening through a ≤ 7 mm sieve or spread out for inspection on a contrasting colour material. Identified ACM or FA fragments are to be collected and weighted (or submitted to the laboratory for weighting) to calculate asbestos soil concentrations.
 - Where Asbestos Fibres (AF) are suspected or present – collection of one wetted 500ml sample from each relevant stratum or 1 m depth for submission to the laboratory for analysis (may be completed with ACM / FA sampling)
- The sample jars will be placed in a cool box filled with ice and delivered to NATA registered laboratories under Chain of Custody (COC) procedures. If warranted, couriers will be arranged to collect samples at 3 pm on Monday to Thursday and at 2 pm on Friday to meet the short holding time of some analytes.
- Test pits will be backfilled upon completion with backfill material compacted using the bucket of the backhoe in layers not more than 300 mm thick. Excess spoil will be mounded over the test pit. The



backhoe will be used to track over the test pit mound to aid in compaction. Where possible, the upper turf layer will be repositioned over the completed test pit to enable rapid site regeneration. Where required, additional non-invasive grass seeds will be spread over the test pit mound to enable rapid site regeneration.

- Remediation excavations will be back filled upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), and the excavations is be considered to have been validated.
- All excavations will be back filled in accordance with the Earthworks Specification (Golder, 2016a).

8.3 Stockpile / Landfarm Sampling

The following works will be undertaken for stockpile sampling:

- Stockpile materials excavated from remediation areas shall be logged in detail including the description of fill materials, soil types and the presence of absence of indicators of contamination (such as staining, odour, unusual colours, or ACM) and photographed with a linear scale indicating depth.
- Field screening of collected samples utilising a photo ionisation detector (PID). The PID will be calibrated daily, in accordance with the manufactures instructions. PID samples will comprise of an approximately equal volume of soil, placed in individual zip lock bags and will be allowed to equilibrate to ambient temperature before being screened. Water vapour filters will be used, and the presence of moisture in the sample bag noted during sampling.
- Where the Environmental Consultant has observed the excavation, transport and placement of the stockpile and is confident the materials within the stockpile are uniform, from a single source and the sampling is occurring immediately following placement. Samples will be collected directly from the stockpile, by hand excavation to 0.1 m into the stockpile;
- Where the Environmental Consultant has not observed the generation of the stockpile samples will be collected with an excavator, or by hand excavation into the middle of the stockpile.
- Where required, asbestos samples will be collected in accordance with the ASC NEPM (2013) and Western Australian Department of Health (WA DOH) *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia* (WA DoH, 2009):
 - Where ACM or Asbestos Fines (FA) are suspected or present – collection of at least one wetted 10 L sample from each relevant stratum (or 1 per 1 m depth) for screening through a ≤ 7 mm sieve or spread out for inspection on a contrasting colour material. Identified ACM or FA fragments are to be collected and weighted (or submitted to the laboratory for weighting) to calculate asbestos soil concentrations.
 - Where Asbestos Fibres (AF) are suspected or present – collection of one wetted 500ml sample from each relevant stratum or 1 m depth for submission to the laboratory for analysis (may be completed with ACM / FA sampling)
- The sample jars will be placed in a cool box filled with ice and delivered to NATA registered laboratories under Chain of Custody (COC) procedures. If warranted, couriers will be arranged to collect samples at 3 pm on Monday to Thursday and at 2 pm on Friday to meet the short holding time of some analytes.

8.4 Groundwater Gauging and Groundwater Sampling

Each groundwater well will be initially gauged using an interface probe to record the thickness of Non aqueous phase liquids (NAPL), if present, static groundwater level and depth to the base of the well. Detection of NAPL in the well shall be confirmed using a bailer and a product sample will be obtained, if present. However, no groundwater sample will be obtained from wells containing NAPL.

Groundwater sampling will be undertaken general in accordance with the following method:



- Collection of groundwater samples using a low-flow micropurge or peristaltic groundwater pump to reduce disturbance to the water column, and therefore minimise changes to chemical concentrations due to oxidation or volatilisation.
- The pump intake will be suspended at a depth approximately 1.0 m below the top of the screened interval shown on the bore logs (or 1.0 m to 1.5 m below the water level if the screen extended into the unsaturated zone). A new pump bladder and new PVC air and water hoses will be used for each bore.
- Where possible, the groundwater will be pumped at a rate between 0.1 L/min to 0.5 L/min selected to prevent or minimise draw down of the standing water level (aiming for maximum drawdown of 0.1 m). The wells will then be pumped at this rate with the aim that the purge volume is greater than the draw down volume. Where continuous draw down is observed at around 0.1 L/min, then the groundwater level will be drawn down to just above the top of the screened interval, the bore allowed to recharge and then sampled at 0.1 L/min.
- The groundwater field parameters, pH, redox potential (using Ag/AgCl electrode), dissolved oxygen, temperature and conductivity will be measured using a calibrated multi parameter meter and a flow-through cell, which minimizes contact of groundwater with air during measurement. Descriptions of the water including, clarity, presence / absence of odour, and unusual colours will be recorded during sampling.
- Groundwater samples will be collected when the field parameters stabilised within acceptable limits (i.e. within 10% of previous two readings) and the water is not turbid. Sample bottles will be filled with bottles for the most volatile compounds filled first. Sample bottles will be filled, by minimising the agitation of the sample, and completely filling the bottles (i.e. no head space). Samples will be filtered in the field using a 45 micron filter for dissolved metals analysis. Should the sample remain turbid following purging, filtering of organic compound bottles will also be considered;
- Reusable sampling equipment and the interface probe will be decontaminated between locations by washing and brushing in a solution of phosphate free detergent solution followed by a rinse in tap water and a rinse in deionised water. The process will be repeated if visual or olfactory evidence of contamination remained.

Waste water from the purge and decontamination process will be collected, and then transferred to storage containers for temporary storage prior to being collected and transported by a licensed contractor to a licensed waste disposal facility. The Principal Contractor will be responsible for disposal of wastes generated during sampling.

8.4.1 Groundwater Sample Collection and Storage

Groundwater samples will be collected in bottles supplied by the laboratories containing the relevant preservatives. The sample bottles are to be supplied pre-spiked by the laboratories with preservatives as shown in

Table 8. The groundwater samples will be pumped directly to the sample bottles, minimising the agitation of the sample and completely filling the bottles. Samples for dissolved metals, will be vacuum filtered in the field through a new disposable 0.45 µm filter unit.

Table 8: Sample Volumes and Preservatives

Test Parameter/s	Bottles (<i>and Preservation</i>)
pH, total dissolved solids, cations, anions, alkalinity, sulphate, chloride, nitrate, nitrite, TKN, reactive phosphorus, fluoride	2 x 1,000 mL plastic (<i>none</i>)
Dissolved heavy metals (field filtered through 0.45 µm filter)	1 x 60 mL plastic (<i>nitric acid</i>)
Ammonia, total nitrogen, total phosphorus	1 x 125 mL plastic (<i>sulphuric acid</i>)
VOCs (inc. BTEX) / TRH(volatile)	2 x 40 mL amber vials (<i>hydrochloric acid</i>)
TRH(semi volatile), SVOC, PAHs (ultra-trace)	1 x 1000 mL amber glass (<i>none</i>)



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Test Parameter/s	Bottles (<i>and Preservation</i>)
Ferrous Iron	60 mL plastic bottle (<i>hydrochloric acid</i>)
PFAS	60 mL plastic Bottle

The sample bottles will be placed in a cool box filled with ice and delivered to NATA registered laboratories under COC procedures. If warranted, couriers will be arranged to collect samples at 3 pm on Monday to Thursday and at 2 pm on Friday to meet the short holding time of some analytes.

The samples will be recorded and transported via the use of chain of custodies and stored in eskies with ice. The laboratory samples will be analysed using NATA accredited laboratories.

8.5 Nomenclature

All samples collected should will unique identification that facilitates tracking and cross-referencing of sample information. This will also include QA/QC samples that are uniquely numbered. Further details are provided in Appendix B.

8.6 Laboratory Analysis

Sample analysis will generally be completed using NATA registered methods (where available) and in accordance with Schedule B(3) of the ASC NEPM 2013. Analytical methods and limits of reporting are presented in Appendix D.

8.7 Quality Assurance and Quality Control

It is important that the data collected in the proposed site remediation validation program is of a quality suitable to meet the objectives of the validation works. Possible sources of error in the collection of soil and soil vapour data can arise in the collection, handling and analysis of samples. An effective field QA/QC program aims to minimise these sources of error and increase the reliability of the results. Details of the QA/QC program are provided in Appendix B.



9.0 ROLES AND RESPONSIBILITIES

9.1.1 General

The implementation of this RAP is the responsibility of the Head Lessee (MIC) under the obligations imposed under Clause 6.1(b)(1) of the Head Lease from the Commonwealth to MIC, where:

“remediating all Contamination on, in or in respect of the Premises to the standard required under any applicable Environmental Law from time to time irrespective of who caused the Contamination and irrespective of whether the Contamination first occurred or was first caused or was first disturbed prior to the Commencement Date or the date of the Tenant's first occupation of the Land.”

To clarify, in respect of this RAP the abovementioned term “remediation” includes the implementation of a management approach where appropriate. The responsible person for the overall implementation of the RAP is the Head Lessee and/or their nominated representative or delegate. The Principal is considered to be the Head lessee (MIC) and it has been assumed the responsibilities will be delegated the Principal's Representative (SIMTA), herein referred to as the Superintendent.

9.1.2 Superintendent

The Superintendent's responsibilities include contract administration, quality control and compliance. The Superintendent's responsibilities also include liaison with stakeholders, including the Environmental Consultant, the Accredited Environmental Site Auditor and the EPA.

9.1.3 Environmental Consultant

The Environmental Consultant's responsibilities include:

- undertaking additional soil and groundwater assessment as required to validate the completed site remedial/management activities;
- supporting the Remediation Works, including by:
 - a) providing on-site technical advice and management;
 - b) undertaking investigation programs in areas previously inaccessible;
 - c) undertaking validation testing and reporting;
 - d) undertaking validation of excavations;
 - e) stockpile validation and classification;
 - f) site observations with respect to materials associated with remediation and other earthworks; and
 - g) providing technical assistance to the Contractor, as required.
- upon completion of on-site Remediation Works, preparing a Remediation and Validation Report (RVR), and associated plans including AMP and or LTEMP; and
- as requested assisting liaison with the Accredited Environmental Site Auditor, Remediation Contractor and EPA.

9.1.4 Accredited Site Auditor

The site is currently subject to an Contaminated Site Audit in accordance with Part 4 of the *Contaminated Land Management Act, 1997*.

The Accredited Site Auditor's responsibilities include:

- approval of the Stage Specific RAPs prepared for the staged site development. Approval will consider the associated objectives, strategy, process and outcomes to be achieved during the remediation;
- ensuring the methods and materials used in the Remediation Works are to a standard commensurate to ensure the remediation of the site in accordance with this RAP;



- provide documentation in the form of a Site Audit Statement certifying that the site can be used for the proposed end land use;
- liaising with the Principal, the Contract Administrator, the Contractor and the Environmental Consultant to discuss/resolve on-site issues with respect to remediation decisions;
- liaising with the EPA as required; and
- endorsing other key deliverables for the project including the RVR(s) and associated plans including an AMP and or LTEMP.

9.1.5 Remediation Contractor Responsibilities

The Contractor's responsibilities include:

- obtaining all permits and Approvals to complete the remediation of the site, including those associated with excavation and disposal of contaminated soil from the site;
- development and compliance with and implementation of the approved Site Management Plans, Work Health and Safety Plan, Construction Environmental Management Plan (inclusive of the EOW and UXO, Asbestos, Heritage, Flora and Fauna, and Acidic Soils Management Plans), Quality Assurance Plan, Materials Tracking Plan and other management plans developed during the Remediation Works;
- implementation and compliance with the Materials Tracking System;
- achieving Remediation Completion in accordance with the requirements of the:
 - a) Contract;
 - b) the Specification;
 - c) Drawings; and
 - d) all other documents which form part of the Contract;
- completion of works as required by the Contract Administrator;
- gaining acceptance from the receiving landfill for material disposed off-site, based on the information provided by the Environmental Consultant. The Contractor must supplement this information including by providing additional sampling where required by the receiving landfill;
- full cooperation with all relevant consultants, subcontractors and Other Contractors on the Project
- collation and provision of all transport and disposal documentation related to off-site disposal of soils classified by the Environmental Consultant; and
- earthworks conformance testing for all site filling and operations in accordance with the required Earthworks Specification.



10.0 ENVIRONMENTAL MANAGEMENT

The following sections of the RAP outline the general environmental controls to be adopted to protect the environment both on-site and immediately surrounding the site. The controls aim to protect surface water, groundwater and air quality, cross contamination and to control odour, noise and vibration levels by preventing the release of dusts, contaminated soils, contaminated sediments and contaminated water to the extent practicable. Where visual observations or monitoring indicates unsatisfactory performance, then work methods and/or controls will be modified.

It is expected that the Contractor will prepare a CEMP for the works which will provide site specific environmental controls and will also stipulate the actions to be taken should additional contamination be identified during the development of the site (i.e. an unexpected finds protocol).

10.1 Environmental Aspects

Elements of the proposed works that can interact with the environment are termed 'environmental aspects'. For the proposed works, these are identified as broadly including the following:

- Surface water discharge;
- Dust/vapour emissions;
- Noise emission and vibration;
- Odour;
- Waste haulage;
- Fuel/oil leaks/spills; and
- Spillage of contaminated materials.

10.2 Environmental Controls

10.2.1 Site Access and Traffic

During the works traffic entering and exiting the site will be limited to the Contractors vehicles, remediation equipment (e.g. excavators) and trucks removing waste materials to off-site waste management facilities. The frequency and timing of truck movements will be a function of staging of the works by the appointed Contractor. A traffic management plan will be documented by the Contractor prior to the commencement work with due consideration given to designated routes for trucks to travel on. Heavy machinery will be utilised for the remediation works. These vehicles will be stored on site during the remediation phase.

Given the duration of the works and material to be removed from the site, it is considered that there will be a negligible impact on traffic conditions in the area. It is considered that any potential impact will be further managed and minimised with the implementation of the proposed mitigation measures.

- Traffic movements will be planned to minimise impacts to traffic flow in the vicinity of the site. Where possible, and subject to the staging of the works, one entry and one exit point will be utilised to avoid the need for vehicles turning on site;
- Public access to the site will be restricted by means of security fencing. Fencing will be covered with shade cloth;
- Hours of operation will be restricted to mitigate traffic and parking impacts on neighbours;
- The timing of truck arrivals shall be planned and coordinated to avoid congestion and excessive truck queuing / idling;
- Off-site parking is not expected to be required;



- There will be limited disturbance of site surface cover and therefore off-site tracking of sediment and soil is not expected to occur. Good housekeeping practices will be implemented and inspections will be undertaken. Identified sediment will be removed by sweeping;
- All loads will be covered except during loading and unloading activities; and
- Licenced transports will be engaged for the haulage of waste materials.

10.2.2 Surface Water, Erosion and Sedimentation

The nearest water course to the site is the Georges River to the west of the site. The river flows to the north. Potential impacts from the remediation works to local surface water are expected to be limited. The potential for increased sediment load or pollutant load from site run-off will be managed by erosion and sediment controls. The erosion and sediment control will be implemented by the appointed Contractor. Mitigation measures will include the following:

- Establishment of erosion and sediment measures prior to works commencing on the site and regular inspection and maintenance to confirm measures are in a functional condition throughout the works;
- Disturbance of site surface cover will be minimised where possible to reduce the potential for off-site tracking of sediment and soil;
- All site exits will remain paved during the works and truck tyres will be inspected prior to leaving site;
- The work areas will be enclosed within a sediment fence, erected on the down gradient perimeter of the works areas. The controls will ensure all run-off leaving the site is sediment-free;
- On-site stormwater inlets and kerb inlets will be protected using inlet filter devices;
- Good stockpile management practices will be put in place and stockpiled material will be stored within appropriate environmental controls (i.e. covered where practical) and outside of drainage lines;
- Should water accumulate in excavations across the site this will be treated as potentially contaminated water; and
- Maintenance on all stockpile control measures will be carried out on a daily, and during and following major storm events. Maintenance will be logged.

10.2.3 Air Quality

Due to the nature of the work there is potential that dust and odours will be generated for a short period of time during the works. Other short term impacts may exist in relation to increased exhaust fumes from equipment.

With the management of potential air quality impacts in accordance with the proposed mitigation measures, it is considered that local community impacts will be minimised. Potential impacts will be managed by good work practices, including:

- Trucks and construction plant entering the site should be well maintained in accordance with the manufacturer's specification. Vehicles with smoky exhausts (more than 10 seconds) shall be stood down for maintenance;
- Unnecessary idling for trucks and plant shall be avoided with engines turned off during periods of inactivity;
- All equipment shall be maintained in good working order;
- Dust retardant/ water spray will be used to prevent dust lift-off where necessary;
- Minimisation of number of stockpiles;
- Stockpiles of soil will require to be covered if remaining on-site for more than 24 hours;



- All dust generating loads will be covered except during loading and unloading activities; and
- Cessation of relevant works under adverse meteorological conditions such as high winds.

10.2.4 Odour Management

The objective of odour management is to control odours generated from the proposed works, and ensure minimal adverse impact on the air quality of the local area. There is potential that the excavation of hydrocarbon impacted soils during the remediation works may expose odorous materials/ volatile organic vapours.

Odour control measures will include, but not be limited to:

- During excavation of potentially contaminated materials a portable PID will be used to assess potential elevated volatile organic vapour concentrations;
- The area of contaminated soils exposed at any one time be minimised wherever possible by a localised staged program;
- Covering exposed surfaces, as required;
- Adequate maintenance of equipment and machinery to minimise exhaust emissions; and
- Conduct regular odour monitoring by olfactory observations.

10.2.5 Noise

The remediation works are likely to cause an increase in noise during the period of work (estimated to be approximately three to four weeks). With the management of noise in accordance with the proposed mitigation measures, it is considered that local community impacts will be minimised. Noise impacts will be managed by the following mitigation measures:

- Hours of operation will be restricted to 7:30 am to 6:00 pm from Monday to Friday, 8:00 am to 2:00 pm on Saturdays and at no time on Sundays and public holiday;
- The works will take place over a relatively short period of time;
- Where possible, the distance between noisy machinery and sensitive receptors will be maximised and noisy equipment/machinery will be oriented away from sensitive areas.
- Equipment will be well maintained;
- Unnecessary idling for trucks and plant shall be avoided with engines turned off during periods of inactivity (e.g. during loading);
- Remediation work will be carried out in accordance with this Work Plan, a copy of which will be located on site at all times during the works; and
- Complaints regarding excessive noise will be investigated and addressed appropriately.

10.2.6 General Waste Management

Works will include the implementation of measures to limit the need for waste disposal and the environmental impacts of waste. The Principle Contractor shall be responsible for safely handling, segregating and temporarily stockpiling wastes on the site. The proposed waste management approach is as follows:

- Waste materials generated on site will be managed so that the volume of waste transported to landfill is minimised;
- Wastes will be characterised and properly disposed of in order to minimise the potential for impacts to the environment; and



- Disposal of all contaminated soils is to be tracked by the Contractor and correlated with the waste disposal site operator's landfill records. This information will be provided to Golder for inclusion in the Remediation Validation Report.

10.2.6.1 Off-site Waste Disposal

If waste is required to be transported, it must be to a licensed off-site disposal facility licensed to accept such material. Material to be disposed off-site may include soil/fill impacted with concentrations of COPC in excess of the site remediation validation criteria.

All waste will be transported by a transporter licensed to transport the material and will have notified the licensed receiving landfill (or storage facility) of the type and quantity of each load of material being received. Each load of waste is required to be sealed at all times. Copies of all consignment authorities for each load will be retained in accordance with the *POEO (Waste) Regulation 2005* (Refer Section 3.4.1)

10.2.6.2 Waste Recycling

Where possible, buildings materials and concrete will be forwarded for recycling to an appropriately licenced recycling facility.

10.3 Environmental Control Performance Monitoring

10.3.1 Site Inspection Program

Regular site inspections will provide quantification of the effectiveness of the safeguards recommended. It will also enable auditing of the safeguard measures to ensure they achieve their objectives and to facilitate modification where necessary.

Site inspection will be undertaken during remediation in the following areas:

- Inspection of trucks used for transporting materials from the site to ensure that soil adhering to the wheels or undercarriage is minimised. Any accumulation of soil will be removed prior to departure from the site;
- Sedimentation control measures will be inspected weekly and after heavy rain. This will involve checking the sedimentation control structures are operating effectively, with no silt being discharged to stormwater. Corrective action will be instituted where necessary and a follow up inspection will be undertaken to verify the outcome of the corrective action;
- Inspection of soil segregation, stockpiling, testing and validation procedures and records; and
- Observation of site activities to assess the extent of dust generation from the work site.

Should routine site inspections and/or external parties identify a potential issue relating to the remediation works, potential issues will be logged, validated and where required, rectified.

10.4 Contingency Planning

10.4.1 Emergency Response Plan

An Emergency Response Plan will be prepared prior to the commencement of the remediation works. The purpose of the plan will be to identify possible emergency situations and to define procedures that would be used to ensure the safety of both on- and off-site personnel in the event of an emergency.

Emergency events may include but are not limited to:

- Oil or other contaminant spillage;
- Fire;
- Failure of any control structures; and
- Industrial accident.



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In order to ensure that the environmental impact of such events is minimised, emergency procedures are to be followed. These may include:

- The first priority is the safety of any persons either workers or others involved in the events. Whatever reasonable actions necessary to protect the safety of potentially affected persons will be taken. The site-specific Health and Safety Plan (HASP) will outline actions to be taken in relation to safety of persons, if these circumstances eventuate.
- The second priority is to quickly minimise the environmental damage. All emergency action should take place as soon as possible after the event. Actions to be taken may include:
 - The containment of pollution by booms, silt fences or other means. Supplies of all pollution control equipment, as listed in the Contractor's EMP, should be maintained on site by the Contractor;
 - The temporary re-establishment of the control structure; and
 - The taking of appropriate samples to assess the extent of the problem.

In the event of an emergency situation arising, the Principal Contractor's site representatives will be contacted immediately after all persons are accounted for and all possible immediate actions to control the pollution have been taken.

10.4.2 Contingency Management Plan

Table 9 below summarises conditions that can reasonably be expected and the resulting problems they may cause, and how these problems may be resolved within the context of the works.

Table 9: Contingency

Anticipated Problem	Corrective Action by Contractor
Further contamination identified	Stop work, notify the Environmental Consultant and Principal. Manage in accordance with remediation objectives and strategy outlined in RAP refer to Section 9.4.2.1
Excessive rain/drainage	Cover exposed surfaces with plastic; or stop work until run-off is more manageable. Inspect and maintain sediment controls.
Excessive dust	Use of local and perimeter sprays, soaking of excavation areas, mobile sprays, covering with geofabric, monitoring of weather conditions or ceasing activity.
Equipment failures	Maintain spare equipment or parts; or maintain alternate rental options; or shut down affected operations until repairs are made.
Release of fuel/oil from machinery	Remove source, use spill kit to remove oil and make any repairs as required.
Silt fence fails	Stop work and repair fence to specifications.
Excessive noise	Identify source and review noise attenuation equipment and as necessary provide silencers on noisy equipment. Change work hours.
Excessive odours	Monitor for volatiles using PID in worker breathing zone and at boundary with residential properties (south of site). Use odour and volatile suppressing agents to eliminate or reduce odours as required.
Encounter suspected asbestos	Stop excavation and cover area. Notify the Principal, Environmental Consultant and Industrial Hygienist. Asbestos classification and management to be conducted by a suitably qualified/licensed contractor. Refer to AMP (Golder, 2016a)

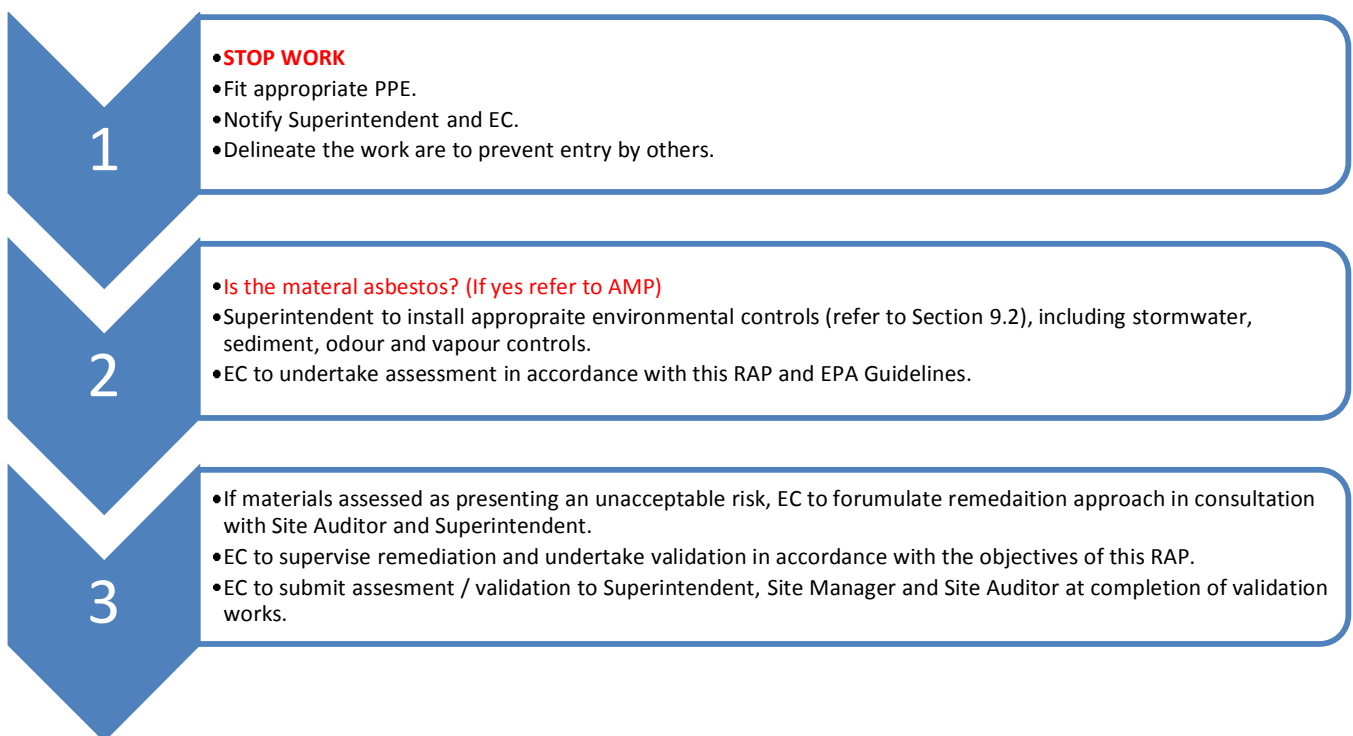


10.4.2.1 Unexpected Finds Protocol

It is possible that workers may unexpectedly encounter unexpected contaminated materials. The adverse conditions which may warrant additional assessment include;

- highly malodorous soils or seepage water (e.g. strong residual petroleum odours);
- hydrocarbon sheen on surface water;
- discoloured chemical deposits or soil staining with chemical waste other than of a minor nature;
- large monolithic deposits of materials (e.g. gypsum as powder, or plaster board);
- presence of putrescible refuse including material that may generate hazardous levels of ground gases (e.g. methane) such as large quantities of green waste or timber waste; and
- presence of objects which may indicate the presence of chemical contamination, such as drums, tanks or other such storage items.

The immediate response should be on preventing the disturbance of material, while protecting workers in the immediate area and any surrounding receptors from potential exposure. The following procedure should be followed if unexpected contaminated materials are encountered.



11.0 OCCUPATIONAL HEALTH AND SAFETY

A site-specific Health and Safety Plan (HASP) incorporating the safe work method statements will be prepared in accordance with the requirements of SafeWork NSW. The implementation of the HASP will be the responsibility of Contractor during the works. At a minimum the plan shall include:

- Details of health and safety programme including an induction process for all personnel working on the site, as well as incident management and reporting plans;
- Safe work method statements (SWMSs) and/or Job Safety Analyses (JSAs);
- Emergency phone numbers;



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- A map showing the shortest route to nearby hospitals or health centres;
- Daily toolbox meeting content and procedures;
- Definition of roles and responsibilities of personnel, including staff and subcontractors;
- Hazard identification procedures and control measures;
- Material safety data sheets;
- Soil, water and material handling procedures;
- Personal protective equipment requirements;
- Occupation health monitoring;
- Decontamination procedures; and
- Incident management.

Site workers and visitors shall be trained on the contents of site-specific health and safety plan prior to entry to the site.



12.0 VALIDATION REPORTING AND FUTURE SITE MANAGEMENT

12.1 Validation Reporting

A Remediation Validation Report will be prepared in general accordance with the requirements of the NSW EPA (1997) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites and the DEC, NSW (2006) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition) (the Auditor Guidelines).

All field information and analytical data will be presented in the Remediation Validation Report.

The Remediation and Validation Report will be prepared for either the whole site, or sections of the site as considered suitable during the remediation works. These will be considered in consultation with the Site Auditor, and where completed will be incorporated into the Construction Environmental Management Plan such that controls are enforced minimising the potential “re-contamination” of areas once validation has been achieved.

12.2 Long Term Environmental Management Plan

At this stage it is considered likely that a LTEMP will be required. It would be implemented following completion of the remediation works to provide a management, monitoring and review framework for the residual soil and groundwater issues and to manage any separation layers installed during the remediation works. The purpose of the LTEMP would be to:

- Assign the responsibilities for management of all aspects of the LTEMP;
- Summarise the nature of residual contamination for information of future occupiers;
- Protect human health and the environment from remnant residual contamination present on the site including that below the installed separation layers;
- Provide an unexpected finds protocol suitable for future redevelopment of the site;
- Address maintenance, monitoring and repair of any installed separation layers;
- Provide the monitoring and management framework for groundwater (i.e. post audit groundwater management plan) including monitoring requirements and reporting frequency; and
- Provide information to assess if contingency actions related to the management of residual contamination are required.

The potential time for closure and cessation of groundwater monitoring activities is when the compliance targets have been met on and off the site, and that the remaining risks to groundwater on and off the site are acceptable. Cessation of LTEMP is unlikely to occur unless further clean-up is undertaken.

12.3 Future Groundwater Monitoring and Management

Residual groundwater contamination is expected to exist on the site following development, it is therefore expected that ongoing groundwater management would be implemented on the site. A groundwater monitoring plan (GMP) is expected to be included within the LTEMP and be considered as part of the Site Audit for the site.

The purpose of the GMP is:

- a) To nominate responsible parties for the residual groundwater issues;
- b) To manage groundwater contamination at the site and to minimise potential harm to human health and the environment;

⁷ Reprinted 2011



- c) To document the performance of the management of the contamination to allow periodic reassessment of the management approach into the future.

An appropriate GMP would attempt to accomplish the following:

- a) Establish whether the residual groundwater contamination plume is shrinking, stable or increasing, and whether natural attenuation and/or migration is occurring according to expectations through line-of-evidence collection;
- b) Provide appropriate trigger levels (where available), based on the receptor of interest and identified contaminants;
- c) Serve as a compliance program, so that potential impacts to down-gradient receptors are identified before adverse effect occurs (relative to above objectives); and
- d) Detect changes in environmental conditions (e.g. hydrogeologic, geochemical or other changes) that may reduce the efficacy of any natural attenuation processes or that could lead to a change in the nature of impact.

A contingency plan is likely to be required should the established trigger levels be exceeded. The contingency plan describes the framework of increased management efforts to be used or active remediation options to be considered, should the monitoring indicate that contamination is found to be increasing or having an adverse effect on human or environmental health.

As far as possible, the development of a GMP will be undertaken as a part of the LTEMP submission to Environmental Auditor to allow all parties to be clear on the proposed management regime and responsibilities for the site.



13.0 IMPORTANT INFORMATION RELATING TO THIS REPORT

Your attention is drawn to the document titled - "Important Information Relating to this Report", which is included in Appendix E of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

Report Signature Page

GOLDER ASSOCIATES PTY LTD

Greg Stratton
Principal Environmental Scientist

Gavin Butterfield
Principal Environmental Scientist

GVS/GB/gvs

A.B.N. 64 006 107 857

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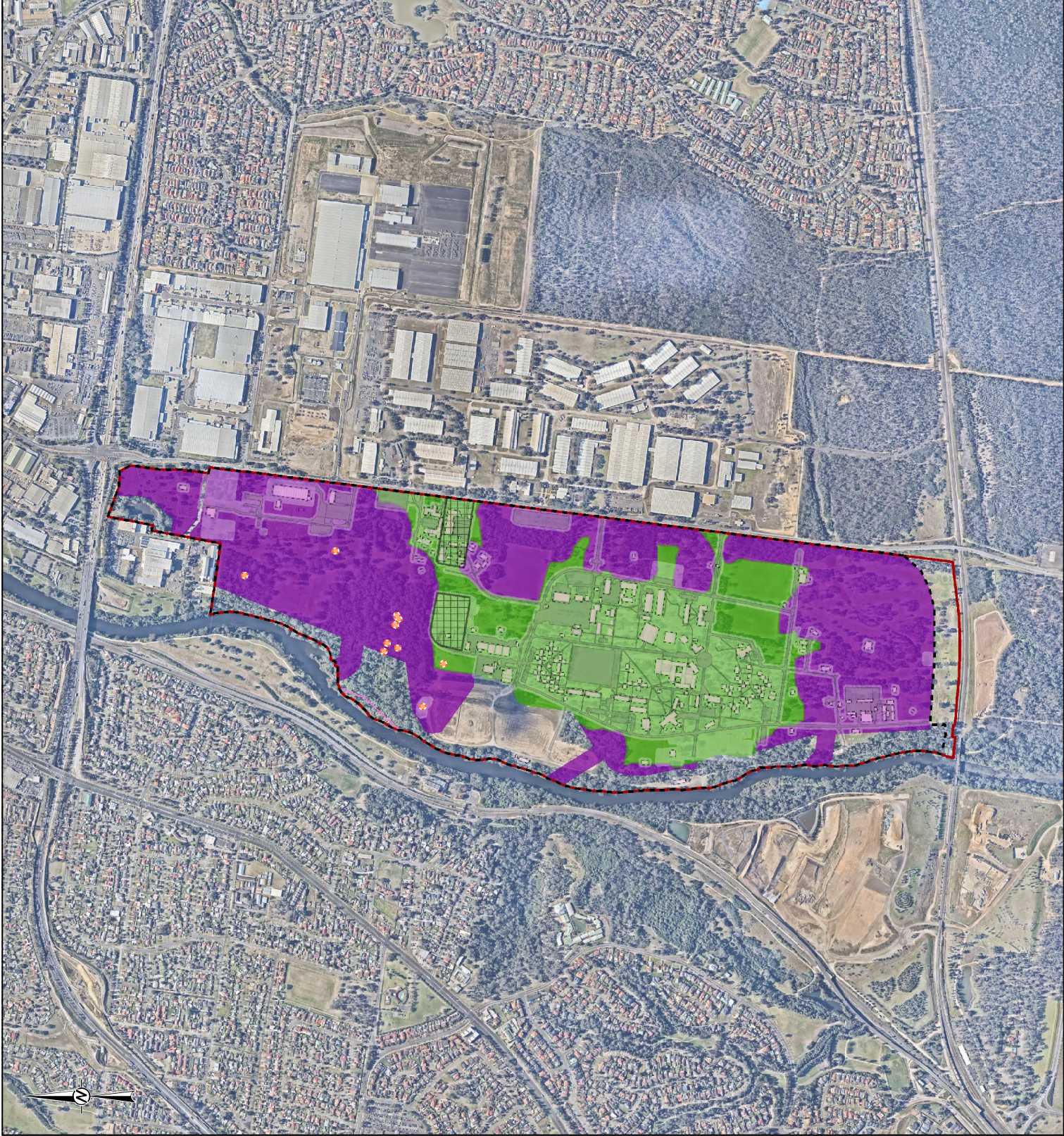
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APPENDIX A

Figures



LEGEND

- RAP Site Boundary
- Priority Area 1
- Priority Area 2
- MIC Property West
- Moorebank Ave
- The Precinct (approximate)
- Asbestos detected
- Proposed works compound
- Existing buildings to be demolished
- Existing buildings to be demolished (3m buffer)
- Hardstand pavement

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder investigation area on this project.

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REFERENCE SCALE: 1:12,500 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

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TACTICAL GROUP

PROJECT

LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

TITLE

PROPERTY OVERVIEW

CONSULTANT

YYYYMMDD	2015-05-05
PREPARED	KJS/KB
DESIGN	-
REVIEW	GVS
APPROVED	GVS
Rev	0
CONTROL	005-R
PROJECT No.	1651776
FIGURE	001





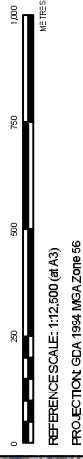
- LEGEND**
- RAP Site Boundary
 - Allotment Boundary
 - MIC Property West
 - Cadastral Boundary

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder investigation area on this project.
2. Lot boundaries provided by Land and Property Information NSW
3. Property allocation:
 - Lot 100 & Lot 101 DP 1049508: Northern Commonwealth Land
 - Lot 1 DP 1187707: MIC Property West (MPW)
 - Lot 2 DP 1187707: Moorebank Avenue
 - Lot 1 DP 1048263: SMTA Property
 - Lot 4 DP 1187707: MIC Property East - Bottland

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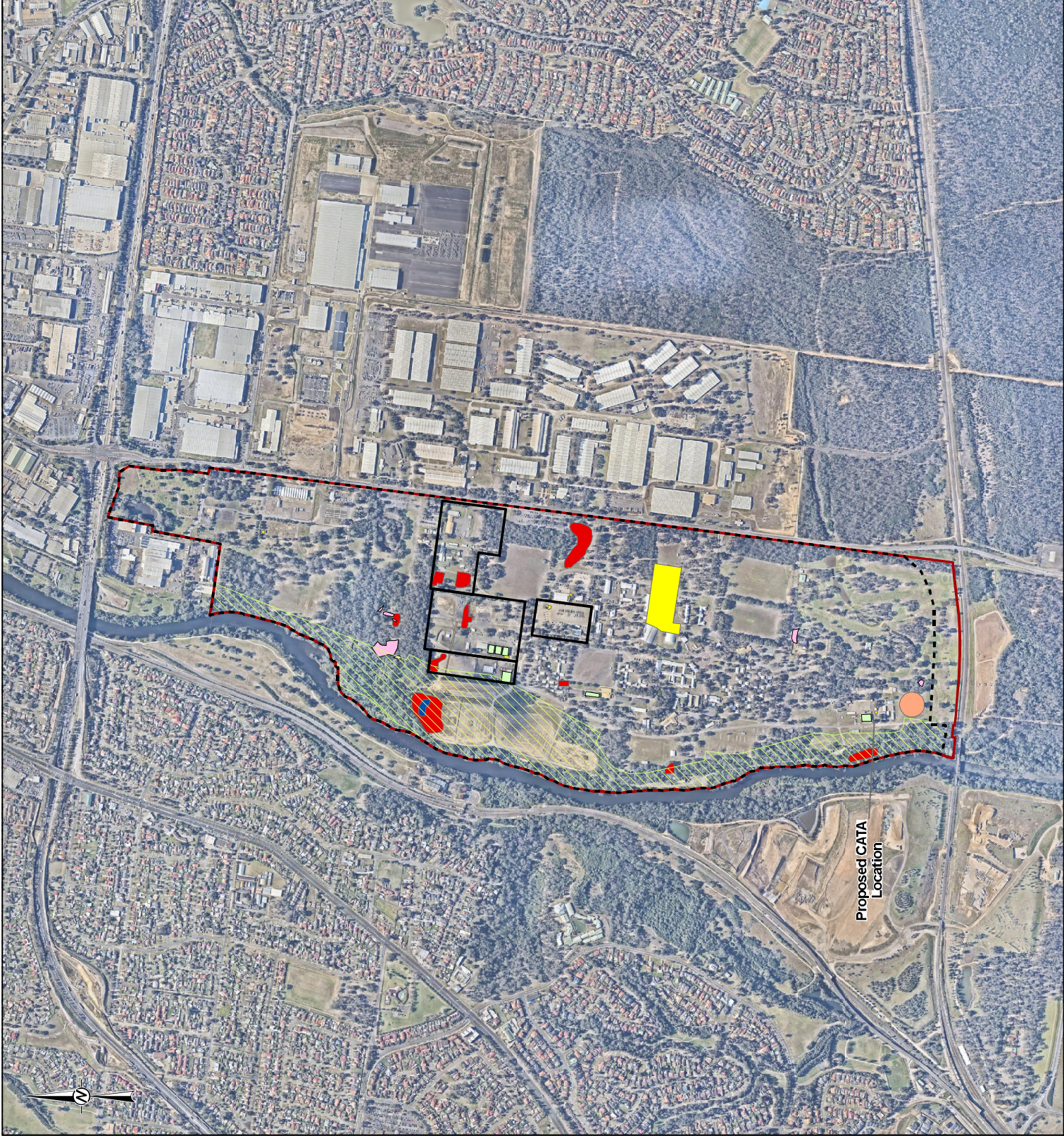
CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

TITLE
PROPERTY BOUNDARIES AND SITE BOUNDARY

CONSULTANT	YYYYMMDD	2015-05-08
PREPARED	KJS/KB	
DESIGN	*	
REVIEW	GVS	
APPROVED	GVS	
Rev.	0	
PROJECT No.	CONTROL	005-R
1651776		
FIGURE		002





LEGEND

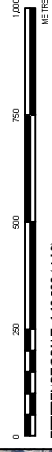
- RAP Site Boundary
- MIC Property West
- Conservation Area (approximate)
- Stage 1 and 2 Remediation Areas
- Hotspot
- Stockpile
- USTs
- Stage 1 and 2 Investigation Areas
- OCPs
- PCBs
- Stage 1 and 2 High Risk Areas
- Anthropogenic Fill (confirmed)
- Anthropogenic Fill (potential)

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder investigation area on this project.
2. Conservation Area digitised from Drawing PREC-ROG-AR-SKC-00002a (Masterplan Precinct, 09/06/2016 Issue K)

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LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

TITLE
REMEDIATION OVERVIEW

CONSULTANT

YYYYMMDD 2016-06-08

PREPARED KJS/KB
DESIGN
REVIEW GVS
APPROVED GVS



PROJECT No. 1651776


CONTROL 005-R

Rev. 0

FIGURE 003



LEGEND

- Legend**
-  RAP Site Boundary
 -  Investigation Locations
 -  Borehole
 -  Groundwater Well
 -  Test Pit
 -  Remediation Areas
 -  USTs

NOTES

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDFER POST PHASE 2 ESA PROJECT.

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LAND PREPARATION WORKS – REMEDIATION
ACTION PLAN



REFERENCE SCALE: 1:250 (at A3)

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE	REMEDIATION AREAS

CONSULTANT

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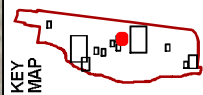
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PROJECT NO.
1651776

PROJECT No.	CONTROL
1651776	005-R

Rev. 0

FIGURE 004-C



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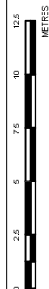
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TITLE REMEDIATION AREAS

CONSULTANT

PROJECT LAND PREPARATION WORKS – REMEDIATION ACTION PLAN



REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

PROJECT No.	CONTROL
1651776	005-R

Rev. 004-D

FIGURE 004-D



LEGEND

- Legend
- RAP Site Boundary
 - Investigation Locations
 - ⊕ Groundwater Well
 - ⊗ Surface Scrape
 - Remediation Areas
 - USTs

NOTES

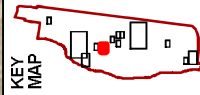
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CLIENT
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PROJECT
LAND PREPARATION WORKS – REMEDIATION
ACTION PLAN



REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE	REMEDIATION AREAS
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PREPARED	KJS/KB
DATE PREPARED	2010-06-03

DESIGN

REVIEW	GVS
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APPROVED	GVS
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PROJECT No.	CONTROL
1651776	005-R

FIGURE 004-E



LEGEND

- RAP Site Boundary
- Investigation Locations
- CPT
- Groundwater Well
- Locations with Asbestos detected
- Vegetation exclusion area

Remediation Areas

- USTs

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDBERG POST PHASE 2 ESA PROJECT.

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT TACTICAL GROUP

PROJECT LAND PREPARATION WORKS - REMEDIATION ACTION PLAN

TITLE REMEDIATION AREAS

CONSULTANT

YYYYMMDD 2015-05-08

PREPARED KJS/KB

DESIGN -

REVIEW GWS

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Rev. 0

PROJECT No. 1551776

CONTROL 005-R

FIGURE 004-G



LEGEND

- TRAP Site Boundary
- Investigation Locations
- CPT
- Groundwater Well
- Sediment
- Test Pit
- Locations with Asbestos detected
- Asbestos detected
- Vegetation exclusion area
- Remediation Areas
- Hotspot

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDBERG POST PHASE 2 ESA PROJECT.

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

TITLE REMEDIATION AREAS

CONSULTANT

YYYYMMDD	2015-05-08
PREPARED	KLS/KB
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REVIEW	GVS
APPROVED	GVS

Rev: 0

PROJECT No. 1551776

CONTROL 005-R

FIGURE 004-H



LEGEND

- RAP Site Boundary
- Remediation Areas
- Investigation Locations
- Hotspot
- Borehole
- Handpit
- Test Pit
- Other

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

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PROJECT No.
1651776

CONTROL
005-R

FIGURE
004-1

Rev.
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DATE
2015-05-08

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REVIEW
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GVS

TITLE
REMEDIATION AREAS

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

Scale bar: 0, 2.5, 5, 7.5, 10, 12.5 METRES



LEGEND

- TRAP Site Boundary
- Investigation Locations
 - Borehole
 - CPT
 - Hand auger
 - Handpit
 - Groundwater Well
- Sediment
- Surface Scrape
- Test Pit
- Vegetation exclusion area
- Non Aboriginal Heritage Area
- Remediation Areas
 - USTs

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDFER POST PHASE 2 ESA PROJECT.

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT TACTICAL GROUP

PROJECT LAND PREPARATION WORKS - REMEDIATION ACTION PLAN

TITLE REMEDIATION AREAS

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PREPARED	KLS/KB
DESIGN	-
REVIEW	GWS
APPROVED	GWS

Rev: 0

PROJECT No. 1551776

CONTROL 005-R

FIGURE 004-J



LEGEND

- TRAP Site Boundary
- Investigation Locations
- Groundwater Well
- Test Pit
- Vegetation exclusion area
- Remediation Areas
- Stockpile

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

REFERENCE

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KEY MAP

CLIENT TACTICAL GROUP

LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

PROJECT

LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE

REMEDIATION AREAS

CONSULTANT

Goldier Associates

PROJECT No.

1651776

CONTROL

005-R

FIGURE

004-K

REVISIONS

Rev	Rev	Rev
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LEGEND

 RAP Site Boundary
 Stage 1 and 2 Investigation Areas

Investigation Locations

-  Borehole
-  CPT
-  Hand pit

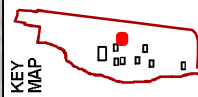
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1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

**KEY
MAP**



CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION
ACTION PLAN



REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone

TITLE INVESTIGATION AREAS

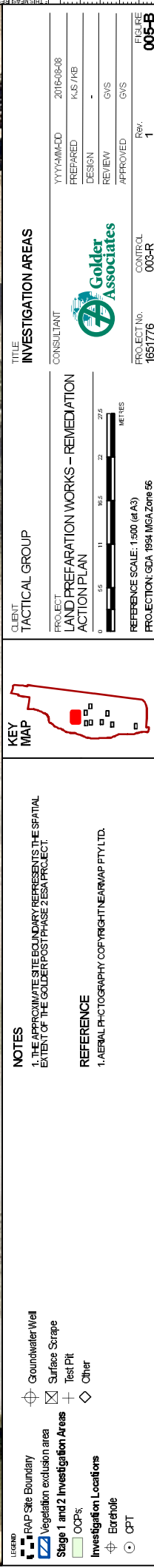
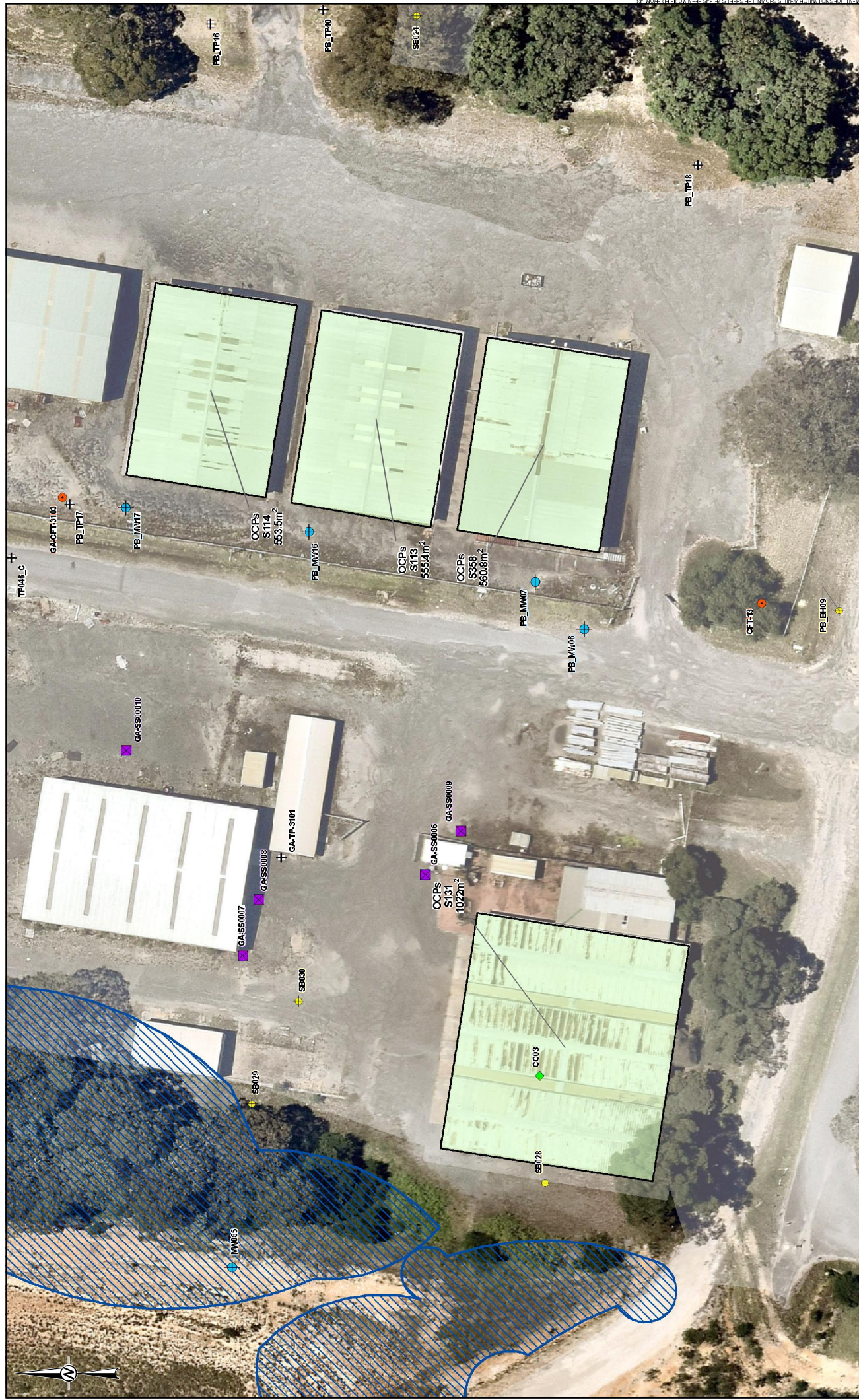
CONSULTANT



PROJECT No.	CONTROL
1651776	003-R








Rev.
1

FIGURE 005-A





LEGEND

-  RAP Site Boundary
 Vegetation exclusion area
Stage 1 and 2 Investigation Areas
 OCP's
 PCB's
Investigation Locations
 Surface Scrape
 Test Pit
 Other

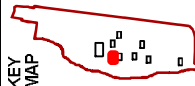
NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDFER POST PHASE 2 ESA PROJECT.

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

**KEY
MAP**



CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION
ACTION PLAN



REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE	INVESTIGATION AREAS
1. <i>How can we improve the quality of our products?</i>	Product Quality
2. <i>How can we reduce the cost of our products?</i>	Cost Reduction
3. <i>How can we improve the efficiency of our production process?</i>	Production Efficiency
4. <i>How can we improve the safety of our products?</i>	Product Safety
5. <i>How can we improve the reliability of our products?</i>	Product Reliability
6. <i>How can we improve the customer service of our products?</i>	Customer Service
7. <i>How can we improve the marketing of our products?</i>	Marketing
8. <i>How can we improve the distribution of our products?</i>	Distribution
9. <i>How can we improve the packaging of our products?</i>	Packaging
10. <i>How can we improve the labeling of our products?</i>	Labeling
11. <i>How can we improve the documentation of our products?</i>	Documentation
12. <i>How can we improve the training of our employees?</i>	Employee Training
13. <i>How can we improve the recruitment of our employees?</i>	Employee Recruitment
14. <i>How can we improve the retention of our employees?</i>	Employee Retention
15. <i>How can we improve the compensation of our employees?</i>	Employee Compensation
16. <i>How can we improve the benefits of our employees?</i>	Employee Benefits
17. <i>How can we improve the work environment of our employees?</i>	Work Environment
18. <i>How can we improve the safety of our employees?</i>	Employee Safety
19. <i>How can we improve the health of our employees?</i>	Employee Health
20. <i>How can we improve the morale of our employees?</i>	Employee Morale
21. <i>How can we improve the productivity of our employees?</i>	Employee Productivity
22. <i>How can we improve the quality of our employees?</i>	Employee Quality
23. <i>How can we improve the quantity of our employees?</i>	Employee Quantity
24. <i>How can we improve the diversity of our employees?</i>	Employee Diversity
25. <i>How can we improve the inclusion of our employees?</i>	Employee Inclusion
26. <i>How can we improve the equity of our employees?</i>	Employee Equity
27. <i>How can we improve the justice of our employees?</i>	Employee Justice
28. <i>How can we improve the fairness of our employees?</i>	Employee Fairness
29. <i>How can we improve the transparency of our employees?</i>	Employee Transparency
30. <i>How can we improve the accountability of our employees?</i>	Employee Accountability
31. <i>How can we improve the responsibility of our employees?</i>	Employee Responsibility
32. <i>How can we improve the integrity of our employees?</i>	Employee Integrity
33. <i>How can we improve the honesty of our employees?</i>	Employee Honesty
34. <i>How can we improve the trustworthiness of our employees?</i>	Employee Trustworthiness
35. <i>How can we improve the loyalty of our employees?</i>	Employee Loyalty
36. <i>How can we improve the commitment of our employees?</i>	Employee Commitment
37. <i>How can we improve the dedication of our employees?</i>	Employee Dedication
38. <i>How can we improve the passion of our employees?</i>	Employee Passion
39. <i>How can we improve the enthusiasm of our employees?</i>	Employee Enthusiasm
40. <i>How can we improve the energy of our employees?</i>	Employee Energy
41. <i>How can we improve the motivation of our employees?</i>	Employee Motivation
42. <i>How can we improve the inspiration of our employees?</i>	Employee Inspiration
43. <i>How can we improve the creativity of our employees?</i>	Employee Creativity
44. <i>How can we improve the innovation of our employees?</i>	Employee Innovation
45. <i>How can we improve the problem-solving of our employees?</i>	Employee Problem-solving
46. <i>How can we improve the decision-making of our employees?</i>	Employee Decision-making
47. <i>How can we improve the communication of our employees?</i>	Employee Communication
48. <i>How can we improve the collaboration of our employees?</i>	Employee Collaboration
49. <i>How can we improve the teamwork of our employees?</i>	Employee Teamwork
50. <i>How can we improve the leadership of our employees?</i>	Employee Leadership
51. <i>How can we improve the management of our employees?</i>	Employee Management
52. <i>How can we improve the supervision of our employees?</i>	Employee Supervision
53. <i>How can we improve the control of our employees?</i>	Employee Control
54. <i>How can we improve the coordination of our employees?</i>	Employee Coordination
55. <i>How can we improve the organization of our employees?</i>	Employee Organization
56. <i>How can we improve the planning of our employees?</i>	Employee Planning
57. <i>How can we improve the execution of our employees?</i>	Employee Execution
58. <i>How can we improve the evaluation of our employees?</i>	Employee Evaluation
59. <i>How can we improve the improvement of our employees?</i>	Employee Improvement
60. <i>How can we improve the change of our employees?</i>	Employee Change
61. <i>How can we improve the adaptation of our employees?</i>	Employee Adaptation
62. <i>How can we improve the flexibility of our employees?</i>	Employee Flexibility
63. <i>How can we improve the resilience of our employees?</i>	Employee Resilience
64. <i>How can we improve the perseverance of our employees?</i>	Employee Perseverance
65. <i>How can we improve the determination of our employees?</i>	Employee Determination
66. <i>How can we improve the resolve of our employees?</i>	Employee Resolve
67. <i>How can we improve the fortitude of our employees?</i>	Employee Fortitude
68. <i>How can we improve the endurance of our employees?</i>	Employee Endurance
69. <i>How can we improve the stamina of our employees?</i>	Employee Stamina
70. <i>How can we improve the vigor of our employees?</i>	Employee Vigor
71. <i>How can we improve the vitality of our employees?</i>	Employee Vitality
72. <i>How can we improve the vigor of our employees?</i>	Employee Vigor
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PROJECT NO.

PROJECT NO.
1651776

Dear

1 rev.

FIGURE

FIGURE 005-F



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LEGEND

RAP Site Boundary

Stage 1 and 2 Investigation Areas

POEs

NOTES

REFERENCE

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION
ACTION PLAN

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

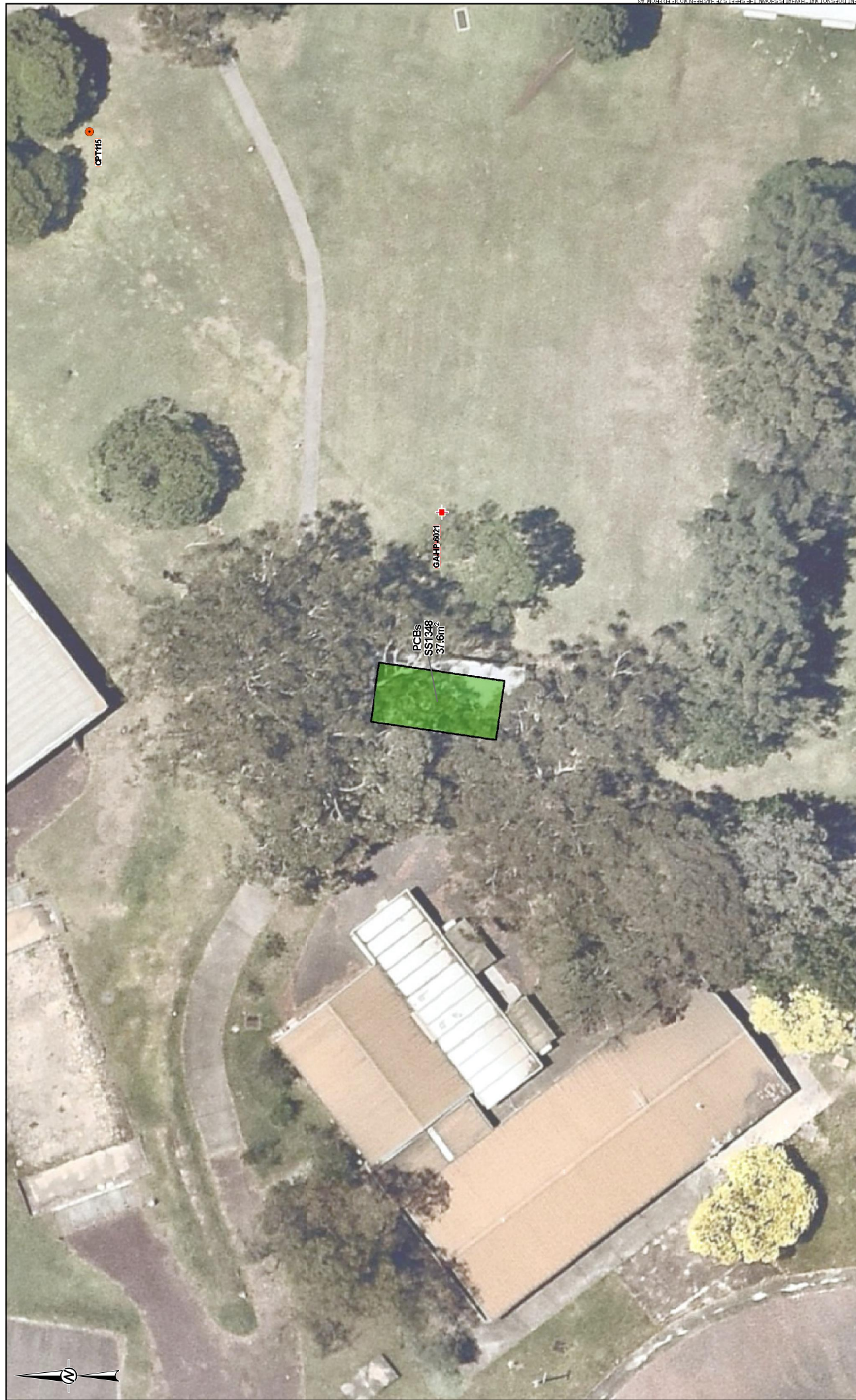
TITLE INVESTIGATION AREAS

CONSULTANT



PROJECT No. 1651776 CONTROL 003-R

FIGURE 005-F



**KEY
MAP**

7

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

LEGEND
 RAP Site Boundary
 Stage 1 and 2 Investigation Areas

■ PCEs

 Hand pit
 CPT

CLIENT
TACTICAL GROUP

PROJECT LAND PREPARATION WORKS – REMEDIATION ACTION PLAN



REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 5

TITLE INVESTIGATION AREAS

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2016-08-08



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Associates**

PROJECT No.
1651776CONTROL
003-RRev.
1

FIGURE 005-G



LEGEND

- RAP Site Boundary
- Proposed works compound
- Investigation Locations
- Borehole
- CPT
- Hand pit
- Sediment
- Surface Scarpe
- Test Pit
- Locations with Asbestos detected
- Asbestos detected
- Vegetation exclusion area
- Stage 1 and 2 High Risk Areas**
- Anthropogenic Fill (confirmed)

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

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CLIENT
TACTICAL GROUP

TITLE

PROJECT
LAND PREPARATION WORKS – REMEDIATION
ACTION PLAN

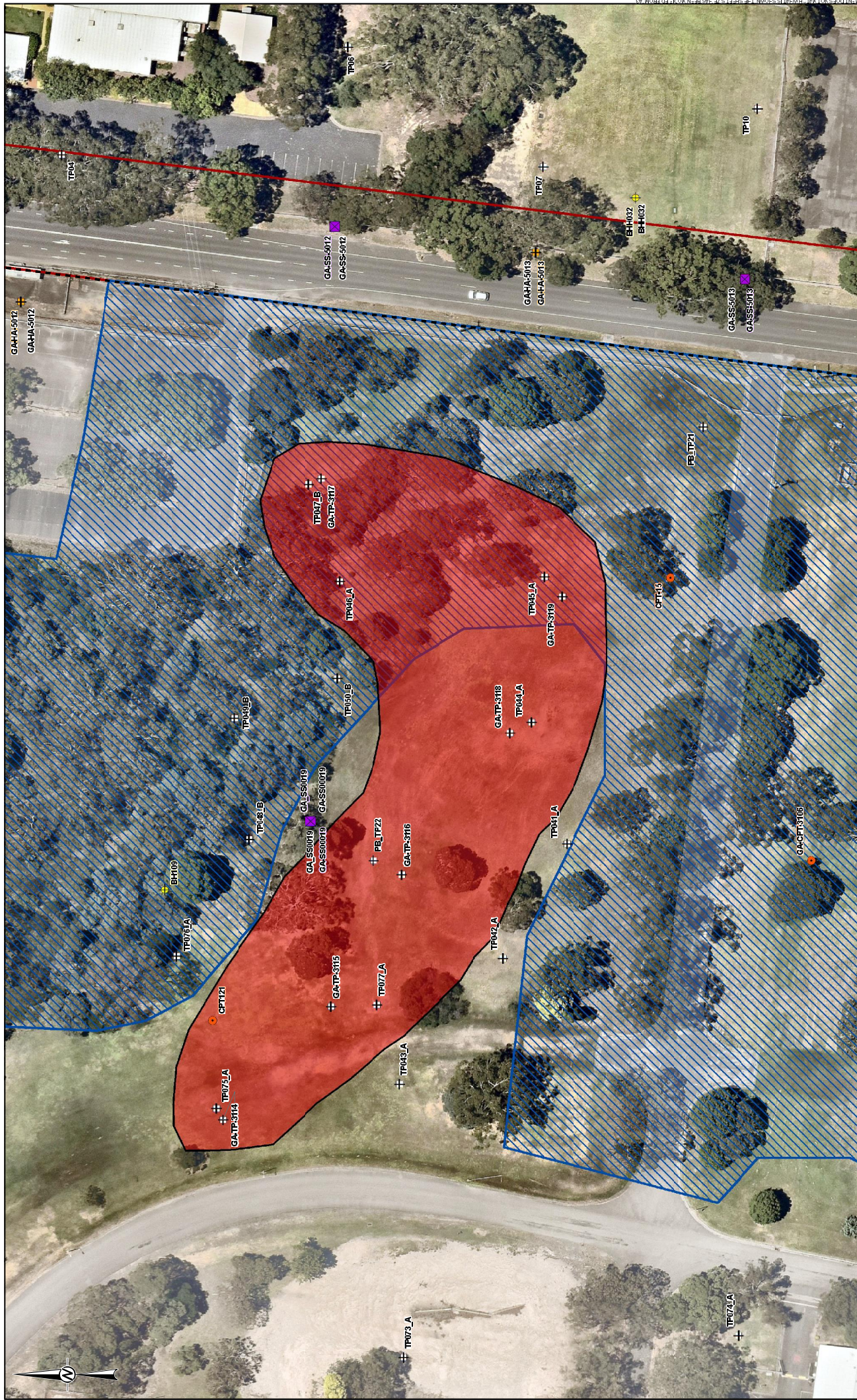
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PROJECTION: GDA 1994 MGA Zone 56

PROJECT No. 1651776	CONTROL 003-R	Rev. 1	APPROVED	GVS
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FIGURE
006-E

FIGURE 006-F

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LEGEND

- RAP Site Boundary**
Investigation Locations
- ⊕ Borehole
⊙ CPT
+ Hand auger
⊗ Surface Scrape
+ Test Pit
▨ Vegetation exclusion

Stage 1 and 2 High Risk Areas
Anthropogenic Fill (confirmed)

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDFER POST PHASE 2 ESA PROJECT.

REFERENCE

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KEY



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PROJECT LAND PREPARATION WORKS – REMEDIATION ACTION PLAN



REFERENCE SCALE: 1:750 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE	HIGH RISK AREAS
1. <i>Introduction</i>	
2. <i>Background</i>	
3. <i>Methods</i>	
4. <i>Results</i>	
5. <i>Discussion</i>	
6. <i>Conclusion</i>	
7. <i>References</i>	
8. <i>Appendix</i>	
9. <i>Supplementary Materials</i>	
10. <i>Other</i>	

CONSULTANT

YYYY-MM-DD 2016-08-08

PREPARED	KJS / KB

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DESIGN	

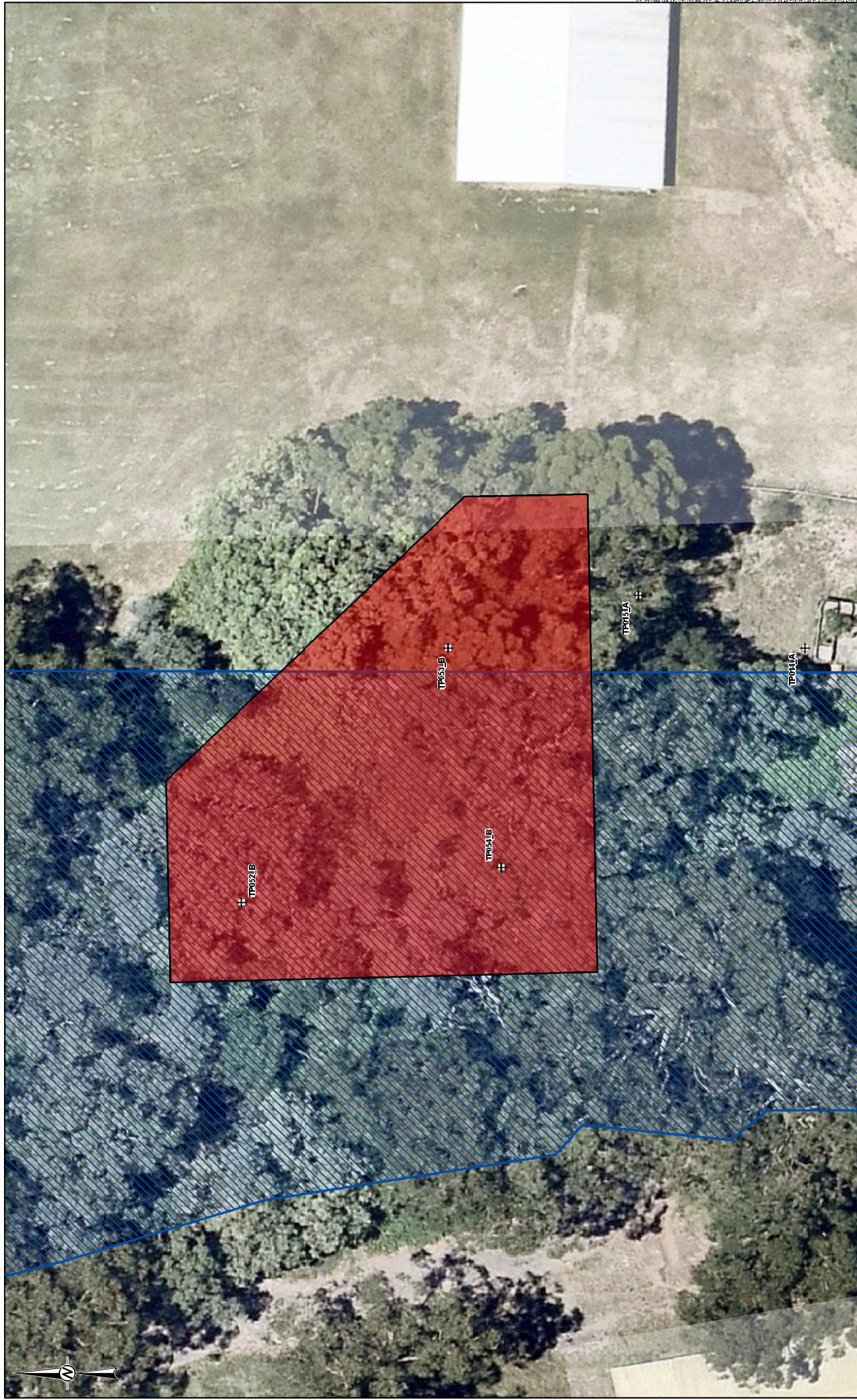
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DOI: 10.1002/eqm2

PROJECT No. 1651776
CONTROL 003-R

FIGURE 006-F



LEGEND

- Legend**
-  RAP Site Boundary
 -  Investigation Locations
 -  Vegetation exclusion area
 -  Stage 1 and 2 High Risk Areas
 -  Anthropogenic Fill (confirmed)
 -  Test Pit

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDFER POST PHASE 2 ESA PROJECT.

REFERENCE

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**KEY
MAP**



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TACTICAL GROUP

PROJECT LAND PREPARATION WORKS – REMEDIATION ACTION PLAN



REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE	HIGH RISK AREAS
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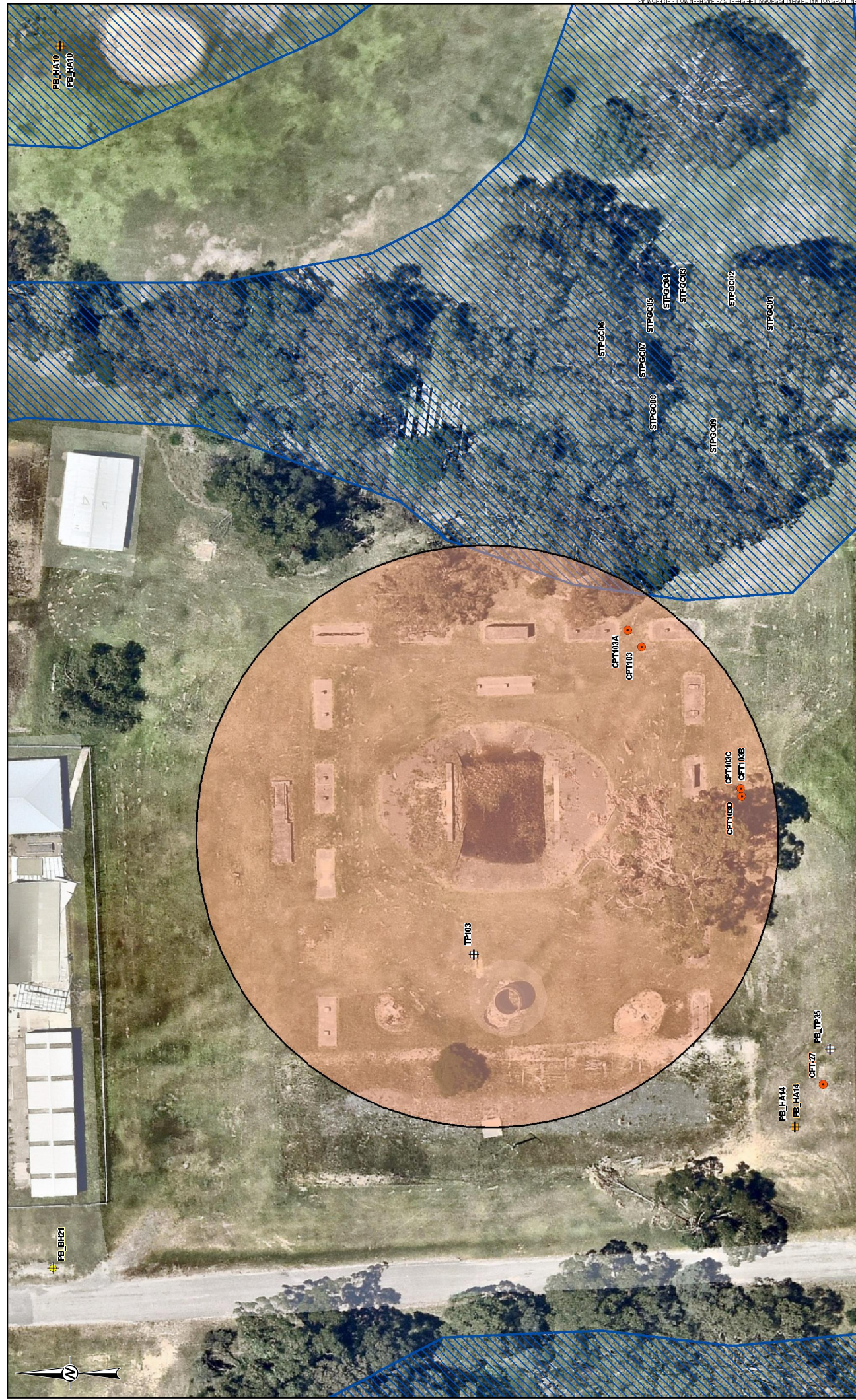
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PROJECT No.
1651776

PROJECT No.	CONTROL
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Rev. 4-78

FIGURE 006-G



LEGEND

- ■ ■ RAP Site Boundary**
■ ■ ■ Investigation Locations

Stage 1 and 2 High Risk Areas
 Anthropogenic Fill (potential)

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDFER POST PHASE 2 ESA PROJECT.

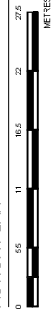
REFERENCE

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**KEY
MAP**



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TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION
ACTION PLAN

REFERENCE SCALE: 1:500 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE

CONSULTANT

PROJECT N
1651776Rev.
1

FIGURE 006-1

YYYY-MM-DD	2016-08-08
PREPARED	KJS / KB
DESIGN	-
REVIEW	GVS
APPROVED	GVS

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APPENDIX B

Field and Laboratory Quality Assurance and Quality Controls



1.0 FIELD AND LABORATORY QUALITY ASSURANCE AND QUALITY CONTROLS (QA/QC)

It is important that the data collected in the proposed site remediation validation program is of a quality suitable to meet the objectives of the validation works. Possible sources of error in the collection of soil and soil vapour data can arise in the collection, handling and analysis of samples. An effective field QA/QC program aims to minimise these sources of error and increase the reliability of the results.

1.1 Field Quality Assurance

The sampling fieldwork will be completed in accordance with Golder's standard operating procedures (SOPs).

Surface and sub-surface characteristics and field observations will be fully documented, including photographic records. Samples will be labelled in the field with a unique sample identification code using waterproof indelible ink. CoC documentation will be used for the transport of samples from the field to the laboratory.

1.2 Field Quality Control

QC samples for the proposed soil and groundwater sampling programs will include duplicate samples and (for soil) blank samples. Duplicate samples consist of media collected at the same place and time and split into two samples. Blank samples are artificial samples designed to monitor the introduction of artefacts into the equipment cleaning and sample handling process.

The following duplicate and blank samples will be collected:

- **Inter-laboratory duplicates (soil, groundwater and vapour):** Individual samples are split into two sub portions in the field and placed into two separate containers. One sample is sent to the primary project laboratory and the other sample to an independent, secondary, check laboratory. The purpose of the inter-laboratory duplicates is to assess the analytical accuracy of the primary project laboratory and other factors including sampling methodology and the heterogeneity of the sample medium. Inter-laboratory samples will be collected and analysed at a rate of no less than 1 in 20 of total samples analysed.
- **Intra-laboratory duplicates (soil, groundwater and vapour):** Individual samples are split into two sub portions in the field and placed into two separate containers. Both samples are forwarded to the primary project laboratory with no communication on the relationship between the duplicate and the primary sample. The purpose of the intra-laboratory duplicates is to assess the analytical accuracy of the laboratory process and other factors including sampling methodology and the heterogeneity of the sample medium. Intra-laboratory soil and soil vapour samples should be collected and analysed at a rate of no less than 1 in 10 of total samples analysed.
- **Equipment Blanks (soil and groundwater):** These samples are prepared from the collection of the rinsate water used to complete the final rinse of the sampling equipment following decontamination. The collected water is then transferred to an appropriate sample bottle. Equipment blanks are a check on the equipment and decontamination process. A minimum of one equipment blank should be collected per day (when sampling is being undertaken) for the duration of the project.
- **Trip Blanks (soil and groundwater):** Trip blanks should be included in each batch where TPH (C₆ to C₉) and BTEX are being analysed in soil and groundwater.

1.3 Laboratory Quality Control

Laboratory analyses should be conducted in accordance with the standard test methods outlined in NEPC (2013) NEPM. The Practical Quantification Limits (PQLs) should be established at levels below the site adopted validation criteria. Laboratories selected for analysis are to be NATA Australia accredited for the analyses required.



Laboratory quality control procedures typically include analysis of the following:

- **Laboratory duplicate samples:** The laboratory collects duplicate sub-samples from a sample submitted for analysis. Analysis of these duplicate pairs is completed at a rate of 1 sample per 20 samples submitted for analysis, or one sample per batch. The purpose of the laboratory duplicate is to assess the analytical precision (repeatability) of the test result.
- **Spiked samples:** Samples submitted to the laboratory are spiked by adding a volume of known concentration of the target analyte prior to extraction and analysis. A spike documents the effect of the sample matrix on the extraction and analytical techniques.
- **Surrogate spikes:** Samples submitted to the laboratory are spiked with an organic compound, which is similar to the analyte of interest in terms of chemical composition and extractability. These organic compounds are not normally found in environmental samples. The surrogates spiked samples are used to assess if any gross error has occurred during a particular stage of the test method.
- Reported percent for continuing calibration verifications (CCV) samples for summa canisters for vapour samples.

1.4 Assessment of Quality Control

The validity of all analytical data will be performed in general accordance with:

- USEPA (June 2008). USEPA Contract Laboratory Program National Functional Guidelines for Organic Methods Data Review, EPA-540-R-08-01.

Accuracy and precision measurements from the appropriate QC check samples will be compared with the analytical Data Quality Objectives (DQOs) to assess the quality of the analytical data. Should data be found to fall outside acceptable limits of precision and accuracy, appropriate corrective actions will be implemented.

1.4.1 Field QC

An assessment of field quality control samples is completed by calculating the relative percent difference of duplicate samples.

The relative percent difference (RPD) of each duplicate set is calculated to assess overall precision, where:

$$RPD = (C1 - C2) / ((C1 + C2) / 2) \times 100\%$$

where; C1 = primary sample concentration C2 = duplicate sample concentration

Guidelines for the assessment of quality control results are provided in the NEPC (1999) NEPM. An acceptable RPD limit is 30%, however, this can be expected to be higher for concentrations near the PQL. A result exceeding this guideline does not necessarily mean that the data is invalid, but rather the effect of the difference needs to be considered.

1.4.2 Laboratory QC

Assessment of laboratory QC is undertaken internally by the laboratory. Laboratory QC includes:

- Relative Percent Differences – assessed as described above, but between internal laboratory duplicate pairs;
- Percent Recovery (PR) is used to assess the accuracy, where:

$$PR = \frac{CS - C}{S} \times 100\%$$

where; CS = spiked sample result C = sample result S = spike added.



1.4.3 Field Methods

Sample Labelling

The sample labels will include the sample identification number, place of collection, date of collection and initials of the sampling personnel. Each sample will be labelled with a unique sample identification number that will facilitate tracking and cross referencing of sample information.

Soil samples should be identified and labelled in the format of VX_Y.Y-Y.Y_date, where X is the soil validation sample location number, Y.Y is sample interval depth (m bgl) and 'date' is the sampling date. QAQC samples should be identified and labelled in the format of QC1XX and QC2XX for intra- and inter-laboratory duplicate samples, respectively, where XX is the sequential QAQC number.

Field Logs

A summary of activities performed at the site will be recorded in a field log book. Entries for each day will commence on a new page, which will be dated. Corrections will be made by marking through the error with a single line, to remain legible, and initialling this action followed by writing the correction.

The following types of information will be recorded for each sample collected:

- Unique sample identification number;
- Date of sample collection;
- Initials of the sampling personnel;
- Type of sample and sampling method;
- Analyses to be performed on sample; and
- Any other relevant comments (odour, colour, sheen, etc).

The following types of information will be recorded for each soil vapour well installed:

- Weather conditions;
- Date of installation;
- Type of equipment used;
- Length of time to complete the installation;
- Depth of the well;
- Well installation geological bore log;
- Well construction log; and
- Any other relevant comments.

Chain of Custody Records

Chain-of-Custody (CoC) records will be used to track samples from the time of collection to the arrival of samples at the laboratory. Each sample container being shipped to the laboratory will contain a CoC form. The laboratory, upon receiving the samples, will complete the remaining sample receipt fields and will return a completed CoC to Golder along with the data deliverables package.

Sample Containers and Handling

Samples will be placed in appropriate sample containers with the appropriate preservative, labelled and properly sealed. Samples will be cushioned within the shipping coolers by the use of bubble pack wrapping. Samples will be kept cool by the use of sealed plastic bags of ice or similar means.



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Samples will be shipped to the project laboratory by commercial courier or delivered by hand. The coolers will be sealed, stored in a secure location, and then picked up by the courier or hand delivered on the same or next business day. A security seal will be placed over the lid on the front and back of each shipping cooler. The seal will secure the lid and provide evidence that the samples have not been tampered with en-route to the contracted laboratory.

Once used for sampling, vapour sample containers (6 L Summa canisters) will be sealed and vacuum pressure recorded on the COC. The containers will be couriered to the analytical laboratory.

Upon receipt of the sample containers by the laboratories, the designated custodian will inspect the samples. The sample custodian will note the condition of the samples and seal on the CoC form. The sample custodian will then check the contents against the information noted on the CoC form. If damage or discrepancies are observed, the discrepancies will be duly recorded in the remarks column of the CoC form. The form will then be signed and dated.

All samples will be analysed within analytical holding times.

Equipment Calibration

Equipment used to perform testing or data recording (including the field portable PID) will be calibrated to the manufacturer's specifications by the supplier prior to use. The calibration records will be retained by the field scientist/engineer. Calibration checks and adjustments will be performed as required during field operations. The identification of the specific device or equipment calibrated, date, reference standard, results or adjustments made and the signature of the person performing the calibration will be documented on field data sheets.

Equipment Decontamination

Decontamination of sampling equipment including sampling trowels, hand augers, shovels and augers is conducted to minimise the potential for contamination between sampling locations and cross contamination of samples. Decontamination of equipment is to be completed prior to coming on-site and after contact with potentially contaminated materials.

During decontamination procedures, nitrile (or equivalent) gloves are to be worn throughout and replaced as needed.

Decontamination of sampling equipment (hand augers, sampling trowels etc.) generally follows the procedures outlined below:

- Decontaminate two buckets with clean water, rinse with phosphate-free detergent (Decon 90), and thoroughly rinse again with clean water;
- Fill the first bucket with detergent and clean water;
- Fill the second bucket with clean water;
- Scrape or brush off any soil/product adhering to equipment;
- Clean equipment in detergent water; and
- Rinse twice in the clean water.

Following the final rinse, equipment will be visually inspected to verify that it is free of material that could contribute to possible cross contamination.



APPENDIX C

Tier 1 Soil and Groundwater Assessment Criteria



1.0 TIER 1 SOIL CRITERIA

Guidance on the assessment of contaminant concentrations on sites is presented in the *National Environment Protection (Assessment of Site Contamination) Measure 1999* (NEPC 2013), herein referred to as the ASC NEPM (NEPC, 2013). Exposure settings considered in the ASC NEPM (NEPC, 2013) are low and high density residential; recreational/open space; and commercial / industrial land uses.

As the site is predominately proposed for commercial / industrial purposes it is considered appropriate to compare the results of soil analysis against the investigation levels for commercial / industrial land. The western portion of the site, immediately adjacent to the Georges River, will be retained and rehabilitated as a natural riparian / conservation zone. At this stage it is not clear if public access to the riparian zone will be allowed. Should public access be allowed the health investigation levels for the recreational/open space exposure setting will be applied to the areas made available to the public.

The following health based criteria have been considered as assessment criteria:

- Health screening levels (HSLs) for petroleum hydrocarbons will be used to assess chronic human health risks of petroleum hydrocarbon impact via the vapour intrusion exposure pathway. The HSLs are also considered to be protective of direct contact. Soil HSLs are provided in the ASC NEPM 2013 for a variety of exposure settings based on land use, depth of impact and soil type. Table 1A(3) in Schedule B1 of ASC NEPM 2013 presents HSLs for the F1 (C₆-C₁₀) and F2 (>C₁₀-C₁₆) hydrocarbon fractions and for benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN). HSLs for F1 and F2 exclude BTEX and naphthalene concentrations respectively. Where appropriate, the health risk of potential exposure via direct contact for F3 (>C₁₆-C₃₄) and F4 (>C₃₄-C₄₀) hydrocarbon fractions will be assessed against guidance provided in CRC 2011;
- Health investigation levels (HILs) are generic assessment criteria for a range of metals and organic substances designed to be used in the first stage of the assessment of potential risks to human health from chronic exposure to contaminants. Table 1A(1) in Schedule B1 of ASC NEPM 2013 presents the HILs, which are generic to all soil types; and
- The ASC NEPM (NEPC, 2013), provides HSL for asbestos in soil, which are based on scenario specific likely exposure levels adopted from the Western Australia Department of Health (WA DoH) *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* (WA DoH, 2009). Table 7 in Schedule B1 of ASC NEPM 2013 presents the HSLs for asbestos contamination in soil.

Although the majority of the site will be converted to terrestrial ecosystem of limited value (i.e. a commercial/ industrial development), in accordance with Section 2.5.3 in Schedule B1 of the ASC NEPM 2013, consideration should also be given to the ecological investigation levels (EILs) within commercial/industrial land uses and EILs have been derived for commercial/industrial land uses. Furthermore, EILs have been derived for areas of ecological significance, which are considered to be areas where the planning provisions or land use designation is for the primary intention of conserving and protecting the natural environment, and include areas designated conservation areas (ASC NEPM, 2013). As the site is proposed for commercial/industrial purposes it is considered appropriate to compare the results of the soil analysis against the EILs for commercial/industrial land use, and in the riparian zone EILs derived for areas of ecological significance should also be considered. Therefore, the following ecological based criteria have been considered as assessment criteria:

- Ecological screening levels (ESLs) for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon fractions are used for assessment of risk to terrestrial ecosystems. Table 1B(6) in Schedule B1 of NEPC 2013 presents the ESLs. ESLs are provided for coarse and fine soils under urban, residential and public open space, and commercial/ industrial land use scenarios. ESLs are relevant to the root zone and habitation zone in soil, corresponding to the top two metres of the finished level of a site;
- Generic ecological investigation levels (EILs) are provided for lead, arsenic, DDT and naphthalene. The generic EILs, which are presented in Table 1B(5) in Schedule B1 of NEPC 2013, are independent



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of soil type. Site specific EILs for chromium (III), copper, nickel and zinc can be calculated from the sum of the ambient background concentration (ABC) of the contaminant and on the added contaminant limit (ACL), which is based on soil specific properties such as pH, cation exchange capacity (CEC) and clay content. The ABC can be determined by measuring the concentration in a soil sample collected at a reference site not impacted by the contaminant. Where a reference site cannot be determined the ABC can be estimated based on urban metal levels or the method from Hamon et al. (Hamon, 2004) as specified in NEPC 2013. Alternatively, where background concentrations cannot be determined, the ACL may be adopted as the EIL as a conservative measure;

The ASC NEPM, 2013 includes management limits (MLs) for petroleum hydrocarbon compounds, which are designed to avoid or minimise the potential effects of petroleum hydrocarbons such as formation of observable light non-aqueous phase liquids (LNAPL), fire and explosive hazards and effects on buried infrastructure e.g. penetration of, or damage to, in-ground services by hydrocarbons. Table 1B(7) in Schedule B1 of ASC NEPM 2013 presents the MLs. The application of the management limits requires consideration of the depth of building basements and services and depth to groundwater.

There are no current Australian guidelines for perfluorooctanic acid (PFOA) and perfluorooctanic sulfonate (PFOS) chemicals in soils, therefore the US EPA regional screening level (RSL) for residential soil will be adopted. It is suggested that the PFOA and PFOS criteria should be reviewed biannually as it is expected that revisions to the national standard and/or Australian criteria will be published within 12 months.

The adopted soil assessment criteria for commercial / industrial settings and recreational / open space settings is summarised in **Table C1** and **Table C2** below.

Table C10: Summary of Adopted Commercial/Industrial Soil Assessment Criteria (mg/kg)

Analyte	HIL – D	HSL-D, Vapour Intrusion Sand 0-1m	HSL-D, Vapour Intrusion Sand 1-2m	ESL* - coarse	EIL ^	Mgt Limits#
TRH						
F1	-	260	370	215*	-	700
F2	-	NL/20,000*	NL	170*	-	1,000
F3	-	NL/27,000*	NL	1,700	-	3,500
F4	-	NL/38,000*	NL	3,300	-	10,000
BTEXN						
Benzene	-	3	3	75	-	-
Toluene	-	NL/99,000*	NL	135	-	-
Ethylbenzene	-	NL/27,000*	NL	165	-	-
Total Xylenes	-	230	NL	180	-	-
Naphthalene	-	NL/11,000*	NL	-	370	-
Inorganics						
Arsenic	3,000	-	-	-	160	-
Cadmium	900	-	-	-	-	-
Chromium (VI)	3,600	-	-	-	-	-
Chromium (III)	-	-	-	-	930	-
Copper	240,000	-	-	-	140	-
Lead	1,500	-	-	-	1,800	-
Mercury (inorganic)	730	-	-	-	-	-
Nickel	6,000	-	-	-	40	-



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Zinc	400,000	-	-	-	430	-
PAHs						
Total PAHs	4,000	-	-	-	-	-
Benzo(a)pyrene	-	-	-	1.4	-	-
Carcinogenic PAHs (as B[a]P TEQ)**	40	-	-	-	-	-
Phenols						
Phenol	240,000	-	-	-	-	-
Pentachlorophenol	660	-	-	-	-	-
OCPs						
DDT+DDE+DDD	3,600	-	-	-	-	-
Aldrin and dieldrin	45	-	-	-	-	-
Chlordane	530	-	-	-	-	-
Endosulfan	2,000	-	-	-	-	-
Endrin	100	-	-	-	-	-
Heptachlor	50	-	-	-	-	-
Methoxychlor	2,500	-	-	-	-	-
Hexachlorobenzene (HCB)	80	-	-	-	-	-
DDT	-	-	-	-	640	-
OPPs						
Chlorpyrifos	2,000	-	-	-	-	-
PCBs						
PCBs	7	-	-	-	-	-
Asbestos						
Bonded ACM	0.05% w/w	-	-	-	-	-
Friable Asbestos	0.001% w/w	-	-	-	-	-

Notes:

NL- non limiting

- No guideline available

+ HSLs for direct contact where HSL for vapour intrusion is NL adopted from CRC Care, 2011.

* ESLs are of low reliability except where indicated by * which indicates the ESL is of moderate reliability

**B[a]P TEQ – Benzo[a]pyrene toxicity equivalency quotient

TRH:

F1 = C₆-C₁₀ (for HSL and ESL subtract BTEX)

F2 = >C₁₀ – C₁₆ (for HSL subtract naphthalene)

F3 = >C₁₆ – C₃₅

F4 = >C₃₄ – C₄₀

Management Limits are applied after consideration of relevant HSLs and ESLs

^ Calculated based on CSIRO NEPM EILS Calculation Workbook (<http://www.scew.gov.au/node/941>) with geo-mean of site wide CEC and pH data of 4.1 and pH of 6.8, respectively. And application of the workbook generic background contaminant concentrations with the site being in NSW and a high traffic environment.



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Table C11: Tier 1 Criteria Open Space Recreational Land Use and Areas of Ecological Significance

Analyte	HIL – C	HSL-C, Vapour Intrusion Sand 0-1m	ESL*- Urban residential and public open space	EIL^*- Urban Residential and Public Open Space	EIL^ – Areas of Ecological Significance	Mgt Limits Residential, parkland and public open space#
TRH						
F1	-	NL/5,100 ⁺	180 [*]	-	-	700
F2	-	NL/3,800 ⁺	120 [*]	-	-	1,000
F3	-	NL/5,300 ⁺	300	-	-	2,500
F4	-	NL/7,400 ⁺	2,800	-	-	10,000
BTEXN						
Benzene	-	NL/120 ⁺	50	-	-	-
Toluene	-	NL/18,000 ⁺	85	-	-	-
Ethylbenzene	-	NL/5,300 ⁺	70	-	-	-
Total Xylenes	-	NL/15,000 ⁺	105	-	-	-
Naphthalene	-	NL/1,900 ⁺	-	170	10	-
Inorganics						
Arsenic	300	-	-	100	40	-
Cadmium	90	-	-	-	-	-
Chromium (VI)	300	-	-	-	-	-
Chromium (III)	-	-	-	-	-	-
Copper	17,000	-	-	100	55	-
Lead	600	-	-	1,100	470	-
Mercury (inorganic)	80	-	-	-	-	-
Nickel	1,200	-	-	25	8	-
Zinc	30,000	-	-	320	170	-
PAHs						
Total PAHs	300	-	-	-	-	-
Benzo(a)pyrene	-	-	0.7	-	-	-
Carcinogenic PAHs (as B[a]P TEQ)**	3	-	-	-	-	-
Phenols						
Phenol	40,000	-	-	-	-	-
Pentachlorophenol	120	-	-	-	-	-
OCPs						
DDT+DDE+DDD	400	-	-	-	-	-
Aldrin and dieldrin	10	-	-	-	-	-
Chlordane	70	-	-	-	-	-
Endosulfan	340	-	-	-	-	-
Endrin	20	-	-	-	-	-
Heptachlor	10	-	-	-	-	-
Methoxychlor	400	-	-	-	-	-



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Analyte	HIL – C	HSL-C, Vapour Intrusion Sand 0-1m	ESL*- Urban residential and public open space	EIL^*- Urban Residential and Public Open Space	EIL^ – Areas of Ecological Significance	Mgt Limits Residential, parkland and public open space [#]
Hexachlorobenzene (HCB)	10	-	-	-	-	-
DDT	-	-	-	180	3	-
OPPs						
Chlorpyrifos	250	-	-	-	-	-
PCBs						
PCBs	1	-	-	-	-	-
Asbestos						
Bonded ACM	0.02% w/w	-	-	-	-	-
Friable Asbestos	0.001% w/w	-	-	-	-	-

Notes:

NL- non limiting

- No guideline available

+ HSLs for direct contact where HSL for vapour intrusion is NL adopted from CRC Care, 2011.

* ESLs are of low reliability except where indicated by * which indicates the ESL is of moderate reliability

**B[a]P TEQ – Benzo[a]pyrene toxicity equivalency quotient

TRH:

F1 = C₆-C₁₀ (for HSL and ESL subtract BTEX)

F2 = >C₁₀ – C₁₆ (for HSL subtract naphthalene)

F3 = >C₁₆ – C₃₅

F4 = >C₃₄ – C₄₀

Management Limits are applied after consideration of relevant HSLs and ESLs

^ Calculated based on CSIRO NEPM EILS Calculation Workbook (<http://www.scew.gov.au/node/941>) with geo-mean of site wide CEC and pH data of 4.1 and pH of 6.8, respectively. And application of the workbook generic background contaminant concentrations with the site being in NSW and a high traffic environment.

2.0 TIER 1 GROUNDWATER ASSESSMENT CRITERIA

The environmental values of groundwater below the site and in the receiving environment of the Georges River and Anzac Creek were considered in the selection of assessment criteria. The consideration of environmental values is summarised as follows:

- With the Project site to be developed for commercial/industrial use, and the surrounding areas serviced by a reticulated water network, the likelihood of groundwater being used for drinking water purposes is considered highly unlikely. Hence, the health-based criteria for the Australian Drinking Water Guidelines (ADWG, 2011) are not considered to be relevant;
- The environmental values of the Georges River, which is considered to be the primary receiving environment for groundwater discharge from the Project site, are considered to be the most relevant. Environmental values of surface water catchments in NSW are defined by water quality objectives (WQOs) for each catchment. A specific set of WQOs have been developed for the Georges River catchment, of which the *Water ways affected by urban development* WQOs are most relevant to the Project site. The WQOs are available at the following web link:

(http://www.environment.nsw.gov.au/ieo/georgesriver/report-02.htm#P134_16430 – viewed on 24 October 2014).

These include the protection of:



- Aquatic ecosystems;
- Visual amenity;
- Secondary contact recreation (identified as a short term objective, possibly achievable in 5 years); and
- Primary contact recreation (identified as a long term objective, possibly achievable in 10 years).

On the basis of the WQOs for the Georges River, the relevant assessment criteria for the RAP are considered to be:

- Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC, 2000) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*;
- The National Health and Medical Research Council (NHMRC, 2008) *Guidelines for Managing Risks in Recreational Water*; and
- The National Environmental Protection Council (NEPC 2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM).

The ANZECC (2000), NHMRC (2008) and NEPC (2013) criteria are discussed in further detail in the following sections.

2.1.1 ANZECC 2000

The ANZECC (2000) guidelines provide trigger values for concentrations of organic and inorganic chemicals in freshwater and marine aquatic environments. The trigger values are generally conservative and contaminant concentrations below the trigger values can be assumed to present a negligible risk to environmental receptors. Where a trigger value is exceeded, it triggers the requirement for more detailed consideration of the potential risks represented by the exceedance. The ANZECC (2000) trigger values were originally developed to assess surface water quality, but they are also applied to groundwater quality at the point of discharge to a surface water environment.

For the purposes of the investigation, groundwater analytical results will be assessed relative to the ANZECC (2000) trigger values for 95% level of protection for fresh water. The 95% level of protection is intended for use in slightly to moderately disturbed environments, which is considered appropriate with regard to the Georges River WQOs.

Due to a lack of reliable data, 95% level of protection trigger levels have not been derived for several of the chlorinated hydrocarbons identified on the Project site. However, interim low reliability criteria have been listed and will be adopted for the following compounds ANZECC (2000);

- Vinyl Chloride (VC) – 100 µg/L;
- TCE – 330 µg/L; and
- 1,1 DCE – 700 µg/L.

2.1.2 NHMRC (2008) Assessment Criteria

With respect to chemicals in recreational waters, the NHMRC (2008) guidelines state (s 9.3):

Mance et al (1984) suggested that environmental quality standards for chemicals in recreational waters should be based on the assumption that recreational water makes only a relatively minor contribution to intake. They assumed a contribution for swimming of an equivalent to 10% of drinking water consumption. Since most authorities (including WHO) assume consumption of 2 litres of drinking water per day, this would result in an intake of 200 mL per day from recreational contact with water (WHO 2003). This provides for a simple screening approach in which a substance occurring in recreational



water at a concentration of 10 times that stipulated in the drinking water guidelines may merit further consideration.

Hence, for the purpose of assessing risks related to primary contact recreation in Georges River, the groundwater data could be assessed relative to the health-based ADWG (2011) criteria with a factor of 10x applied to account for the limited ingestion potential relative to the drinking water exposure assumptions. However, for the purpose of this assessment this approach may be overly conservative as primary recreational contact (such as swimming) is indicated as a long-term, aspirational recreational activity within the portion of the Georges River in the immediate vicinity of the Project site, and consequently the exposure route (if any) is likely to be dermal rather than oral. Therefore, the method as described by the National Health and Medical Research Council (NHMRC, 2008) *Guidelines for Managing Risks in Recreational Water* are not considered to be relevant to the site.

2.1.3 ASC NEPM

The ASC NEPM (NEPC, 2013) incorporates the Health Screening Levels (HSLs) for petroleum hydrocarbons in groundwater based on levels derived by the Cooperative Research Centre for Contamination Assessment and Remediation of the Environment (CRC CARE) (CRC CARE, 2011). The HSLs include criteria for BTEX, naphthalene and unspeciated total recoverable hydrocarbons (TRH).

The HSLs for petroleum contaminants are based on assumed sources of impact being consistent with typical fresh (not weathered or degraded) Australian fuels. These are considered appropriate based on the ongoing use of petroleum contaminants on the Project site.

HSLs have also been derived for BTEX and naphthalene. These values may be used to assess risk from typical and atypical petroleum mixtures. In developing the HSLs for BTEX and naphthalene, they were initially derived independent of solubility and therefore independent of source mixture composition and the presence of other chemicals. It is therefore considered that the HSLs for BTEX and naphthalene can be used to screen the reported groundwater analysis data for assessment of suitability at the Project site.

The groundwater HSLs for vapour intrusion have been developed to assess chronic human health risks and do not consider issues such as aesthetics, explosion risks or environmental considerations. The groundwater HSLs, for vapour intrusion, are also considered to be protective of direct contact and the direct contact pathway has not been assessed separately. HSLs are provided for a variety of exposure settings, soil types and depths.

The groundwater HSL – D (commercial / industrial) is considered the most appropriate for the Project site, however the HSL-C (recreational / open space) should also be considered in the proposed portion of the Project site where public may be permitted to access the riparian zone.

The HSLs are dependent on soil type and depth to groundwater:

- **Soil Type** - The investigations completed on the Project site indicate a variety of soil types, therefore the most conservative soil type (sand) has been adopted.
- **Depth** - Groundwater beneath the Project site was intercepted at depths between 3 mbgl and 13 mbgl. Therefore, PB (2014b) adopted a depth of 2 - 4 mbgl as a conservative assessment value.

The adopted soil assessment criteria for commercial / industrial settings and recreational / open space settings is summarised in **Table C12** below.

Table C12: Summary of Groundwater Investigation Levels



MPW REMEDIATION ACTION PLAN - LAND PREPARATION WORKS

Analyte	HSL - D Commercial/ Industrial, Sand, 2 -<4 mbgl	HSL - C recreational / open space, Sand, 2 -<4 mbgl	ANZECC/ARMCANZ (2000) Freshwater, 95%
TRH (µg/L)			
F1	6,000	NL	-
F2	NL	NL	-
BTEXN (µg/L)			
Benzene	5,000	NL	950
Toluene	NL	NL	-
Ethylbenzene	NL	NL	-
<i>para</i> -xylene	-	-	200
<i>ortho</i> -xylene	-	-	350
Total xylenes	NL	NL	-
Naphthalene	NL	NL	16
Inorganics (mg/L)			
Arsenic	-	-	0.013
Cadmium	-	-	0.0002
Chromium	-	-	0.001
Copper	-	-	0.0014
Lead	-	-	0.0034
Nickel	-	-	0.011
Zinc	-	-	0.008
Mercury	-	-	0.00006
PAHs (µg/L)			
Benzo(a)pyrene	-	-	-
Naphthalene	NL	NL	16
Phenols (µg/L)			
Phenol	-	-	320
2-Chlorophenol	-	-	340
2,4-Dichlorophenol	-	-	120
2,4,6-Trichlorophenol	-	-	3
Pentachlorophenol	-	-	3.6
2,4-Dinitrophenol	-	-	45
2,3,4,6-Tetrachlorophenol	-	-	10
VOCs (µg/L)			
Vinyl chloride	-	-	100*
1,1-Dichloroethene	-	-	700*
Trichloroethene	-	-	330*
1,1,2-Trichloroethane	-	-	6,500
1,2-Dichlorobenzene	-	-	160
1,3-Dichlorobenzene	-	-	260
1,4-Dichlorobenzene	-	-	60



MPW REMEDIATION ACTION PLAN - LAND PREPARATION WORKS

Analyte	HSL - D Commercial/ Industrial, Sand, 2 -<4 mbgl	HSL - C recreational / open space, Sand, 2 -<4 mbgl	ANZECC/ARMCANZ (2000) Freshwater, 95%
1.2.4-Trichlorobenzene	-	-	170
1.2.3-Trichlorobenzene	-	-	10
OCPs (µg/L)			
DDT	-	-	0.01
Endrin	-	-	0.02
Lindane	-	-	0.2
Heptachlor	-	-	0.09
Chlordane	-	-	0.08
OPPs (µg/L)			
Chlorpyrifos	-	-	0.01
Diazinon	-	-	0.01
Dimethoate	-	-	0.15
Malathion	-	-	0.05
Phthalates (µg/L)			
Diethyl phthalate	-	-	1,000
Dimethyl phthalate	-	-	3,700
Di-n-butyl phthalate	-	-	26
PCBs (µg/L)			
Aroclor 1242	-	-	0.6
Aroclor 1254	-	-	0.03
Anilines (µg/L)			
Aniline	-	-	250
Nitrobenzenes (µg/L)			
Nitrobenzene	-	-	550
Explosives (µg/L)			
2,4-Dinitrotoluene	-	-	65

Notes:

NL- non limiting

- No guideline available

µg/L - Micrograms per litre

mg/L - Milligrams per litre

* Interim low reliability criteria

TRH:

F1 = C₆-C₁₀ (for HSL subtract BTEX)

F2 = >C₁₀ – C₁₆ (for HSL subtract naphthalene)

F3 = >C₁₆ – C₃₅

F4 = >C₃₄ – C₄₀

3.0 TIER 1 SOIL VAPOUR ASSESSMENT CRITERIA

Where available, soil vapour screening levels have been sourced from the amended NEPM (NEPC, 2013). The soil vapour HSLs for vapour intrusion HSL C (recreation / open space) and D (commercial / industrial land use) are considered the most appropriate for soil vapour analytical results. The HSLs are also soil type



MPW REMEDIATION ACTION PLAN - LAND PREPARATION WORKS

and depth dependant. Based on the soil type encountered, a coarse soil type (sand) has been assumed. This is also the most conservative criteria.

The analytical results will also be initially screened against the interim soil vapour health investigation levels (HILs) for volatile organic chlorinated compounds (VOCCs) published in the ASC NEPM (NEPC, 2013) for recreational (i.e. open space) and commercial / industrial land uses (i.e. Tier 1 screening assessment). Should the vapour monitoring results be consistently below the published Tier 1 screening criteria, a passive management approach, such as the implementation of monitored natural attenuation and an environmental management plan, may be an appropriate response during the future development of the site.

Should the vapour monitoring results exceed the Tier 1 trigger values, the future management of the identified contamination may need to be supported by a Tier 2 quantitative human health risk assessment (HHRA). The approach taken for the quantitative assessment of human health risks would be in accordance with guidelines published by enHealth (2004)⁸ and the ASC NEPM (NEPC, 2013), and would assess the long term risks of the identified contamination for workers on site based on the site specific conditions. This assessment would also help determine if an active management approach is required (i.e. remediation) and determine what site specific trigger values (SSTLs) need to be achieved through any future remediation or management actions.

The adopted investigation levels for the soil vapour investigation are summarised in Table C4.

Table C13: Tier 1 Soil Vapour Criteria

Analyte	HSL-C Recreation / Open Space, 1-2m, Sand	HSL-D Commercial / Industrial, 1-2m, Sand
TRH		
F1	NL	2,800
F2	NL	2,400
BTEXN		
Benzene	2,400	10
Toluene	NL	16,000
Ethylbenzene	NL	4,600
Total Xylenes	NL	3,200
Naphthalene	NL	15
VOCs*		
1,1,1-Trichloroethane	1200	230
cis-1,2-Dichloroethene	2	0.3
Tetrachloroethene	40	8
Trichloroethene	0.4	0.08
Vinyl chloride	0.5	0.1

Notes:

- No guideline available

NL: non-limiting

mg/m³ - Milligrams per cubic metre

* Interim soil vapour health investigation levels for volatile organic compounds are independent of soil type and depth. Application of interim HILs is based on a measurement of shallow (0-1m) soil vapour (or deeper where the values are to be applied to a future building with a basement) or sub-slab soil vapour.

TRH:

F1 = C₆-C₁₀ (for HSL subtract BTEX)

F2 = >C₁₀ – C₁₆ (for HSL subtract naphthalene)

⁸ Guidelines for Assessing Human Health Risks from Environmental Hazards (enHealth, June 2004).



APPENDIX D

Laboratory Detection Limits



Laboratory Reporting Limits

The analytical Limit of Reporting (LOR) for chemicals which have been set as a driver for will be set below the assessment criteria using standard laboratory methodology and instrumentation. Where required, this will include requesting the provision of results with a lower LOR.

However it is recognised that there are a number of chemicals on the site where the proposed criteria are lower than the LOR, and where there are no criteria which may result in uncertainty as to whether a lower LOR is required for the purposes of the validation. There are circumstances where attaining a lower LOR may not be an economically viable or may not add further value to the understanding of the site conditions. For example, if a chemical is co-occurring with other chemicals that are drivers for remediation and therefore is likely to be remediated, further consideration of the chemical at that stage may not be required. Similarly, if a chemical has not been detected at the site and the secondary laboratory has a lower LOR and has also not detected the compound then further consideration may not be required.

The following will be considered with respect to whether lower LOR are required for individual chemicals or for a chemical group:

- is the chemical likely to be present in the soil? (i.e. was it used at the site or is it a breakdown product of known COI).
- has the chemical been detected elsewhere at the site and is it a driver for remediation?
- could a detection of this chemical highlight an area or chemical group which has not previously been identified as requiring remediation?
- if the chemical has not been detected by the primary laboratory, is the secondary laboratory LOR the same or higher?
- is the screening criteria based upon international guidelines?

Using the above screening approach, an assessment will be made as to whether the laboratory may be requested to provide results with a lower LOR, or a review of the appropriateness of the screening criteria may be required or derivation of Risk Based Criteria.

Analytical Methods and LORs for Australian Laboratory Services (ALS) are provided below and those compounds requiring a lower LOR have been highlighted in red. Should an alternative laboratory be adopted, the LORs specific to that laboratory need to be considered using the above mentioned strategy.

ALS Analytical Methods - Soil Samples

Parameter	Technique/ Method Reference	Limit of Reporting (mg/kg) (or as indicated)
Moisture	In-house	1%
TPH (C6-C9) plus TRH(C6-C10) plus BTEXN	USEPA 3510/8015 GC/FID	10
TPH (C10-C36) plus TRH (>C10-C40)		50-100
8 Metals: As, Cd, Cr, Cu, Ni, Pb, Zn (including digestion)	USEPA 6010 ICP/AES	1-5
Mercury - Total Recoverable	APHA 3112 Hg-B CV/FIMS	0.1
PAH - Standard level	USEPA 3510/8270	0.5



MPW REMEDIATION ACTION PLAN - LAND PREPARATION WORKS

Parameter	Technique/ Method Reference	Limit of Reporting (mg/kg) (or as indicated)
OC Pesticides - Std level		0.05-0.2
OP Pesticides - Std level		
PCB - Standard level	USEPA 3510/8270	0.1
1:5 Water Leach (* denotes leach required)	In house	NA
Phenols - Std level	USEPA 3510/8270	0.5-1
PFAS – Full Suite (28 analytes)	LC/MS-MS	0.0002 – 0.001
Full VOC Scan (includes VHC)*	USEPA 5030/8260 P&T/GC/MS	0.2-5
Full SVOC Target Scan	USEPA 3510/8270	0.5-5

ALS Analytical Methods - Optional Asbestos Samples

Parameter	Technique/ Method Reference	Limit of Reporting (mg/kg) (or as indicated)	Sample Size
Asbestos - Quantitation per NEPM 2013 Guidelines ^{NN} .			
Friable Asbestos (FA+AF ¹) Weight and calculated % as Asbestos in Soil	AS 4964-2004 CRCCARE 2013 NEPM	0.002g (0.001%)	500mL (<1kg) pre-sieved to 7mm
Free Fibres - presence/absence.		Absence/ Presence	
# Additional prep charge for sieving to 2mm (per additional 15 minutes or part thereof)			
Bonded ACM determination plus Asbestos estimation - on wet wt basis including (Includes sieving to 7mm) plus description & weights	AS 4964-2004 CRCCARE 2013 NEPM	0.1g (0.01%)	500mL (<1kg) NOT pre-sieved to 7mm
Friable Asbestos (FA+AF ¹) Weight and calculated % as Asbestos in Soil <u>plus</u>		0.002g (0.001%)	
Free Fibres - presence/absence.		Absence/ Presence	
# Additional prep charge for sieving to 2mm (per additional 15 minutes or part thereof)			
Preparation of large soil samples for subsequent ACM determination			
Sieving of soil to 7mm for ACM determination	In house/NEPM 2013	N/A	>1kg or 500ml

^{NN} ALS is accredited by NATA for EA200/AS4964, however this accreditation does not cover Estimates of Asbestos Weight, Dimensions or Percentage Asbestos.

ALS Analytical Methods - Water Samples

Parameter	Technique/ Method Reference	Limit of Reporting (mg/L)
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MPW REMEDIATION ACTION PLAN - LAND PREPARATION WORKS

		(or as indicated)
pH (generally also performed in the field)	APHA 4500-H ⁺ B	0.01 pH units
Alkalinity - Total as CaCO ₃	APHA 2320 B	1
Major Cations: Ca, Mg, Na, K	APHA 3120	1
8 Metals: As, Cd, Cr, Cu, Ni, Pb, Zn	USEPA 6020, ICP/MS	Cd: 0.0001 Zn: 0.005 Others: 0.001
Hg	CV/FIMS/ICP/MS	0.0001
TPH (C6-C9), TRH(C6-C10)/BTEXN plus F1 & F2	P&T/HS-GC/MS	20 / 1-5 µg/L
TPH (C10-C36) plus TRH (>C10-C40)	USEPA 3510/8015 GC/FID	50-100
PAHs - Std level	GC/MS – SIM	0.5-1 µg/L
PFAS – Full Suite Low Level (28 analytes)	LC/MS-MS	0.002-0.1
VOC Scan (includes VHC)*	USEPA 5030/8260 P&T-GC/MS	1-50 µg/L
SVOC Scan	USEPA 3510/8270 GC/MS	2-20
Total Nitrogen as N (incl. NO _x & TKN)	APHA 4500 N _{org} /NO ₃	0.1



APPENDIX E

Important Information Relating to this Report



IMPORTANT INFORMATION RELATING TO THIS REPORT

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Appendix C

UXO, EOW AND EO MANAGEMENT AND REMEDIATION
PLAN (G-TEK 2018A AND G-TEK 2018B)



**UNEXPLODED ORDNANCE (UXO),
EXPLOSIVE ORDNANCE (EO)
AND EXPLOSIVE ORDNANCE WASTE (EOW)
MANAGEMENT AND REMEDIATION PLAN**

FOR

**MOOREBANK PRECINCT EAST
STAGE 2 DEVELOPMENT SITE**

DOCUMENT VERSION CONTROL			
Version	Date	Raised By	Reviewed/Released By
Draft	12 January 2018	Mark Latimer	Greg Guthrie
V1_01	15 January 2018	Mark Latimer	Greg Guthrie
V1_02	15 February 2018	Mark Latimer	Greg Guthrie
V2_01	16 April 2018	Greg Guthrie	Paul O'Donnell

The following Definitions and Abbreviations apply within this Document:

Ammunition: A device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in connection with defence or offence including demolitions. Certain ammunition can be used for training, ceremonial or other non-operational purposes.

Ammunition Produce: Non-explosive stores and components used in the assembly or the initiation of ammunition.

Explosive Ordnance (EO): All munitions containing explosives, nuclear fission and fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges; demolition charges; pyrotechnics; clusters and dispensers; cartridges and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature.

Explosive Ordnance Waste (EOW): Inert material remnant from the initiation or functioning of explosive ordnance.

Field Validation Survey (FVS): A percentage field sampling activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area (see also UXO Assessment).

Fragmentation: Metallic fragments of the fractured casing of EO resultant from the initiation of high explosive filling and often projected at high velocities over considerable distances from the point of initiation.

Hazard Reduction Operation (HRO): An operation designed to reduce the EO hazard within the boundaries of an affected area (see also UXO Remediation).

Military Produce: Any item identified as military in origin that is not ammunition-related.

Regional Explosive Ordnance Services (REOS): Defence designated units assigned to respond to UXO finds.

Safeguarding: An operation designed to monitor excavation, drilling or other processes in an area of potential UXO risk.

Small Arms: All arms, including automatic weapons of less than 20 mm in calibre and all gauges of shotguns.

Small Arms Ammunition (SAA): Ammunition for small arms, ie all ammunition of less than 20 mm in calibre, and all gauges of shotgun cartridges.

Small Arms Ammunition Waste (SAAW): Inert material remnant from the transport, packaging, preparation, and use of SAA.

Unexploded Ordnance (UXO): Explosive ordnance that has been primed, fused, armed or otherwise prepared for action and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material but remains unexploded either by malfunction or design or for any cause. UXO includes items of military ammunition or explosives removed from their original resting-place for any reason, including souveniring by members of the public.

UXO Assessment: An activity designed to determine whether an area is affected by UXO, the boundaries of any affected area, the location of impact points within any affected area and the nature and concentration of UXO within any affected area (see also Field Validation Survey).

UXO Investigation: A systematic examination to determine whether an area is affected by UXO. UXO Investigation may include historical research, field assessment/survey activities and/or remedial works.

UXO Remediation: An operation designed to reduce the EO hazard within the boundaries of an affected area (see also Hazard Reduction Operation).

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1.0 INTRODUCTION

References:

1. GHD 2016 DNSDC EMP Sep 2016
2. Ordnance Investigation and Hazard Analysis of the DNSDC, October 2002, Milsearch Pty Ltd
3. Hazard Reduction Report Precinct H, Moorebank Defence Land, NSW, G-tek Reference URSA03099, October 2003
4. Hazard Reduction Report Precinct I, Moorebank Defence Land, NSW, G-tek Reference URSA03099, October 2003

This Unexploded Ordnance Management and Remediation Plan (UXOMRP) has been developed by G-tek Australia Pty Limited (G-tek) for use during construction/development works within the Moorebank Precinct East Stage 2 development site in NSW. G-tek is a Member of the current Department of Defence (Defence) Environment and Heritage Panel (DEHP), qualified for Unexploded Ordnance (UXO) related works.

The Managing Contractor will be responsible for the implementation of this UXO Management and Remediation Plan.

2.0 BACKGROUND

Moorebank Precinct East (MPE) is the current working description for former Defence lands located east of Moorebank Avenue at Moorebank, NSW.



Figure 1 – Moorebank Precinct East Site (Client Supplied)

MPE is the former site of the Defence National Stocking and Distribution Centre (DNSDC), holding stock for the Royal Australian Navy, Army and Air Force. Prior to developing as DNSDC, the Site was a principal Army supply depot (21 Supply Battalion) and the overall Moorebank Area has been in use by Defence as storage since pre-federation.

A review of the Defence UXO website indicates no Defence perceived UXO risk within the MPE.

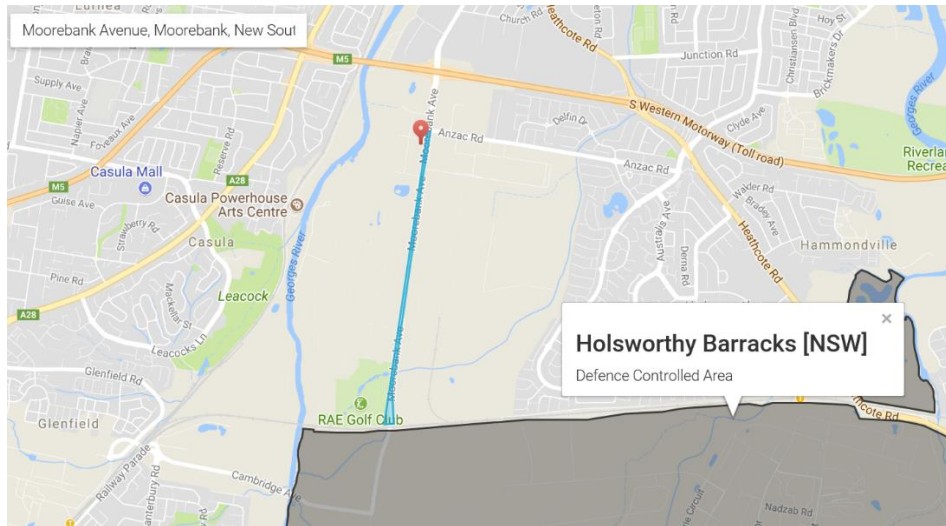


Figure 2 – Moorebank Precinct UXO Search (www.defence.gov.au/uxo/)

It is known that ammunition was previously stored north/east of the MPE within the current location of the recently developed Joint Logistic Unit. This area was remediated for UXO prior to redevelopment.

A review of client supplied documents indicates an area at the south-east corner of MPE as an area of potential UXO (Figure 3)

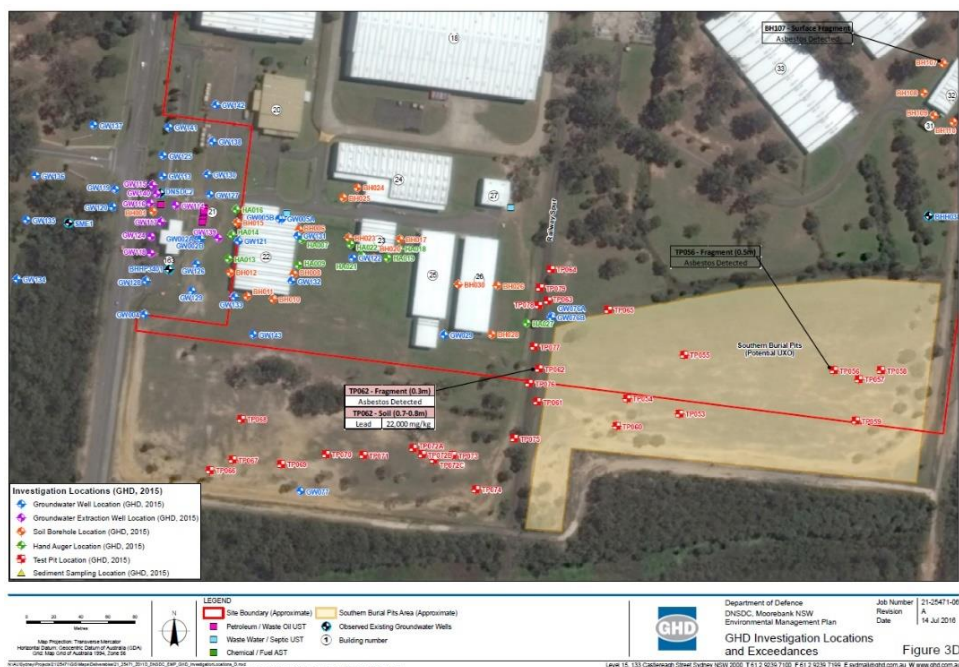


Figure 3 – Moorebank Precinct East Site – South (*Client Supplied*)

A review of Reference B (*Milsearch 2002*), indicates that this potential for UXO was developed as a result of the 2002 identification of scattered inert remnants from functioned 36M hand grenades. The Reference indicates that the soil containing this material was believed to have been imported from the former Anzac Rifle Range at what is now Wattle Grove.

19 **Milsearch**
Final Report: DNSDC UXO Surveys

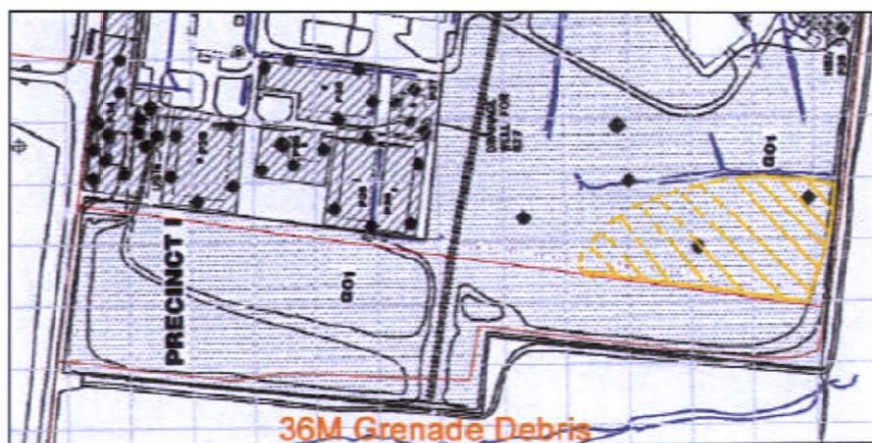


Figure 4 – Moorebank Precinct East Site – South (*Milsearch 2002, p19*)

This 2002 UXO Review found no indications of ordnance related material within MPE other than the hand grenade components within a restricted area at the south-east of the Site.

As a result of Milsearch 2002, Defence contracted G-tek to conduct remediation of the south-east portion of DNSDC to remove any potential material the size of half of a 36M hand grenade; this remediation was conducted through electromagnetic digital imaging of the Site, data processing and interpretation and intrusive investigation of interpreted anomalies. The outcomes were reported via References C (Precinct H) and D (Precinct I); Precinct H falls within the current MPE Site, while Precinct I is south of the MPE boundary. No UXO were identified during this remediation.

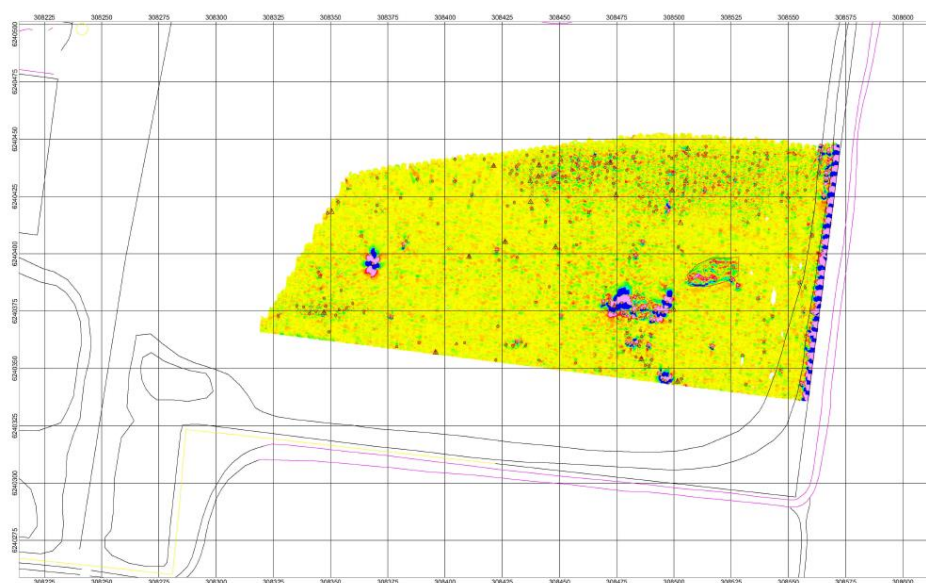


Figure 5 – Moorebank Precinct East Site – South – Precinct H (*G-tek 2003, Ref 3*)

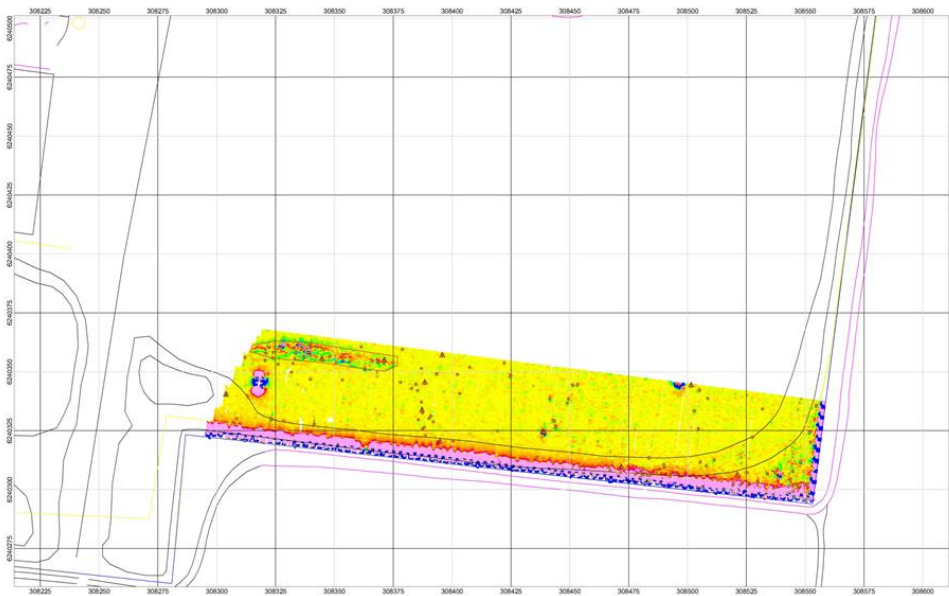


Figure 6 – Moorebank Precinct East Site – South – Precinct I (G-tek 2003, Ref 4)

Subsequent G-tek investigations revealed that a training Hand Grenade Range was established south of the former DNSDC during World War Two (WWII); it would appear that this area was the source of the explosive ordnance waste (EOW) contaminated soil rather than Anzac Rifle Range. This former Grenade Range area has also been remediated for UXO by Defence.

G-tek UXO Safeguarding support to a wide range of intrusive environmental activities within MPE since 2003 have identified no unexploded ordnance (UXO), no explosive ordnance (EO) and no explosive ordnance waste (EOW) within the former DNSDC other than remnant inert hand grenade waste (EOW), within the indicated south-east portion. Remnant inert material is generally grenade base plugs and similar items, all smaller than the UXO remediation parameters used for 2003 remediation works, i.e. “an item half the mass of a 36M Hand Grenade”.



Figure 7 – Grenade Hand 36M and typical 36M EOW

3.0 OBJECTIVE

The primary objective of this UXO, EO and EOW Management and Remediation Plan (UXOMRP) is to define mitigation measures that will reduce UXO/EO related risks to a point where they no longer pose a risk during site redevelopment. This requires constant examination of possible risks across the site and mitigation measures based on development processes.

The UXOMRP is designed to ensure that appropriate UXO awareness and any remediation processes are in place to ensure the safety of all on site activities will be met through:

- On-site UXO induction and awareness training of all personnel conducting works within the Project;
- Implementation of an 'Unexpected Finds Protocol' to include UXO/EO as a potential contaminant;
- Receipt of an UXO Clearance/Area Release for any area where UXO remediation is required to be conducted as a result of an "Unexpected Find";
- Reinforcement of UXO awareness as part of regular toolbox briefings.

4.0 OVERVIEW

The Moorebank Precinct East (MPE) is designated as a 'low risk' UXO site because of past assessment and remediation activities and a lack any UXO finds evidence. With the risk categorisation as 'low' intrusive works and redevelopment can take place with the following controls implemented.

1. UXO awareness induction to be provided to all on-site personnel;
2. Appropriate 'Unexpected Finds Protocol' to be implemented;
3. UXO potential noted in any intrusive works Contractors Safe Work Method Statements (SWMS)/Job Safety Analysis (JSA) or similar safety document; and
4. An current UXO contractor member of the DEHP will be appointed to the Project team to provide support and callout response as required to potential UXO "finds".

5.0 INDUCTION AND TRAINING

All personnel working within the Moorebank Precinct East (MPE) site will be required to be inducted onto the Site and a record maintained of all inductions. The induction will include information on the history of the area, information on the potential natures of EOW that may be remnant within the sites and action to be taken in the event of any potential UXO being discovered.

This induction training will be regularly reinforced at toolbox meeting.

6.0 UNEXPECTED FIND – POTENTIAL UXO

UXO may generally be treated the same way as other contaminants within the Project "Unexpected Finds" Protocol, but may be reinforced as:

Recognise It

- Leave any item alone that cannot be positively identified as not UXO.

Retreat

- Don't touch any potential UXO.
- Leave the area the same way you entered it.
- Stay away from the item and prevent others entering the area.

Report it

- Report UXO or suspected item to the responsible Site Manager.
- The Site Manager will confirm the nature and location of the item and confirm or develop a restricted area around the item; the Site Manager will then report it to Project management and notify appropriate UXO support personnel as well as internally and externally as required within the "Unexpected Finds" Protocol.

Other Activities (as possible)

- Record and/or photograph the item, without touching or moving it. If possible carefully place a pen or glasses near the item so that the size can be determined in the photograph.
- If possible, mark the location so that it can be found later. Red coloured tape in a tree or paint marks near the item make relocating the item easier.
- Restrict other personnel from approaching the item by cordoning off the area with Red tape at a minimum of 10 metres from the item in all approach directions.

7.0 MANAGEMENT ACTION ON FINDING POTENTIAL UXO, EO

Where an item is identified as potential UXO or EO:

1. All activities within 100 metres of the UXO/EO will cease until the item is evaluated by a qualified EOD Technician (Contractor or Defence), who will decide on increasing or decreasing the exclusion perimeter as deemed appropriate.
2. Any item of potential UXO/EO will be reported by the Contractor to Defence Regional Explosive Ordnance Service (REOS), who will then arrange for inspection and removal/disposal in accordance with Defence procedures.

8.0 UXO CONTRACTOR RECOMMENDATIONS FOR ASSESSMENT, REMEDIATION

When an item has been identified as potential UXO or EO and appropriately disposed by Defence, no further works will be undertaken within the exclusion perimeter until Management, in conjunction with the designated UXO Contractor, decide on appropriate action to be taken in the area of the "find"; actions may include:

1. Removal of the exclusion perimeter and resumption of the "Unexpected Finds" protocol.
2. Retention of the exclusion perimeter and conduct of UXO Assessment within the area.
3. Retention/variation to the exclusion perimeter and conduct of UXO Remediation within the designated area.

Where UXO Assessment or Remediation is to be conducted, the minimum UXO search parameters will be for an object of the size/nature of the unexpected "find" to a depth of 250 mm below the depth at which the item was identified.

Assessment/Remediation technology/methodology may be analogue or digital provided it can be shown to meet or exceed the minimum parameters indicated.

9.0 DISPOSAL OF EXPLOSIVE ORDNANCE WASTE

Any explosive ordnance waste (EOW) materials or non-hazardous materials uncovered during any works will be stockpiled for removal off site to an appropriate facility. Under current recycling restrictions and federal laws, any item that resembles a military item, even if certified as Free from Explosives (FFE), cannot be removed from the site. These items will be collected by the local REOS for appropriate storage or disposal until the recycling difficulty is resolved. All EOW will be inspected by a qualified EOD Technician and certified as not containing any energetic material before being stockpiled. Any EOW that cannot be identified as military origin and containing no energetic materials can be recycled or disposed at a recognised waste site.

10.0 REPORTING REQUIREMENTS

Any UXO or EO located within the site will be listed in a Site UXO Register maintained by Project Manager. This Register could be part of an "Unexpected Finds" register and should list, as a minimum:

1. Date;
2. Item as described;
3. Location (confirm with GPS Coordinates);
4. Consultant notified;
5. Consultant confirmation;
6. Disposal action;

If an item is confirmed as UXO/EO, an appropriate UXO Certificate will be completed by the Consultant and hand-over receipted by the Defence personnel disposing or removing the item. This Certificate will provide an appropriate Audit trail for the disposal of the item/s.

Any additional UXO Assessment or Remediation works required to be conducted as decided after an unexpected "find" will be fully reported in the same manner as the original Site Reports Referenced.

G-tek Australia Pty Limited

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BETTER BY DEFINITION

Specialising in:

- explosive ordnance assessment
- detection and remediation
- sub surface mapping

File Ref: 17114EPRI
Doc Ref: let_MPEB133_gg_180209

9 February 2018

Kellie Guenther
Principal Environmental Scientist
EPRISK
109/283 Alfred Street
North Sydney, NSW, 2060

Dear Kellie,

CoA B133 – MOOREBANK PRECINCT EAST – TACTICAL

References:

- Ordnance Investigation and Hazard Analysis of the DNSDC, October 2002, Milsearch Pty Ltd*
- Hazard Reduction Report Precinct H, Moorebank Defence Land, NSW, G-tek Reference URSA03099, October 2003*
- Hazard Reduction Report Precinct I, Moorebank Defence Land, NSW, G-tek Reference URSA03099, October 2003*

G-tek Australia Pty Limited (G-tek) has reviewed previous reports and activities relating to intrusive works within the Moorebank Precinct East (MPE) with particular emphasis on the potential for remnant unexploded ordnance (UXO), explosive ordnance (EO) and explosive ordnance waste (EOW) within the overall Site and the area referred to as the “southern burial pits” in the provided GHD image.



Figure 1 – Southern Burial Pits Area MPE.

Principal Office
Unit 5K, 256 New Line Road
Dural NSW Australia 2158

Northern Territory
Unit 39, 8 Knuckey Street
Darwin NT 0800

As a result of this review it is found that the overall MPE area was found to be free of UXO risk other than within the southern area defined by Milsearch Pty Ltd during UXO works in 2002 (Reference A) as having a potential to contain potential UXO within hand grenade waste identified within this area.

This identified area was remediated for UXO in 2003 by G-tek (References B and C).

Based on the Milsearch findings and the G-tek remediation works, it is considered that the requirements of CoA B133 are met and that no additional UXO, EO or EOW Site Assessment Surveys are required within the MPE Site prior to any demolition, entry or subsurface activities.

Copies of Referenced Documents are attached.

Please don't hesitate to contact me should you require further information or need to discuss this matter further.

Kind Regards,
G-tek Australia Pty Limited



Greg Guthrie
Chief Operating Office
0418 977424
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Attachments:

1. *Ordnance Investigation and Hazard Analysis of the DNSDC, October 2002, Milsearch Pty Ltd*
2. *Hazard Reduction Report Precinct H, Moorebank Defence Land, NSW, G-tek Reference URSA03099, October 2003*
3. *Hazard Reduction Report Precinct I, Moorebank Defence Land, NSW, G-tek Reference URSA03099, October 2003*

ORDNANCE INVESTIGATION AND HAZARD ANALYSIS OF THE DNSDC, MOOREBANK

OCTOBER 2002

CONDUCTED FOR THE COMMONWEALTH OF AUSTRALIA



BY

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ORDNANCE INVESTIGATION AND HAZARD ANALYSIS OF THE DNSDC, MOOREBANK

OCTOBER 2002

INTRODUCTION

Milsearch Pty Ltd, together with its teaming partner, Alpha Geoscience Pty Ltd, was contracted by the Commonwealth of Australia (Department of Defence), to conduct an ordnance investigation and hazard analysis of approximately 82 hectares of the Defence National Storage and Distribution Centre (DNSDC) site at Moorebank, NSW. Much of the site being the storage depot proper, or planning Precinct H, is designated for sale and lease back in the near future.

These investigations, together with a programme of environmental examination including soil and ground water contamination testing, are to support due diligence investigations associated with the sale process.

As an initial part of its contracted tasks, Milsearch had conducted a Hazard Analysis (attached at Appendix A), based primarily on an examination of past aerial photography and a review of relevant files and interviews. The Hazard Analysis had identified a range of potential burial sites, which became the subjects for a subsequent programme of geophysical survey and characterization.

The environmental testing programme, comprising the conduct of soil drilling and hand auguring throughout the DNSDC, commenced before and thereafter ran in conjunction with the geophysical survey and characterizations.

Sites identified within the DNSDC needed to be characterized ahead of the environmental testing programme, to ensure that any munitions that might present a hazard had first been identified and so that soil and water samples could be collected from the Milsearch excavation sites on a timely basis prior to 10 October.

The roles of Client site representative and Project UXO Consultant were performed by Mr Carl Chirgwin of Chirgwin Services Group Pty Ltd.

ACKNOWLEDGEMENT

Milsearch Pty Ltd acknowledges that this report may and will be relied on by:

- a. the Commonwealth of Australia and its advisers;
- b. any Accredited Site Auditor appointed by the Commonwealth in respect of the subject site; and
- c. any purchaser of the subject site from the Commonwealth or its successors in title.

SITE OPERATIONS

A detailed work plan was developed by 23 September and subsequently approved by the UXO Consultant.

Final Report: DNSDC UXO Surveys

Detailed Quality Control and EH&S Plans had previously been developed and approved by the UXO Consultant

Mobilization occurred on 25 September, with site operations commencing the following day. All geophysical surveys and burial pit characterizations of the DNSDC were completed by 3 October, a timing consistent with the completion of the environmental testing programme.

KEY PERSONNEL

Site management and quality control was vested with Mr Dan Reavey, the Milsearch Operations Officer. Geophysical data capture and characterization support was provided by Milsearch's Mr Mike Skiffington. Reavey is a former RAAF air weapons engineer, resident in Canberra, with well in excess of 40 years experience in both the Royal Air Force and Royal Australian Air Force. Skiffington served 11 years as an Ammunition Technician in the New Zealand Army and is currently on leave from his duties as the Explosives Technical Administrator with the NZ Naval Armament Depot.

Electromagnetic data capture and technical advice to the magnetic surveys, was provided by Alpha Geoscience's Mr Chris Adams, a trained geophysicist.

Geophysical data interpretation was provided by Mr Tim Pippett, the Principle Geophysicist with Alpha Geoscience Pty Ltd.

Quality assurance and overall project guidance was provided by Mr David Halmarick, the Managing Director of Milsearch.

GEOPHYSICAL SURVEY SITES

A total of seven sites had been identified for geophysical survey during the conduct of the Hazard Analysis. The Hazard Analysis document is attached at Appendix A.

A further site was added during the field programme, bring the total to eight sites within the sale precinct. On the direction of the UXO Consultant, the area around the POL point (Bldg 21) and south of POL Building 22, were added to the geophysical surveys to provide added surety to the environmental drilling programme. These were designated POL.1 and POL 2. Both POL 1 and POL 2 combined totalled 0.645ha.

The sites carry numerical identifiers, which for consistency are those used in the Hazard Analysis. The sites are described in the table below:

Site	Description
1E	This is a portion of the open ground in the south, east of the rail spur line and south of the E-W oriented drainage line.
POL	This site is the area around the POL point and south of POL Building 22. It was split into two sites for convenience during the geophysical survey: (POL 1 –the petrol point, POL 2 –sth of Bldg 22).
2/3	This site is adjacent to the POL complex and covers: a. land between Bldg 25 and to about 8 m east of the rail spur rail; and b. land south of Bldg 25 and west of the southern end of Bldg 26 for 15m
5	A site comprising about 85m x 65m on vehicle hard-stand to the north east of Building 52.
6	A site comprising about 65m x 25m partly on vehicle hard-stand immediately north

Final Report: DNSDC UXO Surveys

	of the Comms/Electrical Workshop (Bldg 69) in the north west of the DNSDC.
7	An irregular shaped site of approx 0.6 ha on open grassed land east of the rail spur in the south of Precinct H.
9	A site of grassed road verge straddling the road and measuring about 30m x 30m immediately adjacent to the SW corner of Bldg 53.
11	A triangular shaped site of about 1/4 hectare on open grassed land immediately south of Buildings 31/32 near the southern DNSDC boundary.

All the site locations, including POL 1/POL 2 are presented on a 1996 aerial photograph of the DNSDC shown below. This photograph shows the approximate positions of the DNSDC precinct boundaries represented by white lines. Building numbers close to the sites are shown in black. The sites shown are not to scale and indicative only of the dimensions and orientation of the geophysical surveys subsequently conducted on these sites.



DETAILED METHODOLOGY

GEOPHYSICAL SURVEYS

Surveys were conducted using either the G858 magnetometer or the EM61 deep metal detector. Relocation of anomalies requiring investigation was achieved with the Foerster 4 032 Magnetometer, an analogue gradiometer used for ferrous item location.

TOTAL FIELD MAGNETOMETRY

The G858 Magnetometer is a high sensitivity, high repetition system for the measurement of the earth's total magnetic field. Ferrous metal objects cause the earth's magnetic field to change in flux direction. These magnetic perturbations are located by sensitive magnetometer sensors. These variations in field strength are used to model the position, depth and theoretical mass of the buried ferrous item, in this case an agglomerate mass of discrete ferrous objects in the form of a burial site.

Made by Geometrics Inc. of the USA, the G858 system is in extensive use by the US Army Corps of Engineers and by commercial UXO companies engaged on US Defence site remediation. The unit records all data in the data logger for subsequent down-loading to a PC computer for either on or off-site processing and interpretation. The unit sensors are of high sensitivity and capable of operating at very high sampling rates, making it eminently suitable for the location of buried ordnance.



Geometrics G858 Digital Magnetometer with Dual Sensors at 2m

Hired from Fugro Instruments in Sydney and mounting two cesium vapour sensors, the unit was applied at a survey sensor lane separation of 2m and a swath width of 4m. This survey specification was considered adequate for the larger targets anticipated and given the relatively un-cluttered backgrounds obtaining on site.

Positioning on the G858 is time based, meaning that data must be gathered at a constant ground speed. Constant speeds and effective positioning was achieved by the Milsearch technician over all the sites.

ELECTROMAGNETICS

An EM-61 Deep Metal Detector was also employed on the Site by Alpha Geoscience. Manufactured by Geonics, Inc. of Toronto, Canada, it is ideal for the location of metallic items of either a ferrous or non-ferrous nature or other areas of markedly changed soil conductivity such as areas of non-metallic pyrotechnic burn residues.

The unit comprises a hand pulled or pushed cart with two square detector coils mounted on it, a back-pack which has the battery and interface electronics and a portable data acquisition system. The data is recorded in the acquisition system for processing and interpretation at the end of the survey. Its positioning and data sampling is odometer based, with the odometer triggered by the cart wheels. Positioning is thus independent of ground speed.

The EM-61 is a transient electro-magnetic system which inputs an electro-magnetics field into the earth, switches off and records a window of information relating to conductors in the sub surface. It is designed to locate a 44-gallon drum at 3 metres and will locate much smaller items such as pockets of small arms ammunition buried closer to the surface.

Mounting the 1m wide coil, this unit provides an effective survey swath width of 1m per pass.

POSITIONING

The precise position of external boundaries of each site was first logged with ICOM MAX DGPS, which operates to sub metre accuracy. Sites were grided out using metric chains with walk paths indicated with fluorescent markers.



ICOM MAX DGPS

SITE TECHNOLOGY APPLICATION

The application of the two technologies to the various sites was based on an understanding of the instrument capability and experience. Selection of technologies to sites is shown in the following table.

Site	Technology	Factors Influencing Technology Selection
1E	G858	Size of site and distant from facilities
2/3	EM61	Proximity to facilities and rail spur

POL1 and POL2	G858	Equipment availability for task priority
5	G858	Distant from facilities
6	EM61	Asphalt layer not conducive to magnetometry
7	G858	Distant from facilities
9	EM61	Close proximity to facilities
11	G858	Distant from facilities

INTERPRETATION

Data was interpreted for burials by the Principal Geophysicist with Alpha Geoscience. Downloaded data was transferred by email and interpreted images returned to the Milsearch field operatives within 24 hrs.

INTERPRETATION CRITERIA

During interpretation of the geophysical data, the fundamental criteria employed by the geophysicist for determining which anomalies might be a burial pit, was:

“a magnetic or electromagnetic anomaly of a modelled mass and depth attributable to a tip site of 0.5 cubic metres volume, containing a minimum of 5% ferrous waste (ie. 200 kg) at a depth of 1.2m”.

At the St Marys site, total field magnetic sensors were employed with virtually identical performance characteristics to the G858 sensors used at the DNSDC. At St Marys, a line separation of 3m was employed and tip sites of these dimensions were detected with greater than 95 % probability, a level of confidence accepted by the NSW EPA and independent auditors.

With the closer 2m line spacing employed at the DNSDC, the confidence level of detecting all burial sites of the described proportions at a greater depth of 2m, will approach 100 %.

During data interpretation, all anomalies capable of being equivalent to the above size/depth criteria were identified and then subjected to software modelling techniques, which provided an estimate of ferrous mass and depth.

These anomalies were identified on the images by a number and a cross hair. Coordinates and estimated mass/depth were also printed to the supporting investigation or ‘dig’ sheets.

As well as mass/depth, orientation of the anomalies is also a criteria, with anomalies arranged in line attracting the interpreter’s interest. Thus the data interpreter will identify a linear arrangement of anomalies as either a burial site, or a service connection. Such areas of interest were identified for investigation on the images by a drawn line, which attempts to delineate the burial or service.

On site data of existing cultural objects such as services, buildings or other objects observed during data capture in the field, are also important factors in deciding to investigate an anomaly on the ground. Returning to the precise position with the assistance of DGPS, the field investigation supervisor is in the best position to make a final decision on whether an anomaly identified by the data interpreter is in fact attributable to a cultural item.

Finally but not least in importance, is the data gathered by other forms of investigation, ie., from aerial photography, interviews and by observance of actual ground characteristics, such

as depressions in the surface and greening of vegetation directly over the site. All these factors are taken into account by the site investigation supervisor.

CHARACTERIZATION

SITE SERVICES

All sites were first checked for service connections against Services Plans, which were made available by the Department of Defence.

Prior to excavations commencing, a specialist cable locator, Mr. Paul Forbes of Down Under Locaters Pty Ltd, was sub-contracted to locate sites for live cabling and storm water drainage. All such services were identified on the ground by distinct surface markings.



Cable Location in Progress

Any services located by the cable location specialist were then correlated to the interpreted geophysical site imagery, which frequently provided confirmatory indications of the service locations.

RE-LOCATION

Anomalies for investigation were relocated with the aid of the geophysical survey images which show X and Y coordinates. Positions were either chained out from established grid coordinates or established by DGPS. On arrival at the approximate location, precise positioning was confirmed with an analogue magnetometer.



Re-location of Anomalies Using DGPS and Foerster Magnetometer

EXCAVATIONS

Anomalies were then excavated by mechanical back-hoe working to instructions from the EOD technicians. Mr. Dennis Sencanin of D & G Backhoe Pty Ltd was sub-contracted for this task.



Pit Characterization: Opening of Pit #8 at Site 1E

Trenches were dug down to original ground base, to establish a measure of depth for pit capacity estimation. Cross-sectional trenches were dug at regular intervals along the interpreted length of the pit, to ensure that content could be ascertained with reasonable surety and to more precisely gauge the end points and pit width.



Typical Characterizing Trenches: Pit #11, Site 2/3 West of Rail Spur

Pits were serially numbered, contents recorded and photographed and their estimated extent at the surface recorded by DGPS. An environmental consultant remained with the excavation team for the taking of soil and ground water samples within each trench.



Environmental Representative Taking Soil Samples: Trench in Pit #2, Site 5

Once samples had been taken, the trenches were filled in and made good. Trenches in hard-stand were made good with similar surfacing materials.

QUALITY CONTROL

A formal and logged quality control process was conducted throughout the operations. As a key element of the quality control, the site investigation supervisor selected and investigated in excess of 10% of those anomalies identified by the data interpreter as being equal to or above the tip site mass/depth criteria, but not identified by the geophysicist as being a potential burial site. In the conduct of this QC process, the selected anomalies invariably turned out to be large discrete ferrous objects and not burial pits.

A logged daily system check was also carried out on the geophysical instruments and the Forster locator.

Results of the Site Manager's QC anomaly investigations and the Daily Instrument System Checks are contained at Appendix B.

FINDINGS

A total of thirteen burial pits were located within the DNSDC sale area. Most of these contained residues from stock disposal activity. Two of these appeared to be burning pits, rather than disposal pits. A small number were pits where building rubbish had been buried during construction activity. The pits varied in proportions, some being of considerable size and depth, others quite small and shallow.

No munitions or weaponry were encountered in any of the pits. Some empty ammunition boxes were found in one pit, but no ammunition or ordnance related items were found during the characterization.

The pits are listed in the table below, together with location, size and the estimated capacity of each pit. The coordinates shown are for the centroid of each pit.

Final Report: DNSDC UXO Surveys

No	Svy Site	X Coordinate	Y Coordinate	Dimensions metres	Capacity m3	Contents
1	5	308,628.41	6,241,660.63	6 x 4 x 2	48	Burnt refuse
2	5	308,689.75	6,241,667.19	18 x 3 x 2	108	Burnt refuse
4	11	308,564.48	6,240,501.62	22 x 6 x 4	528	Metal shelving/ Building waste
5	11	308,552.93	6,240,497.03	18 x 6 x 4	432	Metal stays / Building material
6	7	308,420.22	6,240,459.49	8 x 3 x 0.5	12	Metal piping
7	7	308,411.2	6,240,454.76	4 x 3 x 0.5	6	Large metal articles
8	1E	308,269.98	6,240,421.67	88 x 6 x 6	3,168	Stores waste material
9	1E	308,298.52	6,240,434.48	10 x 5 x 3	150	Stores waste material
10	1E	308,475.95	6,240,379.17	10 x 3 x 2	60	Metal bars, hardwood tree trunks
11	2/3	308,252.41	6,240,425.35	84 x 6 x 5	2,520	Stores waste material
12	2/3	308,196.46	6,240,381.95	6 x 3 x 2	36	Reinforced concrete
13	POL2	308,107.98	6,240,401.65	6 x 3 x 2	36	Reinforced concrete
14	POL2	308,115.90	6,240,401.15	6 x 3 x 2	36	Reinforced concrete

The spatial location of these pits within the overall DNSDC site is shown on the two maps at Appendix C, one showing the EM61 surveys, the other the G858 surveys. Survey area positions are also shown on the individual mapinfo plots for each of the geophysical survey sites which are attached at Appendix D.

SPECIFIC SITE ACTIONS

A summary of site actions and a description of pits found is provided below. Supporting data for each site is attached in the following appendices:

Appendix D: Mapinfo Site Plots using WGS 84 coordinate system

Appendix E: Interpreted Geophysical Survey Images shown in ISG coordinate system¹

Appendix F: Investigation Record Sheets

The location of the DNSDC sale precinct boundary is superimposed on relevant plots and images. For mapinfo plots at Appendix D, the Precinct H boundary is shown in approximate position, as the precise location of the boundary was not available at the time of field activities

Site 1E

Site 1E was surveyed by means of the G858 Magnetometer on a North to South grid. A total area of 4.041ha was surveyed. Investigation resulting from the data interpretation revealed the presence of three pits and a quantity of surface metal. The pits were numbered 8, 9 and 10.

Pit No 8 was the largest of the pits. It ran parallel with and 1-2m from the railway line. Depth varied, but at the centre point achieved 6m. The pit was 6m wide x 6m deep and continued to the Precinct H boundary for a length of approximately 88 metres. It contained quantities of general stores equipment including shelving, metal mugs, building tie bars, small arms ammunition boxes (all empty) and remnants of old building material. The pit was closed once characterisation was achieved.

¹ Department of Defence made available an autocad drawing of the DNSDC in ISG coordinate system. The geophysical survey images are presented in ISG to facilitate spatial orientation within the DNSDC. Precinct H boundaries are superimposed employing ISG coordinates provided by Defence.

Final Report: DNSDC UXO Surveys

Pit No 9 was located in a small open area between the rail spur and a N-S oriented drainage ditch. This area was just outside the area covered by geophysical surveying. For completeness, the open area was surveyed at 2m line spacing by analogue magnetometer, which located this additional pit, measuring 10m x 5m x 3m deep. On opening, it contained similar surplus stores and equipment including metal bars and drinking mugs. It was apparent that Pit 9 dated to the same period as Pit No 8.

The third pit, Pit No 10 sat more to the centre of the area near to the southern DNSDC boundary. Pit No 10 measured 10m x 3m x 2m deep. This pit contained large metal objects and hardwood tree trunks. It did not appear to be a disposal or burning pit.



Pit No 8, Site1E: East of the Rail Spur



Pit Content, Including Ammunition Boxes : Pit No 8, Site1E

Site POL

For the purpose of survey the POL Site was divided into two areas namely POL 1 and POL 2. Investigation of the interpreted data collected from both POL1 indicated that the area was clear of pits and could be declared safe for drilling operations.

Two pits were investigated in the POL 2 area. Both contained building rubble with large sections of reinforced concrete. The pits were both the same size, being 6m x 3m x 2m deep.



Pits No. 13 and No. 14, Site POL2

Site 2/3

Site 2/3 was surveyed by Alpha Geoscience using the EM61 Deep Metal Detector. One pit was excavated on this site, being Pit No 11. Pit No 11 proved to be very similar to Pit No 8 in Site 1E and contained very similar materials, i.e. general stores rubbish, which dated both Pits 8 and 11 from the same period. Pit No 11 also ran parallel with the railway line and measured 84m x 6m wide x 5m deep.

A smaller pit, 6m x 3m x 2m deep, containing building rubbish and a long steel cable, was also excavated on this site.

Both pits were back filled prior to leaving the site.



Pit No 11 at Site 2/3 Close to Rail Spur: Typical Content

Site 5

Site 5 encompassed a variety of terrains including surface storage hard standing, roads and grassed areas. Depot staff cleared vehicles and trailers from the hard standing prior to commencement of the survey.

Information provided during interviews with Depot staff, indicated that it had been the routine at the end of a working week to collect unwanted and surplus consumable stores such as paint and packaging from the warehouses nearby and burn it all in a shallow bull-dozed pit in the area.

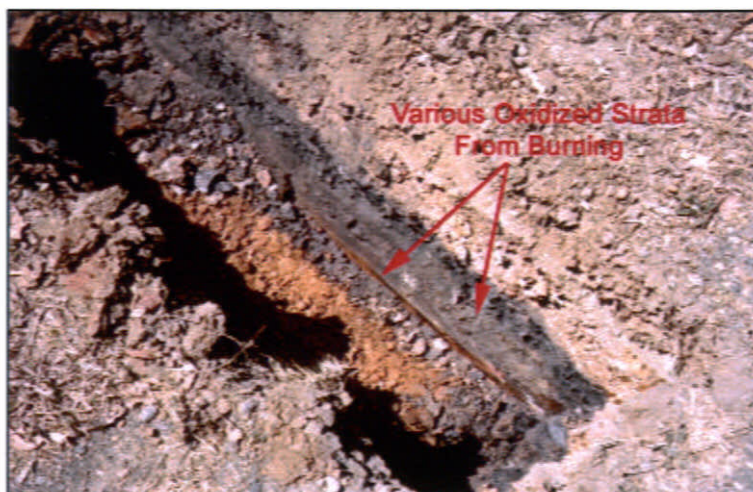
Two significant anomalies were investigated. Pit No 1 was located at the edge of the geophysical survey zone at the location indicated in the Hazard Analysis. Excavating through hard-stand, the remnants of a shallow burning pit were encountered, measuring 6m x 4m x 2m deep.

The other pit, No 2, was a significant geophysical anomaly to the east of Pit No 1 and was selected as part of the QC process. This proved to be the remains of a shallow but extensive burning pit, measuring 18m x 3m x 2m deep and looked to have been two pits that had eventually joined into one. Pit No 2 did not appear in any of the past aerial photography and had apparently operated after 1974. This pit's location tallied with the recollections of three of the Depot staff interviewed.

Both pits were back filled and landscaped on closure.



Pit No 1, Site 5. Excavating through Hard-stand



Pit No 2, Site 5

Site 6

Site 6, north of the Comms/Elec Workshop Building 69, was surveyed by EM61 Detector with the resulting data indicating a clear area. Examination of the data indicates the presence of known services, communication lines and fire services. The survey data also shows several surface objects attributed to a volley ball court on the site. Two intrusive holes were dug to the east of the volley ball court, through compacted overburden down to natural earth for the purpose of Quality Control. Nothing was found.

The holes were backfilled and landscaped prior to site clearance.

Site 7

Site 7 was surveyed by G858 and comprised a large grassed area bounded on the north eastern extremity by an access road. Two pits, No 6 and No 7, were excavated on the site.

Pit No 6 measured 8m x 3m x 0.5m deep and contained metal pipes and similar rubbish.

Pit No 7 proved to be a small dump of metal bars, measuring 4m x 3m x 0.5m deep.

Additional anomalies in the north of the site were investigated under the QC programme. These all proved to be the remains of a disused road approximately 0.5m beneath the surface, complete with the remains of a wooden gate post and associated fence wiring.



Pit No 6, Site 7

Site 9

Site 9, at the corner of Building 53, was surveyed by EM61, to ensure that remediation on pits in the area prior to building erection had been total and not just sufficient to clear the building site.

The survey data showed only the presence of the fire hydrant and associated services. There was no evidence of a burial pit. No intrusive works were carried out on this site.

Site 11

Site 11 was surveyed by G858 and comprised the grassed area south of Building 32. Two large pits No 4 and No 5, each running parallel, were indicated on the geophysical data and intrusive investigation proved this a correct analysis. Pit No 4 closest to the eastern boundary fence, measured 22m x 6m x 4m deep. Pit No 5 to its immediate west, measured 18m x 6m x 4m deep.

Both pits contained large quantities of surplus stores equipment. Items included stores shelving and binning material with a number of long pre-fabricated building tie rods and building material. Both pits contained water trapped in the pit and samples were taken by the environmental consultant for assessment (reported separately). Both pits were backfilled and landscaped on closure.



Pit No 4, Site 11: Metal Shelving and Binning in Contents

36M GRENADE CONTAMINATION

During the conduct of geophysical surveys at Site 1E, an area of potentially UXO contaminated land was noted towards the south east of the site.

Debris from expended WW2 era 36M hand grenades was noted visually on the surface during the geophysical survey and confirmed as widespread by a random mine detector survey. The debris is typical of that found in the bursting ground of a live grenade training facility.

A very small quantity of expended .303 calibre projectiles and more modern expended 7.62mm blank cartridge were also found in the material. It was also apparent that much of the ground at Site 1E was not original and extensive earthworks had been conducted there.

Interviews with Warrant Officers Haz and Edwards of the DNSDC staff, revealed that the grenade material had been trucked onto the site in the late 1970's as part of earthwork training conducted by Plant Wing of the then School of Military Engineering at Casula. WO Haz took part in the earth moving operations. At that time, large quantities of material were taken from the vicinity of the Cities Commission Site controlled by the then NSW Department of Urban and Regional Development (DURD). The Cities Commission was constructing a housing project on the eastern half of the former Anzac Rifle Range. The material taken from that site was accepted to fill swampy ground that previously existed in much of the SE portion of the DNSDC.



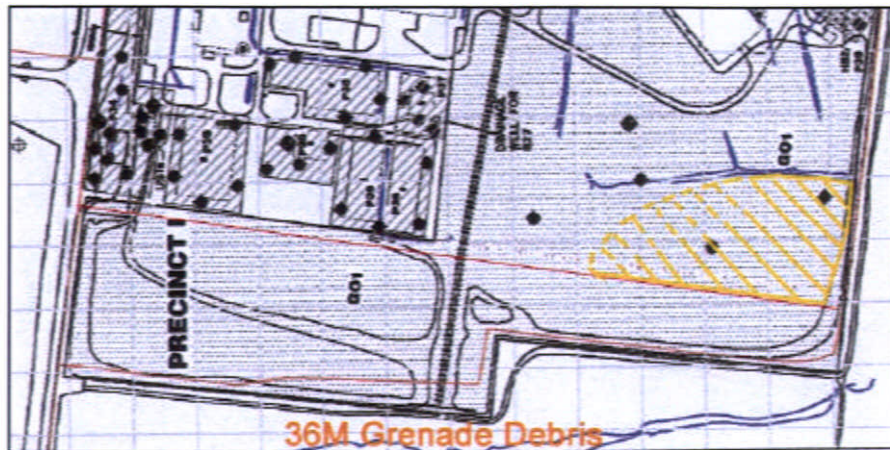
36M Grenade Residues: Filling Plugs (L), Fuze wells (R).

There is a low level threat presented by the possibility that a very small number of 36M grenade UXO may have been imported onto the DNSDC land within the fill material.

There is also a slight possibility that zones of lead particulate material may exist. Only two bullet projectiles were located indicating that the proportion of stop butt material imported onto the site was very small, compared with that taken from a grenade training facility. Any lead particulate concentrations have probably been attenuated over the site during the spreading that occurred.

Material potentially containing grenades extends from the DNSDC boundary north to the E-W oriented drainage line. Checks were conducted north of the E-W drainage line but no evidence was found that the material exists further north than the drainage line.

A random detector survey suggests that the main concentrations are as indicated on the attached sketch. There is no evidence that this material is present west of the rail spur line.



CONCLUSIONS AND RECOMMENDATIONS

The reliance on past aerial photography as a principal determinant in locating burial pits on a site of this nature proved valid.

No pits were found at Sites 6 and 9. At Site 6, interview information was that only a small shallow trench was used for burning of wood and non-hazardous materials. No indication of metallic content usually associated with burning or disposal pits was evident in the geophysical data. It is reasonable to conclude that this disposal area was obliterated with the general site works in the construction of the Comms/Elec Workshop Building 69 in the late 1980's. No further investigation appears warranted here.

At Site 9, no indications of a burial pit were apparent in the geophysical data. It is reasonable to assume that all the existing pits in this vicinity were remediated during the construction of Building 52/53 in 1994. No further investigation or action is required here.

The two Pits No 1 and No 2, which appear to contain only burn residues, probably do not limit or constrain future site utility. Unless soil and ground-water sampling analysis reveals they are contaminating site aquifers, no remediation appears warranted.

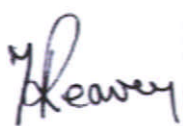
The seven Pits No 4-No 9 and No 11, which are disposal pits containing stores residues, should be remediated as their presence limits future site utility. For each of these pits, the urgency to remediate and the precise remedial strategy to be applied can only be determined when the analysis of soil and ground water sampling is available.

Pit No 10 contains only construction debris and tree trunks. From a visual inspection, it does not appear to require remediation, although results of soil and ground water tests are yet to be evaluated.

Apart from several empty small arms ammunition boxes, no munitions or munitions related material was encountered during the characterization process. As the intersect trenching process employed was in effect a percentage sampling, it cannot be stated with certainty that munitions do not exist within the pits. It is however, considered unlikely. Notwithstanding, it would be prudent to have an EOD capability on site during any subsequent remediation of these pits.

Final Report: DNSDC UXO Surveys

The 36M grenade material constitutes a hazard, albeit low, to DNSDC staff. That hazard should be addressed by a UXO hazard reduction² search designed to remove 36M grenade UXO. The hazard reduction search should comprise a digital magnetometer survey with sensor separation at 0.5m, followed by investigation of all magnetic anomalies capable of being 36M grenade in size.



D. Reavey
Site Manager

Dated: 1 November 2002



D. J. Halmarick
Managing Director

Dated: 1 November 2002

APPENDICIES

- A. Hazard Analysis
- B. Quality Control Logs
- C. Maps of Geophysical Survey Locations
- D. Mapinfo Site Plots
- E. Interpreted Geophysical Survey Images
- F. Investigation Record Sheets

². This specification should locate 36M grenade equivalents to approximately 250mm depth with a confidence level approaching 98%. As the imported soil on this site may well be deeper than 250mm, targets below that depth would not be detected with confidence, hence the term "hazard reduction" rather than "remedial" search. Provided the site is to remain as open space, a hazard reduction search would be an adequate treatment of the hazard.

DNSDC HAZARD ANALYSIS

HAZARD ANALYSIS
OF
DEFENCE CONTAMINATION WITHIN THE
DNSDC SITE, MOOREBANK, NSW

AUGUST-SEPTEMBER 2002
CONDUCTED FOR THE COMMONWEALTH OF AUSTRALIA

BY

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INTRODUCTION

Milsearch has been engaged to conduct geophysical surveys and characterization of Defence contamination on an approximately 82 hectare site at Moorebank NSW occupied by the Defence National Storage and Distribution Centre (DNSDC). An integral part of this task is the conduct of a hazard analysis to address the possibility of UXO, ordnance and other Defence contamination existing on the site. The task is being conducted as a precursor to a detailed programme of soil and groundwater studies, which can only proceed after hazards from Defence contamination have been fully addressed.

The DNSDC site has been employed as a major Defence material storage, distribution and maintenance site since the early 1900's. Operated in the main by Army, the original storage depot facilities were established in the northern portion of the site in the period 1910-1920 and continued in this role until a major expansion southwards into vacant Defence land took place in the period 1944-45. This saw the construction of large permanent warehouse and workshop facilities with the assistance of United States Construction Battalions. Large areas of open land were utilized for vehicle and other field equipment storage on improved hard-stands.

The site continued in this role until the late 1980's when the first of several stages of new facility construction took place, culminating in 1993-94 with the construction of new centralized distribution buildings and the re-cladding of many of the original storehouses. External hard-stands were retained and improved. Control of the site transferred to Defence with the establishment of a tri-service depot on the closure of RAAF's Regents Park and Navy's Zetland Depots.

APPROACH

Milsearch has had a long association with the DNSDC site. Milsearch's Managing Director had previously served in the Depot in 1975 and in the 1980's had been involved with planning and funding the development of the new centralized distribution facilities later constructed on the site. Subsequently, Milsearch had conducted extensive historical reviews into military use of the Moorebank area generally, as part of its characterization and remediation of the Defence Housing Authority-Delfin Wattle Grove housing development.

In 1994, Milsearch had contributed to the investigation of two proposed construction sites within the DNSDC. Contracted by Thiess Environmental, Milsearch had conducted geophysical surveys on the proposed sites of building 25 and 26 in the POL complex area, and had provided EOD support during excavations of burial pits on the proposed construction sites of buildings 53 and 54.

Milsearch had also provided input to the Stage 1 studies of the site conducted by Egis Consulting Australia in 2000.

As a result of its earlier involvement, Milsearch possessed an extensive library of past aerial photography. This was supplemented by additional photography made available by the Defence Department in the tendering process for the adjacent former Moorebank Ammunition Depot characterization.

It was thus readily apparent that the library of past aerial photography would serve as the most pertinent data source for any hazard analysis of potential Defence contamination on the site.

AIR PHOTOGRAPHY

Situated on the outskirts of Sydney and being a primary Army establishment close to the Holsworthy Training Area, photographic coverage of the site was extensive. Since the immediate post war period, photography was available with few if any gaps of longer than five years.

With the site being well defined since 1944 by an external man-proof fence, the photography also lent itself to easy scaling and employment in useful composites with topographical data of the current facilities.

PAST HISTORICAL RESEARCH

An extensive review of archival material had been conducted by Milsearch in 1990-91 as an element of its support to the Wattle Grove development. Whilst centering on the land immediately east of the former Moorebank Ammunition Depot, the archival review necessarily covered military activity throughout the Moorebank Military Area. Milsearch had also conducted further historical review in its examination of the adjacent Yulong Ovals site.

These reviews indicated that the DNSDC site had probably been used as a close training area for unit infantry minor tactics, but no evidence of live firing of either small arms or other weaponry on the site had come to light. While spent blank small arms ammunition and expended pyrotechnic devices may have existed on the site at the time of the 1944 construction, no evidence was found concerning the existence of target areas for the use of ammunition containing high explosive content.

Prior historical review had included an examination of Explosive Ordnance Incident Reports (EOIR) and the associated registers of such reports maintained by the Army's Senior Ammunition Technical Advisor's (SATO) staff in Victoria Barracks Sydney. These reports are generated each time a member of the SATO staff responds to a request from the public or police to retrieve or dispose of ammunition items found by the public. Milsearch's examination of these records in 1991 had revealed only one ammunition item reported from the 21 Supply Battalion (DNSDC) site at that time. This item was identified as a live brass cartridge from a 25 pdr blank round. It was found in black loam imported into the depot for grounds improvement purposes. No other items were found in this soil.

A more recent review of EOIR records was conducted by the Project UXO Consultant, Mr Carl Chirgwin. He found no records of UXO or munitions items having been found or handed in from the DNSDC site.

INTERVIEWS

Interviews were conducted with members of the DNSDC staff. Members interviewed included:

- a. Mr Winston Coles, Fleet Manager Communications;
- b. Maj George Kosciusko, SO2 Coord;
- c. WO2 Wayne Edwards; and
- d. WO2 Ray Haz.

Winston Coles has had a close association with the site since 1970, having been previously in the Army and serving within 2 Base Workshops. He subsequently transferred to the public service and has served almost continuously in various positions within the DNSDC for the last 25 years or so.

WO Edwards is a long serving Army Ordnance Corps member who has served in various storage functions within the DNSDC for the last 20 or more years.

WO Haz is a long serving Army Corps of Engineers member who has served in various positions within the DNSDC and the adjacent School of Military Engineering since the early 1970s. He has served several tours of duty within the vehicle company of the DNSDC, involved with plant and engineer vehicle stocks.

Interviews with Coles and Kosciusko established that the disposal of rubbish and waste materials within the DNSDC has long been conducted on a controlled and centralized basis, with all materials now going off site to recognized municipal tip sites. The use of centralized burial trenches for the conduct of stock disposals had not occurred since the late 1970's.

During the 1980's, rubbish had been taken to the Liverpool tip until that site closed. Thereafter, the Cambridge Avenue municipal tip had been employed until that too, closed. The Menai municipal tip was currently employed.

ANALYSIS OF AIR PHOTOGRAPHIC RECORD

Disposal of unwanted stores and material within the DNSDC and its predecessor establishments, 21 Supply Battalion and 2 Base Ordnance Depot, involves the use of formalized procedures known as Boards of Survey. Boards are established to closely control the decision on what method will be employed to dispose of an item, be it by public auction sale, by conversion to scrap, or by burning, bashing and burying. For the latter method of disposal, Board representatives are required to witness the actual destruction process and sign off on the materials destroyed.

In large logistic stores units, such procedures had been long established and disposal trenches for the purpose of burning and burying sentenced material would be excavated and employed on a centralized basis. Plant for the excavation, fire services to control burning and transport to convey the sentenced stores were all provided from within the depot headquarters resources. With such arrangements, there was little need for ad hoc burial locations.

Examination of the air photography revealed nine areas of interest. These variously depicted typical large-scale bull-dozed burial pits either open and in use for board of survey destruction purposes, or in partly or fully closed over condition.

The following section describes each of these areas of interest. They are presented generally in chronological order, commencing with the immediate post WW2 period through to more recent years.

The nine areas of interest are shown below on a composite map of the existing DNSDC area overlaid on a 1970 photograph. A description of each area then follows, with supporting air photography enlargements and other material gathered during the analysis.



**Nine Areas of Known and Potential Burial Pits
(Building Numbers Shown in Black)**

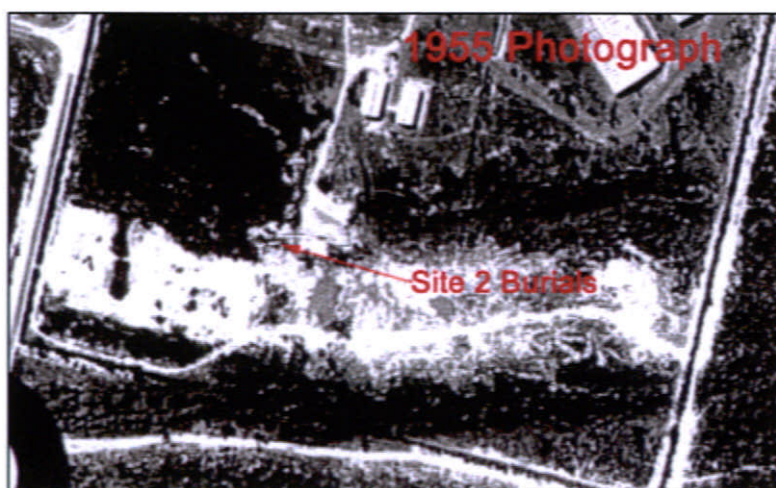
SITE 1

This area is located at the south eastern end of the DNSDC and comprises that land south of the E-W oriented drainage channel. It is surmized that burials were conducted in this area in the period late 1944 through to the early 1950's.

The earliest photography held of the southern portion of the DNSDC was flown in March 1949. This shows what appears to be surface scarring possibly consistent with burial activity. The scarring is more evident in 1955 air photography.

**SITE 2**

This area is in the south of the DNSDC but immediately north of Site 1 and towards the centre of the Depot. This area was apparently in use at least as early as 1955 and probably until the early 1960's. Two E-W oriented pits can be seen in the 1955 photography, one open and active, the other closed over.



The site continued in use through the 1960's, with a 1965 photograph showing two open E-W oriented pits further to the north of the 1955 pits, with evidence of other parallel pits nearby in closed over condition.



This site was subsequently remediated by Thiess Environmental as part of the 1994 construction of the current POL complex buildings 25 and 26. A fuller description and analysis of the Site 2 burials and the later 1994 remedial work is provided in the following description of Site 3.

SITE 3

This site is quite close to Site 2, immediately to the north east and near the existing rail spur line. The site appears first in 1970 air photography although probably was in use earlier. This site most likely continued in use into the early 1970s. This site contains a single N-S oriented pit of considerable length. It is located very close to the existing spur line and in the general vicinity of POL building 26.

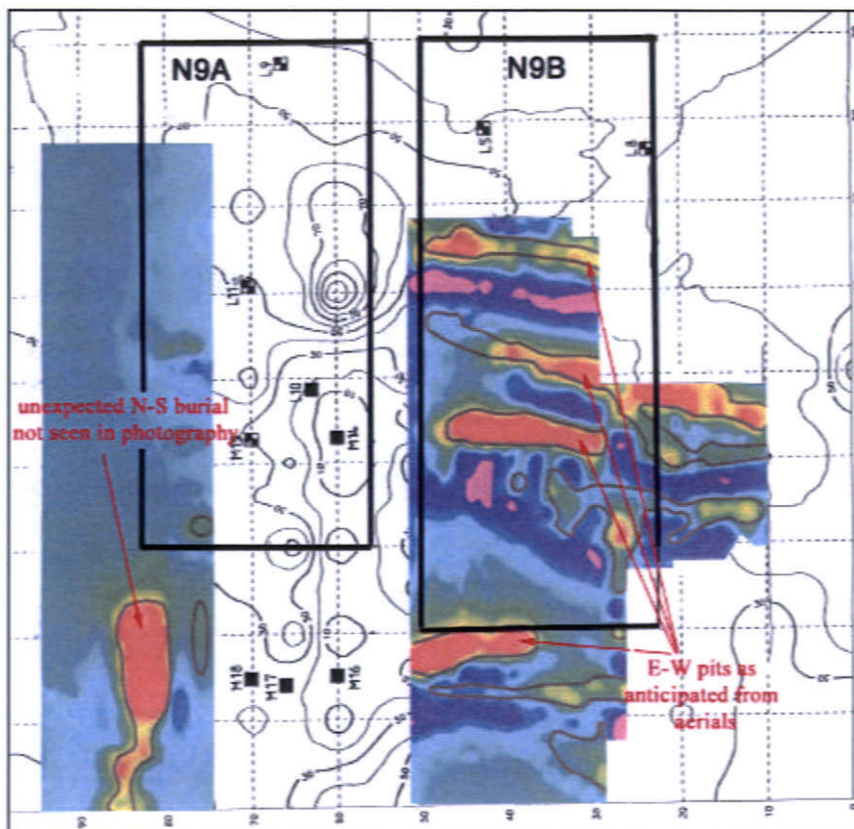


THIESS REMEDIATIONS

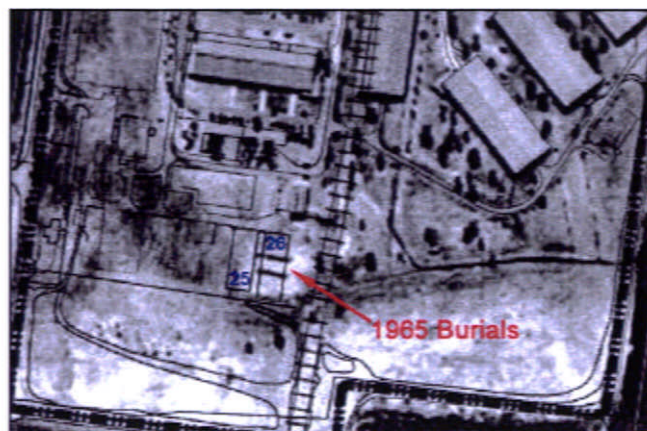
From an examination of Milsearch files, it is now apparent that both the Site 2 and Site 3 burials were selected as the construction site for the current POL complex buildings 25 and 26. These buildings, in pre-construction planning, were known as buildings N9A and N9B.

Construction was undertaken by Multiplex, with Thiess Environmental engaged to conduct preliminary site investigations for burials. C. J. Douglas had been engaged by Thiess and EM31 surveys had revealed several burial pits. These were opened to reveal largely ferrous materials such as wire hawsers, chains and other heavy items of obsolete material. Milsearch

was engaged to conduct additional geophysical surveys in two limited zones alongside the Thiess remediated pits. These surveys employed the TM-4 digital imaging magnetometer system from Geophysical Technology Limited at Armidale, NSW. These surveys discovered several additional burial pits. These pits were subsequently remediated by Thiess. However Milsearch files indicate that some portions of the surveyed pits were judged by Thiess to be beyond the proposed building footprints and were not to be remediated.

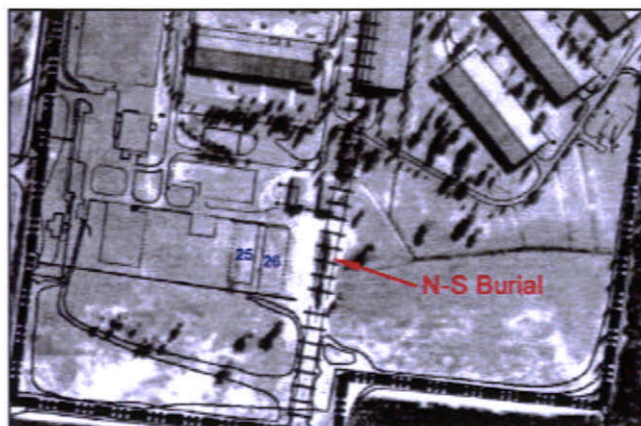


From material held on Milsearch files, the TM-4 surveys were superimposed on the original D.J. Douglas EM31 drawings, which showed the proposed construction footprints of both buildings 25 and 26. From this overlay, a series of short E-W burial trenches existed under the proposed site. These are now assumed to be the pits described at Site 2. An examination of a composite plan of existing structures overlaid on the 1965 photography confirms this.



It is also apparent that another N-S oriented burial lay to the immediate south of POL building 25, outside that building's construction footprint. From the site visits, it was noted that building 25 has been extended further southwards in more recent years since the 1994 construction phase. This new extension does not appear on current topographical drawings of the DNSDC. It is not known whether any burial pits were remediated during the construction of the extension.

It was also apparent that neither the EM31 survey nor the TM-4 survey had covered ground sufficiently east of the existing POL buildings to detect the major N-S burial pit shown in the 1970 photography. A composite drawing over the 1970 photography showed that the existing rail spur line now runs over the top of this N-S burial site.



Examination of additional period photography further complicated the analysis. 1994 photographs taken during construction of buildings 25 and 26 show what appears to be a significant linear excavation oriented N-S between building 26 and the rail spur. It is reasonable to conclude that, while well beyond the actual construction footprint, a large N-S burial pit had been discovered and remediated by Thiess, along with lesser pits surveyed by Milsearch and C.J. Douglas.

From the above, it is possible that additional burials may exist in two locations within Sites 2 and 3. These are:

- a. under and to the immediate south west of the recently extended building 25; and
- b. to the east of building 26 towards the rail spur line, or under neath the rail spur line.

SITE 4

This area is apparently beneath the two new buildings (Building 53 and 54) in the north east of the DNSDC. Two large linear bull-dozed pits first appear in the May 1974 photography. Both pits are oriented NE-SW, parallel to the rail spur that existed to the west of these pits prior to the 1990's construction period.

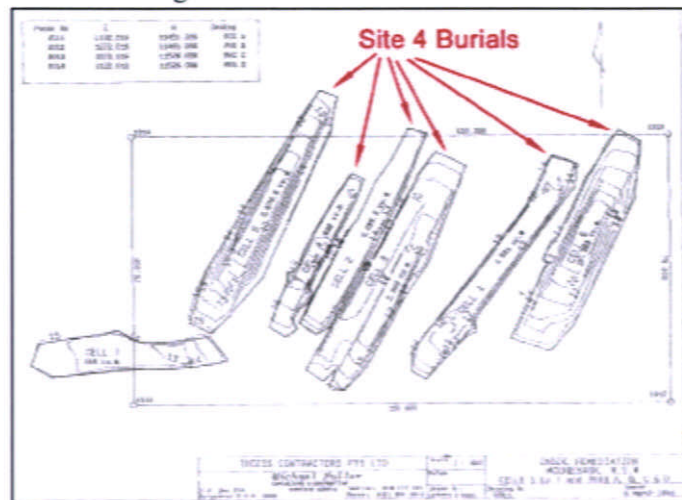
The author took part in Boards of Survey in this location in 1975, when serving on the staff of the Army's 21 Supply Battalion, a predecessor to the DNSDC.

These pits still appear active in the October 1980 photography.



These burials were remediated prior to the construction of buildings 53 and 54 in 1994. Again the remedial work was undertaken by Thiess Environmental. Milsearch provided EOD support during the remediation of these pits, but did not conduct any geophysical surveys.

A series of parallel pits oriented NE-SW following the orientation of the rail line, were remediated here in 1994. A large quantity of boxed Owen Machine Carbines were found in functional condition in one of these pits. The position of these pits is recorded in a topographical survey conducted by Thiess. Regrettably the grid coordinates used in this drawing were taken from a local grid.



Consequently it was not possible to position the drawing to determine the exact location of the excavations relative to the two new building footprints. However, given the large size of the new buildings eventually constructed here, it is probable that the majority of the Site 4 pits were remediated at that time.

SITE 5

This site is to the north east of Site 4 and appears in the same 1974 photography. A single burial trench of smaller proportions is sited parallel to the rail spur oriented NE-SW. This pit is closed over in the 1994 photography and is not apparent in earlier photography, indicating its period of operation was quite limited. It is located sufficiently north to be outside the footprints of the new facilities. It is probable that its presence was not located during the 1994 remediations and that this pit still remains beneath vehicle hard-stand north east of the new building.



Interviews were conducted with Mr Winston Coles, the DNSDC Fleet Manager Communications Stores. He described a shallow bull-dozed pit that was employed for burning general rubbish each Friday afternoon during storehouse 'make and mend' periods. He thought the location of this pit was further east nearer the boundary fence. He recalled large quantities of paint being burnt in the pit, as well as a variety of other materials, with the flames exhibiting a variety of colours from the chemical content. It was not a Board of Survey pit, being too shallow. They were the larger pits further south described previously at Site 4.

SITE 6

This area is immediately north of the Communications-Electrical Stores Workshop Building 69 in the north west of the DNSDC. An active excavation appears first in 1985 photography and again in the 1986 photography. It is a large excavation of unknown purpose, and does not seem to be typical of a bull-dozed pit.



Interviews with Mr Winston Coles threw some light on this site. Mr Coles designed the new Communications-Electrical Stores Workshop near this site and oversaw its construction in the mid 1980's. He confirmed that prior to the Workshop's construction, camp earmark stores operated from the four Igloo buildings since demolished on this site. Just north of the Igloo Buildings, general rubbish such as

packaging and broken pallets were burnt in a shallow bull-dozed pit in a location that coincides with Site 6.

SITE 7

This area is in the southern portion of the DNSDC, east of the rail spur line and close to the warehouses. Ground scarring consistent with burial activity appears in the 1991 photography, with one, perhaps two E-W oriented pits being evident close to mature trees. The pits appear closed over with the site inactive in 1994 photography.



SITE 9

This site is immediately adjacent to Site 4. In the 1994 remediation of the Site 4 pits, a single E-W oriented pit was remediated to the south west of the others. This pit was located very close to the existing south west corner of building 53. Experience within the DNSDC and elsewhere suggests that where a single bull-dozed burial is located, other similar and parallel pits may exist nearby. As the precise location of the Site 4 pits could not be established relative to the footprint of Building 53, there remains the possibility that an additional E-W pit may still exist to the south of and outside the building.

Examination of 1949 photography revealed a long closed over burial site oriented E-W in this vicinity. Noting that this burial took place in the period 1944-49, it is most probable that the boxed Owen Machine Carbines recovered during the 1994 Site 4 remediations, came from this early pit. Certainly much tighter controls over the disposal of weaponry were well established by the 1970's when the other pits of Site 4 were established.

A composite overlay of the existing facilities over a 1955 air photograph was also examined. This suggested that the single E-W pit was probably now under the extreme southern edge of Building 53. If another 'sister' pit existed to the south, then that would be outside the existing Building 53.



Given the possibility that another burial may exist here, a geophysical survey of a limited zone close to the south west corner of Building 53 appears warranted.

SITE 11

This area is in the south east of the DNSDC, immediately south of the former radiation hazard buildings 31 and 32. Indications of a closed over burial pit oriented N-S appear first in 1986 photography. These indications are also visible in 1991 photography. The area is about 1 hectare in size and is bounded by a drainage channel to the west.



SUMMARY

A total of nine areas have been identified for geophysical examination, primarily from an analysis of air photography together with data obtained from other relevant sources. These sites are presented below as follows:

Svy Area	Probable Period (1-7 in chronological order)	Description
1E	1944- late 40's	Appear as ground scarring in Mar 1949 (earliest) photography and again in 1955 photography.
2	Early to late '50s	Appears active in 1955 photography, with two E-W oriented pits, one open, the other closed over. Majority remediated by Thiess during new POL facility construction. Digital surveys

		conducted by Milsearch. Some pits probably remain close and to south of new facilities, as Thiess decided not to remediate beyond the new facility footprint.
3	Probably late '60s to around '72/'73.	Appears active in Aug '65 photography and again in 1970 photography, with a N-S oriented pit now just west or partially under the new rail line.
4	Early '70s-late '70s	First appears active in May 1974 photography and still active in Oct '80 photography. Author conducted burials here in 1975. Two linear pits oriented NE-SW are apparent. Milsearch assisted Thiess with remediation of these pits in early 1990's ahead of new construction. There were actually some 4-5 pits parallel of varying size.
5	Early '70s	Appears in 1974 photography as closed over. This is an isolated linear pit of smaller proportions to those to the south. Well to the north of new construction, it probably remains under existing hard stand.
6	mid-late 1980's	This appears in 1985 and 1986 photography as an active excavation, probably for disposal activity. The excavation has occurred several years earlier than the first phase of new construction (90-91). Located well away from any new facilities, it probably remains below hard stand.
7	late '80s- early '90s	This appears only in the 1991 photography, as one, possibly two pits oriented E-W. Closed over in 1994 photography.
9	Pre 1949	<u>Possibly</u> a former burial pit. First appears as a closed over indication in 1949 and again in '52 & '55 photography. Relatively small and oriented E-W. If it existed, it was probably remediated in the new construction. If not, it is just under the southern part of the new facility. Thiess located pits by backhoe follow-on from aerials analysis. No digital surveys were conducted.
11	Late 1980's	<u>Indication only</u> of a possible smaller-scale burial appears in Aug '86 photography, oriented N-S. Some indication remains apparent in 1991 photography.

VEHICLE HARD STAND AREAS

Since 1944, the depot has always held the role of storing, maintaining, then issuing and receiving stocks of vehicles and engineering plant. Due to manoeuvrability factors, the majority of the vehicle and plant stocks have always been stored in the open, on improved hard stand areas. These hard stands are located to the north of the DNSDC and in two other locations in the central portion of the DNSDC bordering the eastern boundary.

An examination of the air photography reveals that these main hard stand areas have always been employed for this purpose since 1944. At no stage does any evidence appear in the photographic record, that any portion of these hard stand areas have ever been used to accommodate any centralized large-scale disposal pits.

AREAS BETWEEN BUILDINGS

The examination of air photography also revealed no evidence that large-scale burial pits had ever been established on ground between the various storehouses.

The organization of depot operations saw the establishment of various storeholding groups based on the nature of their generic stores types, such as weapons, communications stores, general stores, vehicle groups, camp earmark and the like. From the author's working knowledge of large military storage depots, group officers-in-charge (OIC) took fierce pride in the general presentation of their areas of responsibility. This sense of ownership and responsibility manifested itself in good housekeeping which usually extended to fastidious maintenance of grounds around the storehouses, often with the planting of shrubs and other grounds beautification measures. It is considered unlikely that any group OIC would permit the establishment of either ad hoc or centrally controlled burial and burning sites within close proximity to the stores buildings. These factors and the attendant fire danger mitigate strongly against the use of land between the buildings within the DNSDC for burial purposes.

A close examination of the available photographic record revealed no evidence that burial sites had ever been established between storage buildings within the DNSDC.

DNSDC Defence Contamination Hazard Analysis Report compiled by:



D. J. Halmarick
Managing Director

QUALITY CONTROL LOG SHEETS

MOOREBANK QA LOG

Date	Block/Lines Checked	% Check	Items Found	Research Ordered		Recheck		Inspector's Signature
				Y	N	Pass	Fail	
30-Sep-02	Site 11	25%	2 Pits + small scrap		N			<i>Heavey</i>
30-Sep-02	Pol 1 - MOD	36%	No pits - minor metal		N			<i>Heavey</i>
1-Oct-02	Pol 2 - MOD	10%	minor rubbish		N			<i>Heavey</i>
1-Oct-02	Site 7	12%	2 small dumps - minor metal		N			<i>Heavey</i>
2-Oct-02	Site 2/3	10%	1 pit - surface metal		N			<i>Heavey</i>
3-Oct-02	Site 6	10%	Anomaly free report check holes dug		N			<i>Heavey</i>
3-Oct-02	Site 5	15%	3 burn pit remains 5 openings		N			<i>Heavey</i>
3-Oct-02	Site 1E	10%	2 pits small dump		N			<i>Heavey</i>
4-Oct-02	Site 1W	DATA	Data Drop outs	Y				<i>Heavey</i>
7-Oct-02	Site 1W	DATA	Data confirmed		N			<i>Heavey</i>
8-Oct-02	Site 9	DATA	Nil readings - Foerster check		N			<i>Heavey</i>
8-Oct-02	Site 10	50%	Hits confirmed as Geo / Metal		N			<i>Heavey</i>
9-Oct-02	Site 1W	75%	All hits checked		N			<i>Heavey</i>

SEARCH EQUIPMENT DAILY TEST LOG

[illegible][illegible]

MAPS OF GEOPHYSICAL SURVEY LOCATIONS



Acquisition Parameters

Instrument: EM61
Sampling mode: Distance
Sample interval: 0.2 metres
Line spacing: 2 metres
Acq. software:

Processing Parameters

Data recovery: AGSProc V1.73
Data gridding: AGSProc V1.73
method: Minimum curvature
Grid cell size: 0.40m x 0.40m
Other processing:

Image Presentation

-687.45nT -50.00nT 585.00nT
Histogram bin width: 5.00nT
Colour interval: 50.00nT
Colour mapping: Linear

Colour Image of EM Field

Project: DNSDC, Moorebank
Project ID: AG-058
Client: Milsearch Pty. Ltd.
Processed by: Timothy Pippett
Map scale: 1:6000
Date printed: 29 October 2002
Program version: AGSProc V1.73

EM_Data

ALPHA GEOSCIENCE Pty. Limited.
(ABN 14 080 819 209)
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E-mail info@alpha-geo.com
Website www.alpha-geo.com



Acquisition Parameters

Instrument:
Sampling mode:
Sample interval:
Line spacing:
Acq. software:

Processing Parameters

Data recovery: AGSProc V1.73
Data gridding: AGSProc V1.73
method: Minimum curvature
Grid cell size: 0.40m x 0.40m
Other processing:

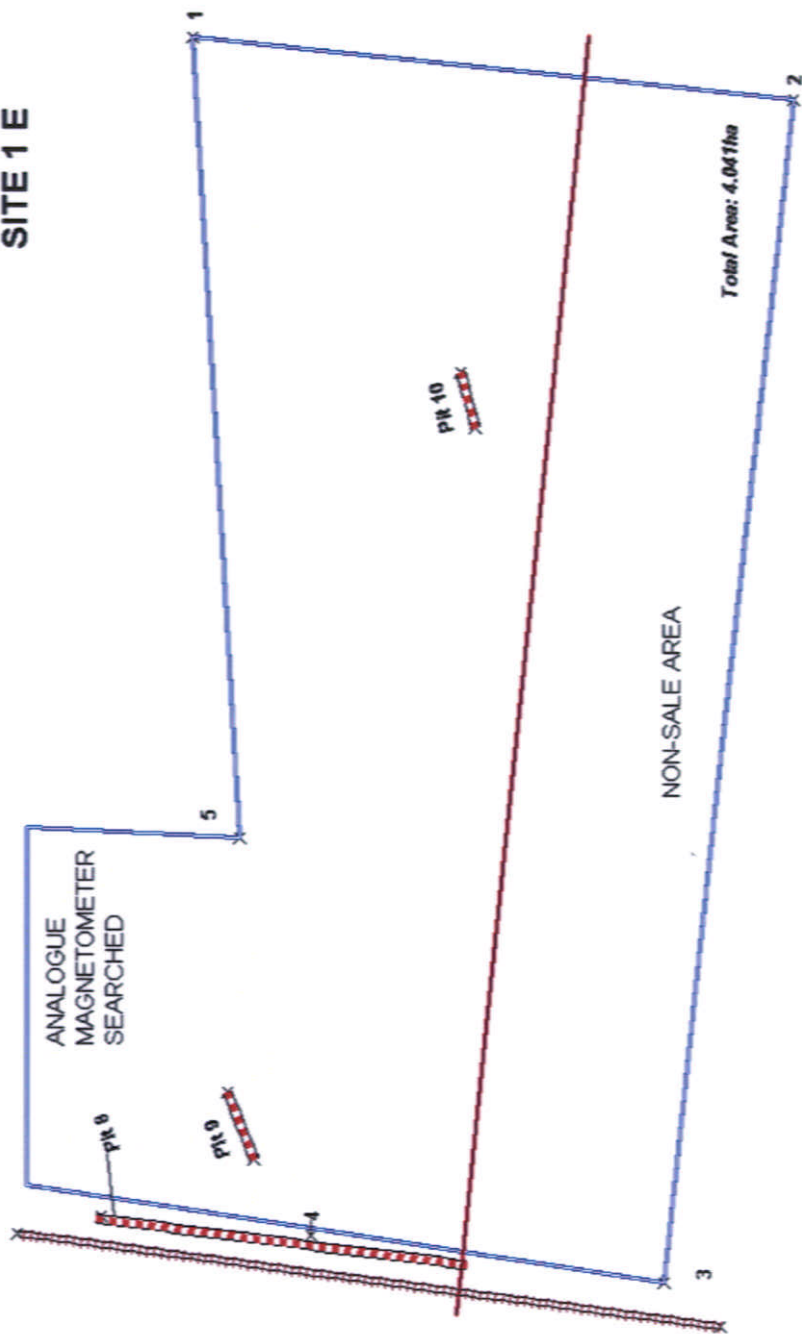
Colour Image of Total Magnetic Field

Project: DNSDC, Moorebank
Project ID: AG-058
Client: Milsearch Pty. Ltd.
Processed by: Timothy Pippett
Map scale: 1:6000
Date printed: 29 October 2002
Program version: AGSProc V1.73

Total_Site

MAPINFO SITE PLOTS

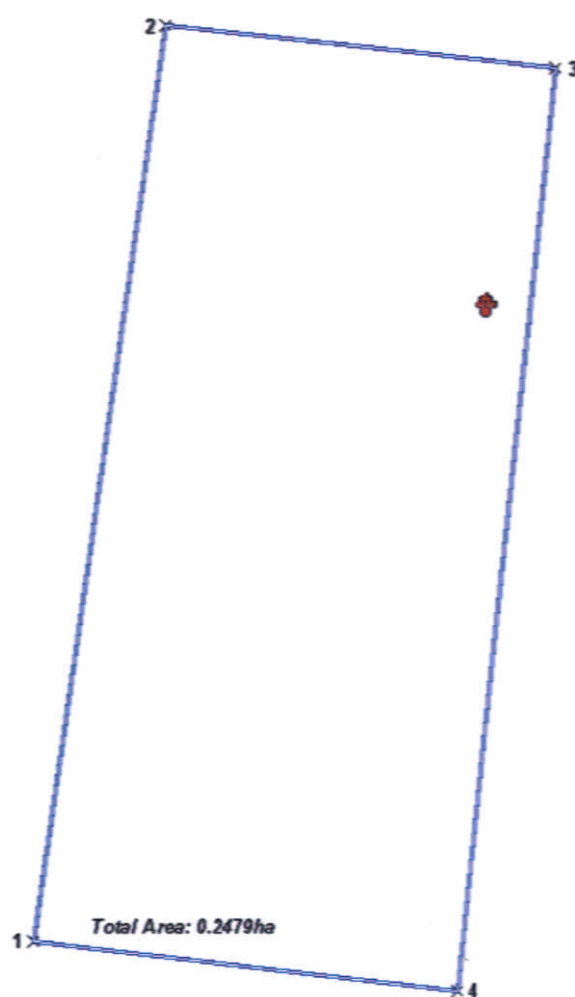
SITE 1 E



Area	Coords	x	y
1		308,584.27	6,240,448.7
2		308,549.53	6,240,299.84
3		308,260.35	6,240,331.29
4		308,271.74	6,240,417.27
5		308,368.82	6,240,434.88
Site 1 E		308,412.31	6,240,373.27

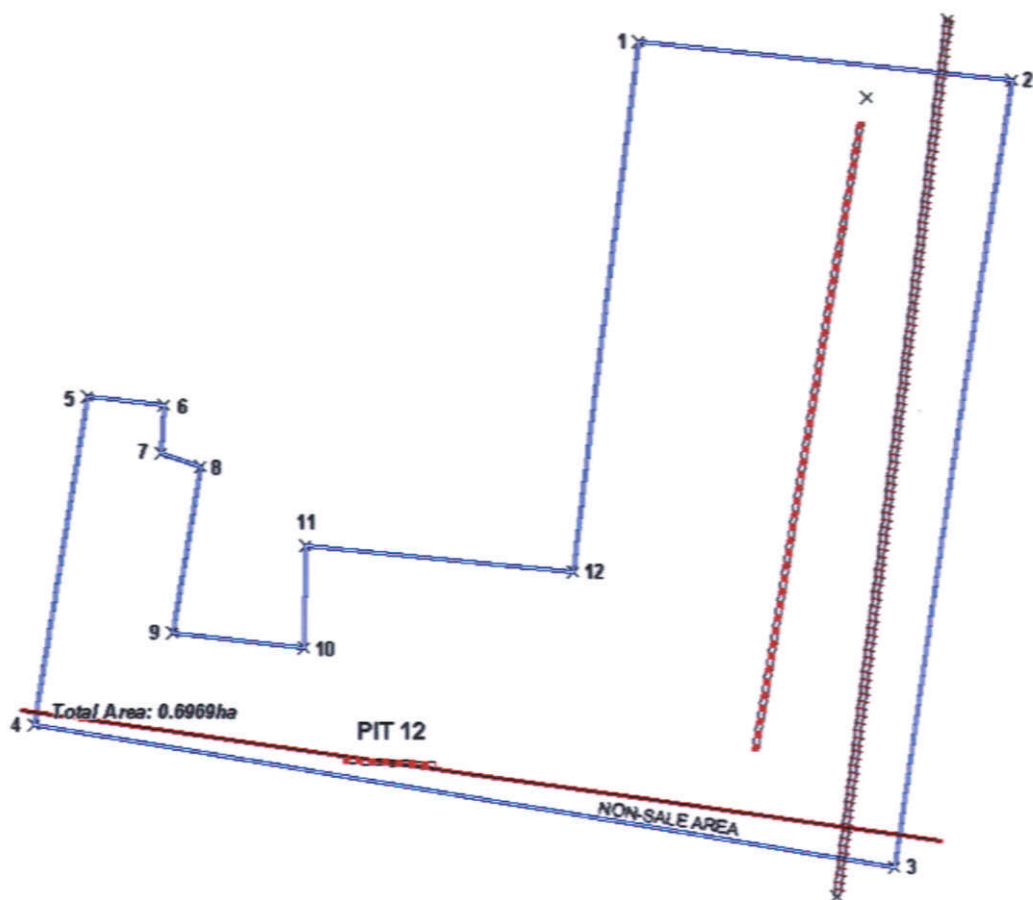
Pits	x	y
8 north	308,276.34	6,240,488.34
Pit 8	308,269.98	6,240,421.87
10 west	308,469.2	6,240,377.5
10 east	308,482.71	6,240,380.83
Pit 10	308,475.95	6,240,379.17
9 south	308,290.37	6,240,431.31
9 north	308,306.66	6,240,437.65
Pit 9	308,298.52	6,240,434.48

SITE POL1



Area_Coords	x	y
1	307,996.2	6,240,412.9
2	308,006.99	6,240,486.92
3	308,036.39	6,240,463.55
4	308,030.52	6,240,408.83
POL 1	308,017.29	6,240,447.68

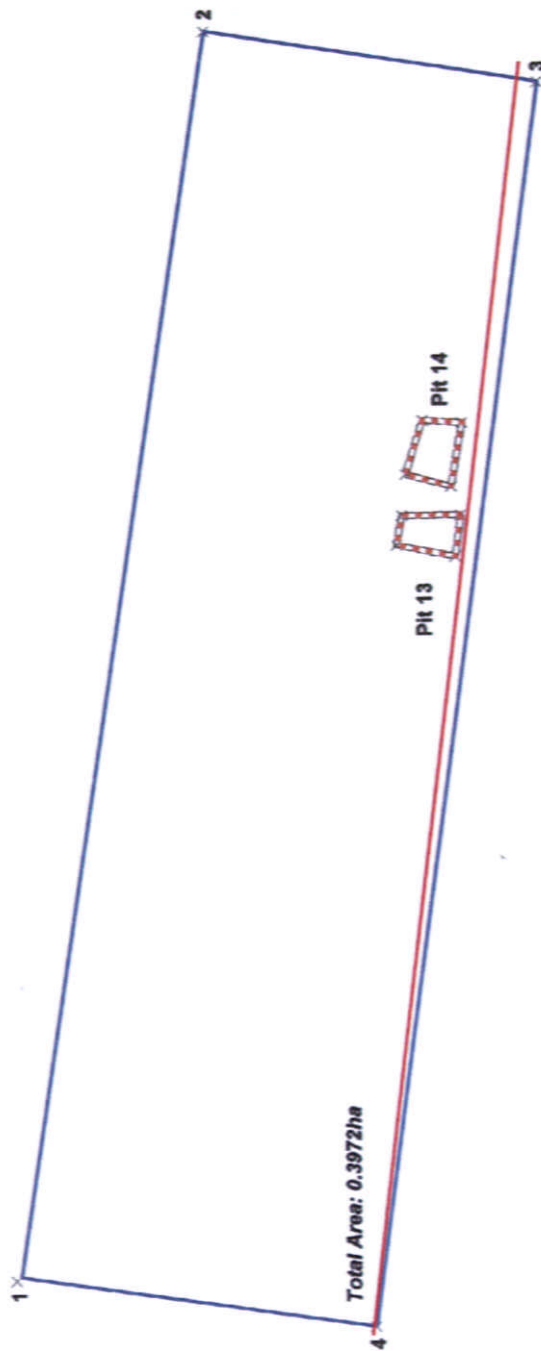
SITE 2/3



Pits	x	y
	308,259.82	6,240,469.02
Pit 11	308,252.41	6,240,425.35
	308,203.27	6,240,381.53
	308,189.65	6,240,382.37
Pit 12	308,196.46	6,240,381.95

Area_Coords	x	y
1	308,229.52	6,240,476.25
2	308,278.84	6,240,471.29
3	308,264.53	6,240,374.66
4	308,151.35	6,240,392.11
5	308,157.13	6,240,429.54
6	308,167.19	6,240,428.33
7	308,166.82	6,240,422.01
8	308,172.01	6,240,420.29
9	308,168.37	6,240,398.3
10	308,185.62	6,240,396.39
11	308,185.65	6,240,409.74
12	308,221.07	6,240,406.33
Site 2/3	308,161.77	6,240,425.46
	0	0

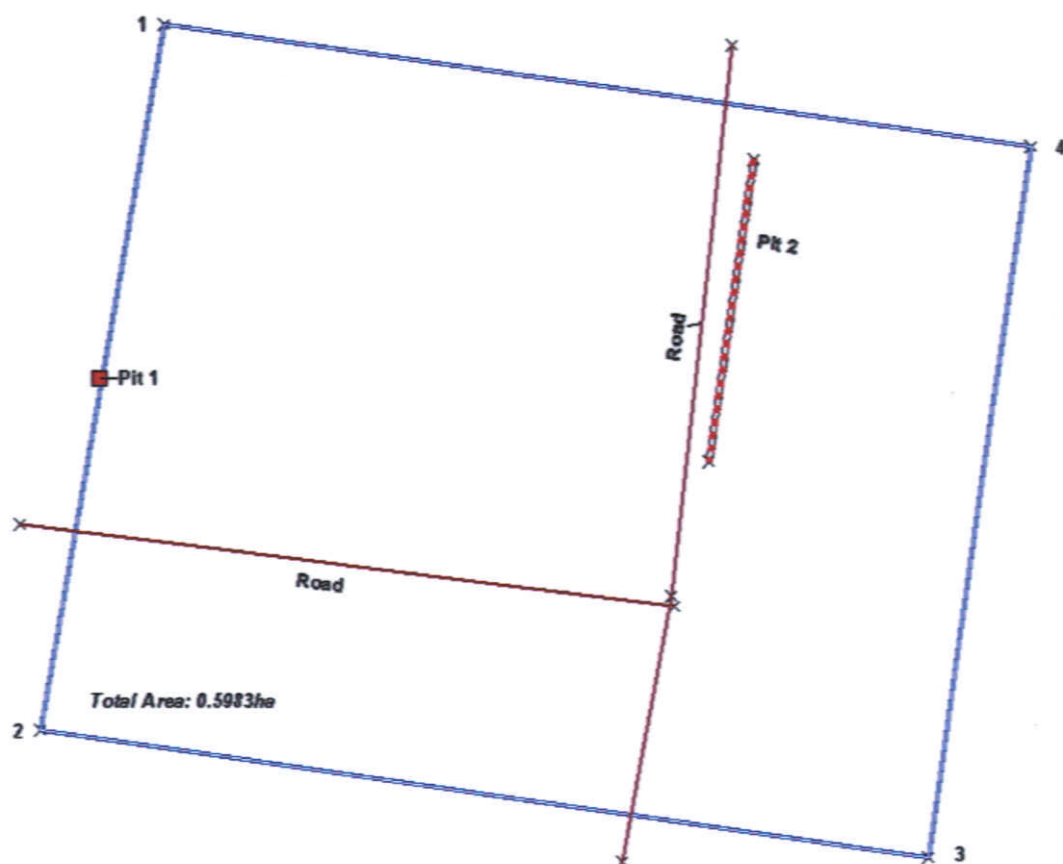
SITE POL2



Area_Coords		x	y
1		308,038.9	6,240,440.52
2		308,156.57	6,240,422.73
3		308,151.59	6,240,391.25
4		308,032.01	6,240,406.99
POL 2		308,094.29	6,240,415.89

Pits	x	y
	308109.960337	6240398.66866
	308108.002317	6240398.158562
	308107.069035	6240404.547464
	308109.919108	6240404.157562
Pit 13	308107.981327	6240401.658062
	308113.85239	6240403.777636
	308119.072028	6240402.16796
	308118.832898	6240398.528698
	308112.730951	6240399.559482
Pit 14	308115.905612	6240401.158162

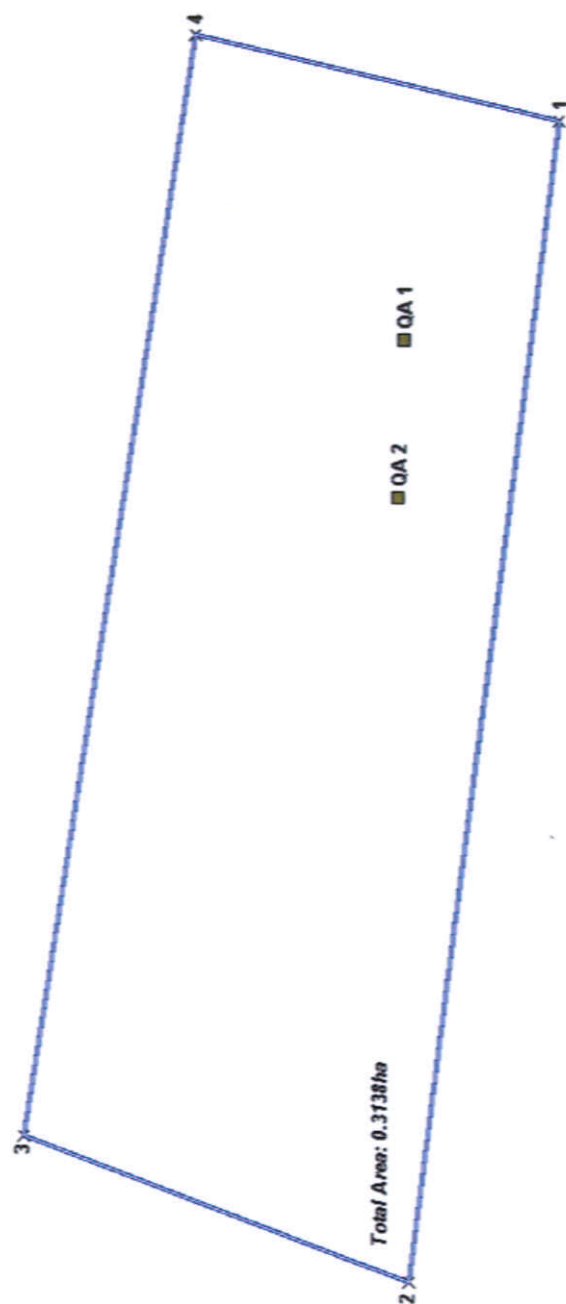
SITE 5



Pits	X	Y
	308,692	6,241,681.88
	308,687.5	6,241,652.5
Pit 2	308,689.75	6,241,667.19
Pit 1	308,628.41	6,241,680.63

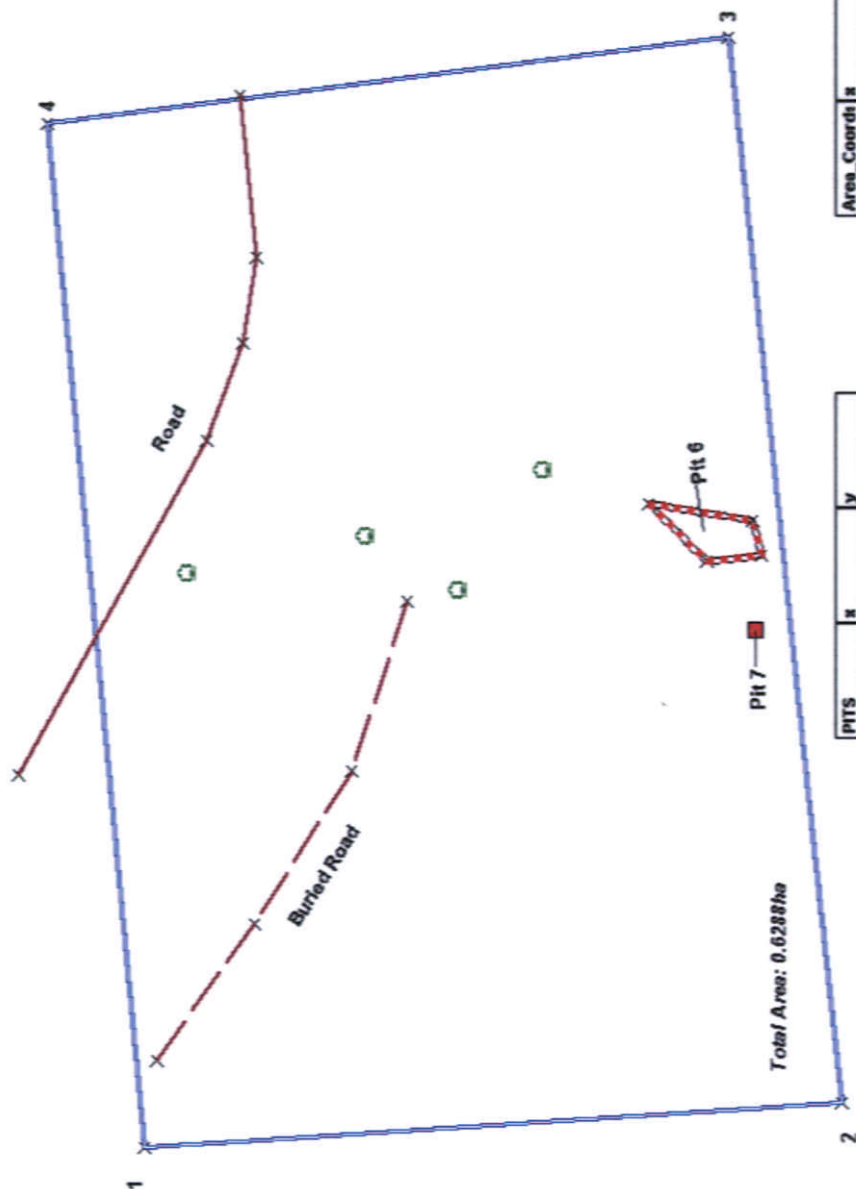
Area_Coords	X	Y
1	308,634.69	6,241,685
2	308,622.73	6,241,626.46
3	308,708.78	6,241,614.18
4	308,718.71	6,241,683.23
Site 5	308,670.72	6,241,654.59

SITE 6



Area_Coords	x	y
1	308,377.79	6,241,711.58
2	308,280.05	6,241,724.21
3	308,292.36	6,241,758.60
4	308,394.96	6,241,742.27
Site 6	308,332.51	6,241,734.13

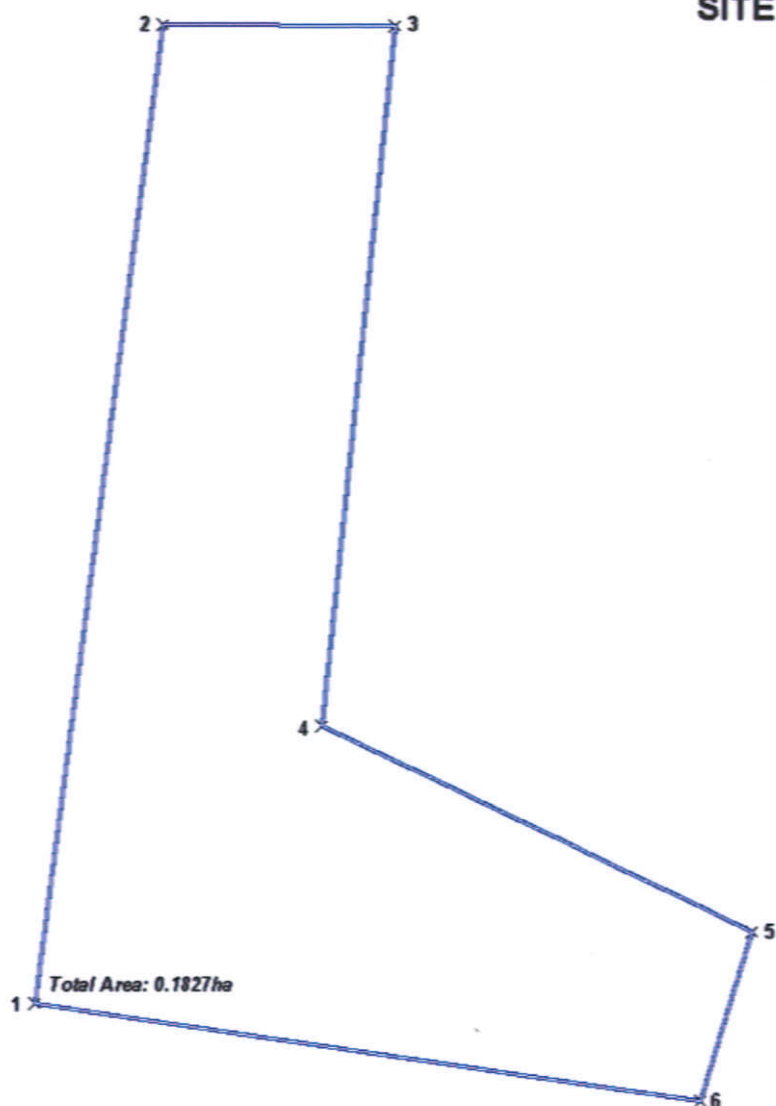
SITE 7



PITS	x	y
	308,422.89	6,240,464.79
	308,421.35	6,240,455.03
	308,418.15	6,240,454.19
	308,417.54	6,240,459.27
Pit 6	308,420.22	6,240,459.49
Pit 7	308,411.2	6,240,454.76

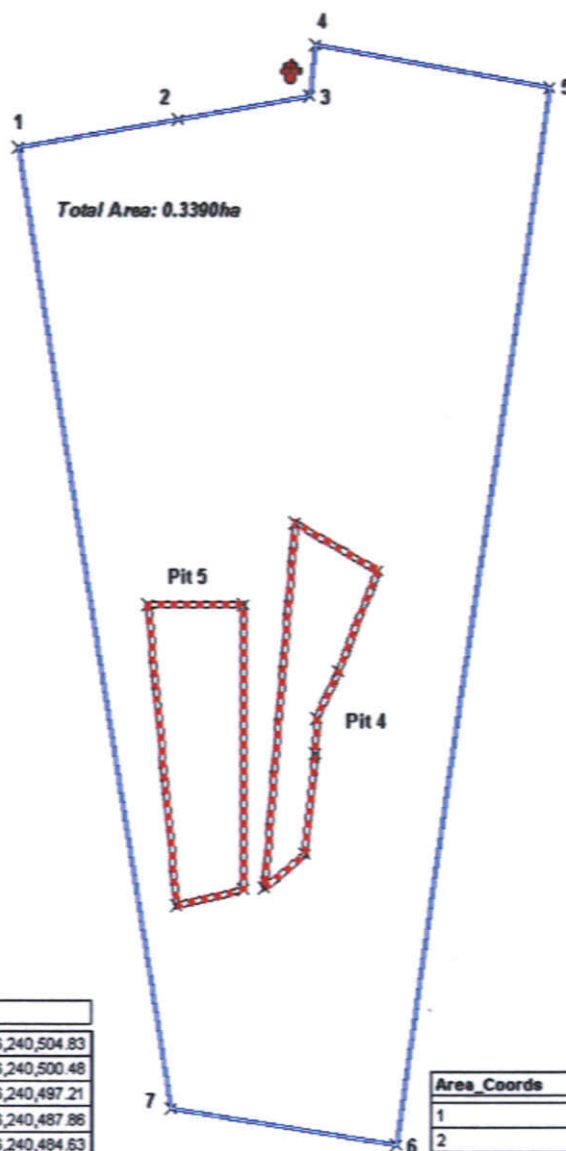
Area	Coord	x	y
1		308,362.92	6,240,511.58
2		308,367.21	6,240,446.76
3		308,466.37	6,240,457.29
4		308,450.2	6,240,520.55
Site 7		308,414.65	6,240,483.66

SITE 9



COMMENT	x	y
1	308,433.67	6,241,492.28
2	308,442.95	6,241,562.9
3	308,459.59	6,241,562.78
4	308,454.36	6,241,512.31
5	308,485.3	6,241,497.49
6	308,481.52	6,241,485.25
Site 9	308,446.71	6,241,524.07

SITE 11





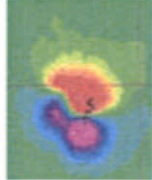

Pits	x	y
	308,566.24	6,240,504.83
	308,564.19	6,240,500.48
	308,563.99	6,240,497.21
	308,563.04	6,240,487.86
	308,559.24	6,240,484.63
	308,562.15	6,240,518.59
Pit 4	308,564.48	6,240,501.62
	308,548.48	6,240,511.05
	308,551.14	6,240,483
	308,557.37	6,240,484.61
	308,557.36	6,240,511.03
Pit 5	308,552.93	6,240,497.03

Area_Coords	x	y
1	308,536.36	6,240,553.43
2	308,551.28	6,240,556.13
3	308,563.52	6,240,558.18
4	308,564	6,240,562.93
5	308,585.76	6,240,559.1
6	308,571.54	6,240,460.78
7	308,550.64	6,240,464.24
Site 11	308,561.06	6,240,511.86

APPENDIX E

INTERPRETED GEOPHYSICAL SURVEY IMAGES

KEY

Symbol	Meaning
	A blue line is used on some geophysical images to signify either: a. an underground service such as drainage in the image for Site 5; and b. an attempt by the data interpreter to delineate a burial site, as in the image for Site 11
	A call out of this type is the data interpreter calling attention to an item as requiring investigation (I) in the field.
	A typical colour image of total magnetic intensity produced by a sub-surface ferrous object. Ferrous objects are dipolar, with the N and S poles being discernible in the image on either side of a cross hair and number. The cross hair signifies the modelled centre of the object's mass. The number is the target identification number.
	Typical colour range applied to indicate variations in total magnetic intensity. Measurements are in NanoTessela (nT).

Acquisition Parameters

Instrument:	G858 Magnetometer
Sampling mode:	Time based
Sample interval:	0.2 seconds
Line spacing:	2 metres

Processing Parameters

Data recovery:	AGSProc V1.73
Data gridding:	AGSProc V1.73
Method:	Minimum curvature
Grid cell size:	0.20m x 0.20m
Other processing:	

Image Presentation

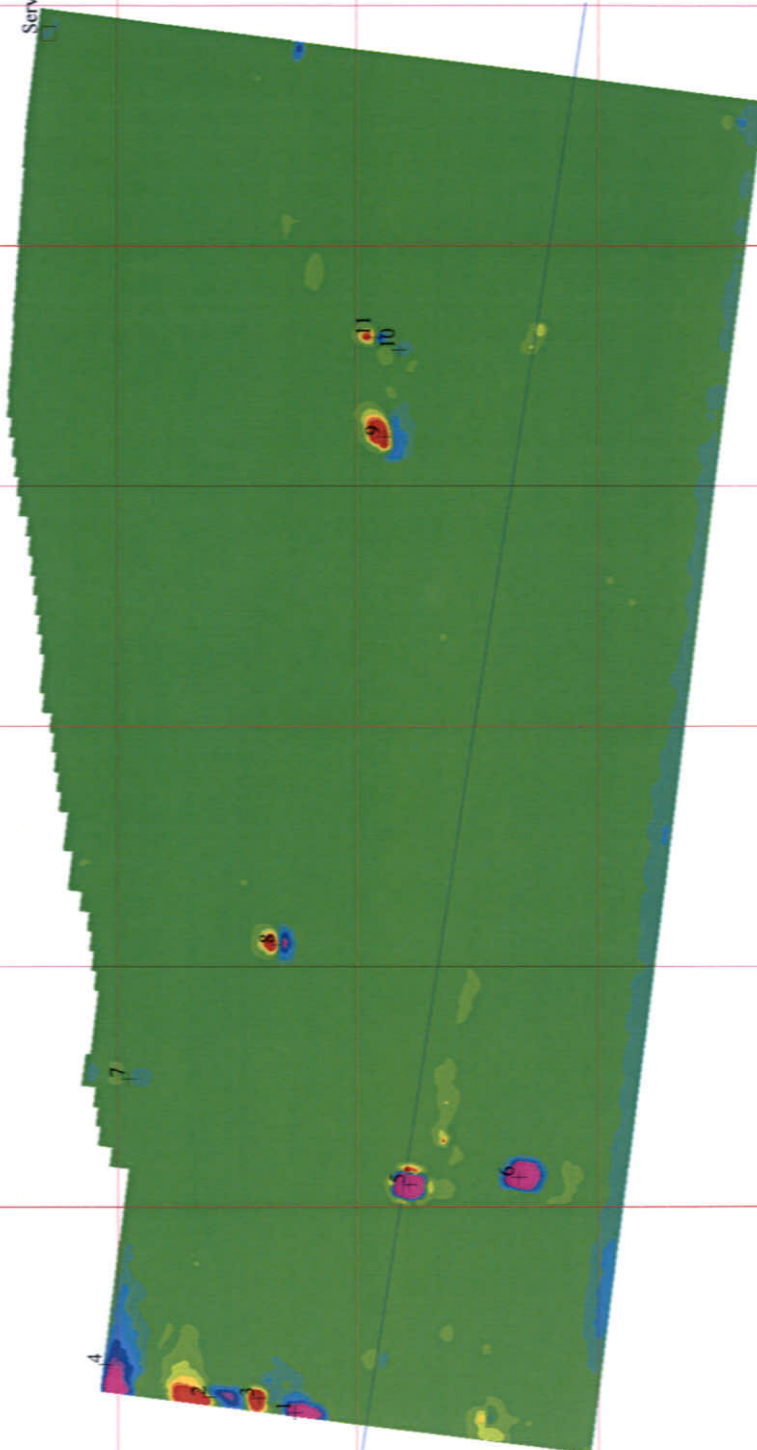
-687.45nT	-50.00nT	585.00nT
Histogram bin width:	5.00nT	
Colour interval:	50.00nT	
Colour mapping:	Linear	

Colour Image of Total Magnetic Field

Project:	DNSDC, Moorebank
Project ID:	AG-058
Client:	Milsearch Pty. Ltd.
Processed by:	Timothy Pippett
Map scale:	1:1500
Date printed:	31 October 2002
Program version:	AGSProc V1.73

Site_1e

Services ?



1240950mN

1240900mN

1240850mN

1240800mN

1240750mN

29:

29:

29:

29:

29:

29:

Acquisition Parameters

Instrument: G858 Magnetometer
Sampling mode: Time based
Sample interval: 0.2 seconds
Line spacing: 2 metres

Processing Parameters

Data recovery: AGSProc V1.73
Data gridding: AGSProc V1.73
Method: Minimum curvature
Grid cell size: 0.20m x 0.20m
Other processing:

Image Presentation

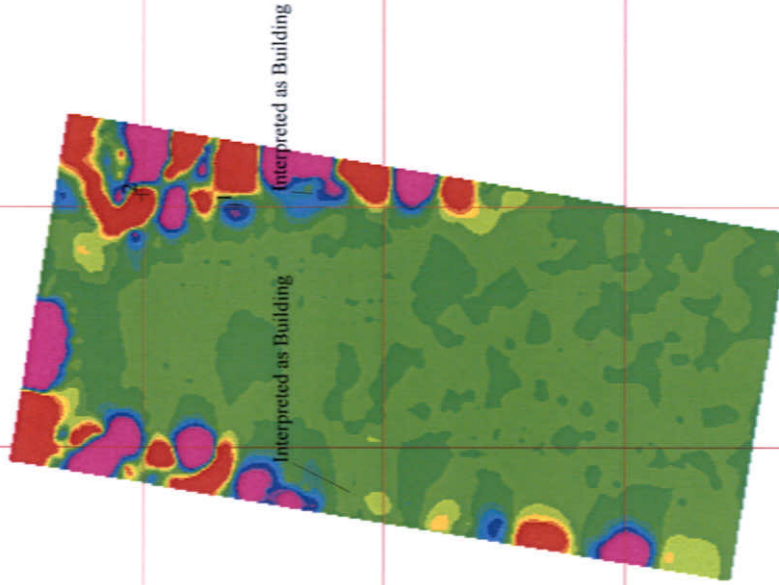


-690.00nT -50.00nT 585.00nT
Histogram bin width: 5.00nT
Colour interval: 50.00nT
Colour mapping: Linear

Colour Image of Total Magnetic Field

Project: DNSDC, Moorebank
Project ID: AG-058
Client: Mfsearch Pty. Ltd.
Processed by: Timothy Pippett
Map scale: 1:750
Date printed: 31 October 2002
Program version: AGSProc V1.73

pol_1



1240975mN

1240950mN

1240925mN

1240900mN

1240875mN

29°

29°

29°

29°

29°

29°

Acquisition Parameters

Instrument:	G858 Magnetometer
Sampling mode:	Time based
Sample interval:	0.2 seconds
Line spacing:	2 metres

Processing Parameters

Data recovery:	AGSProc V1.73
Data gridding:	AGSProc V1.73
Method:	Minimum curvature
Grid cell size:	0.20m x 0.20m
Other processing:	

Image Presentation

Project:	-690.00nT	-50.00nT	585.00nT
Histogram bin width:	5.00nT		
Colour interval:	50.00nT		
Colour mapping:	Linear		

Colour Image of Total Magnetic Field

Project:	DNSDC, Moorebank
Project ID:	AG-058
Client:	Milsearch Pty. Ltd.
Processed by:	Timothy Pippett
Map scale:	1:750
Date printed:	31 October 2002
Program version:	AGSProc V1.73



Acquisition Parameters

Instrument:	EM61
Sampling mode:	Distance
Sample interval:	0.2 metres
Line spacing:	2 metres

Processing Parameters

Data recovery:	AGSProc V1.73
Data gridding:	AGSProc V1.73
Method:	Minimum curvature
Grid cell size:	0.20m x 0.20m
Other processing:	

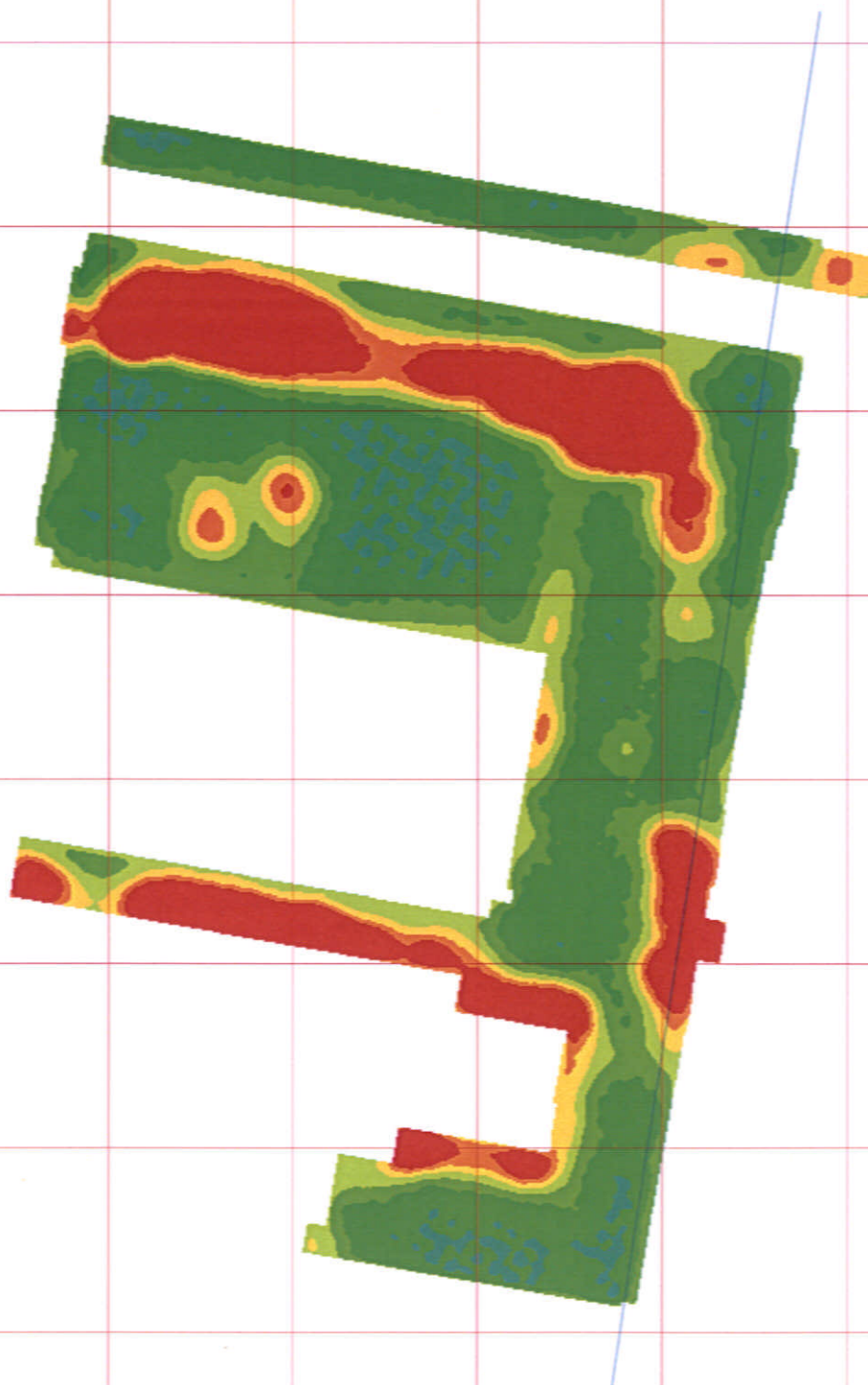
Image Presentation

--	--

-637.40nT	0.05nT	635.05nT
Histogram bin width:	5.00nT	
Colour interval:	50.00nT	
Colour mapping:	Linear	

Colour Image of EM Field

Project:	DNSDC, Moorebank
Project ID:	AG-058
Client:	Milsearch Pty. Ltd.
Processed by:	Timothy Pippett
Map scale:	1:750
Date printed:	31 October 2002
Program version:	AGSProc V1.73



140mN

120mN

100mN

80mN

60mN

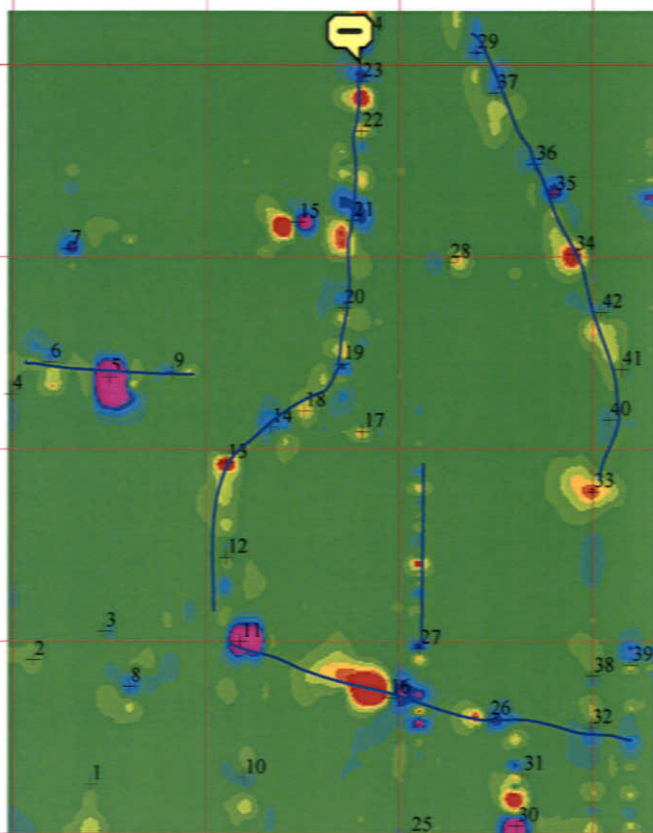
40mN

20mN

0mN

-20mN

-40mN



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 E-mail info@alpha-geo.com
 Website www.alpha-geo.com

Acquisition Parameters

Instrument:
 Sampling mode:
 Sample interval:
 Line spacing:
 Acq. software:

Processing Parameters

Data recovery: AGSProc V1.71
 Data gridding: AGSProc V1.71
 method: Minimum curvature
 Grid cell size: 0.20m x 0.20m
 Other processing:

Image Presentation

-3450.00nT -250.00nT 2925.00nT
 Histogram bin width: 25.00nT
 Colour interval: 250.00nT
 Colour mapping: Linear

Colour Image of Total Magnetic Field

Project: Moorebank DNSDC
 Project ID: AG-058
 Client: Milsearch
 Processed by: Timothy Pippett
 Map scale: 1:750
 Date printed: 01 October 2002
 Program version: AGSProc V1.71

Site 5

Instrument:	EM61
Sampling mode:	Distance
Sample interval:	0.2 metres
Line spacing:	2 metres
Acq. software:	

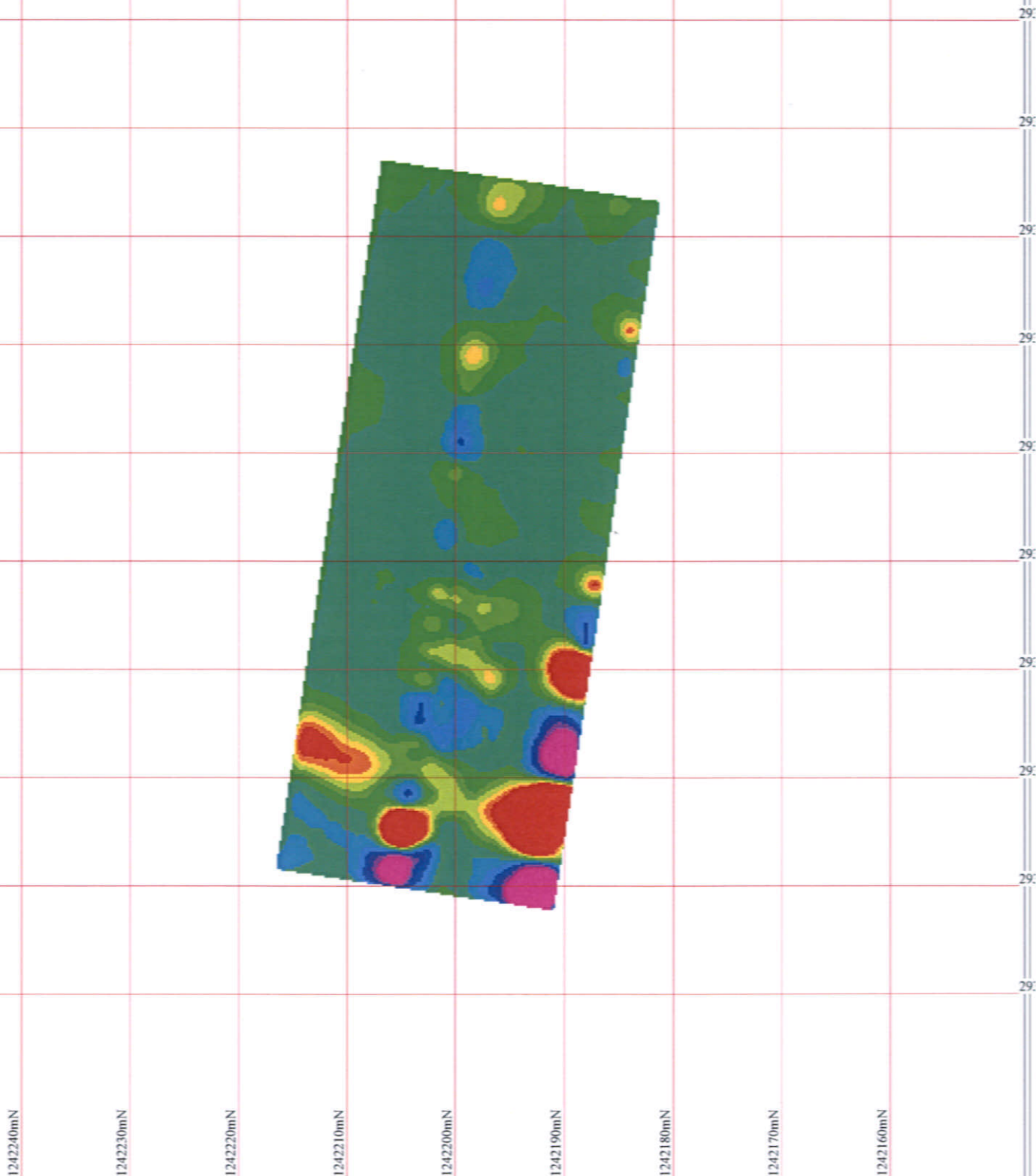
Data recovery:	AGSPProc V1.73
Data gridding:	AGSPProc V1.73
method:	Minimum curvature
Grid cell size:	0.20m x 0.20m
Other processing:	

--

-138.00nT -10.00nT 117.00nT
Histogram bin width: 1.00nT
Colour interval: 10.00nT
Colour mapping: Linear

Project:	DNSDC, Moorebank
Project ID:	AG-058
Client:	Milsearch Pty. Ltd.
Processed by:	Timothy Pippett
Map scale:	1:500
Date printed:	29 October 2002
Program version:	AGSProc V1.72

Site 6





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Website www.alpha-geo.com

Acquisition Parameters

Instrument:
Sampling mode:
Sample interval:
Line spacing:
Acq. software:

Processing Parameters

Data recovery: AGSProc V1.71
Data gridding: AGSProc V1.71
Method: Minimum curvature
Grid cell size: 0.20m x 0.20m
Other processing:

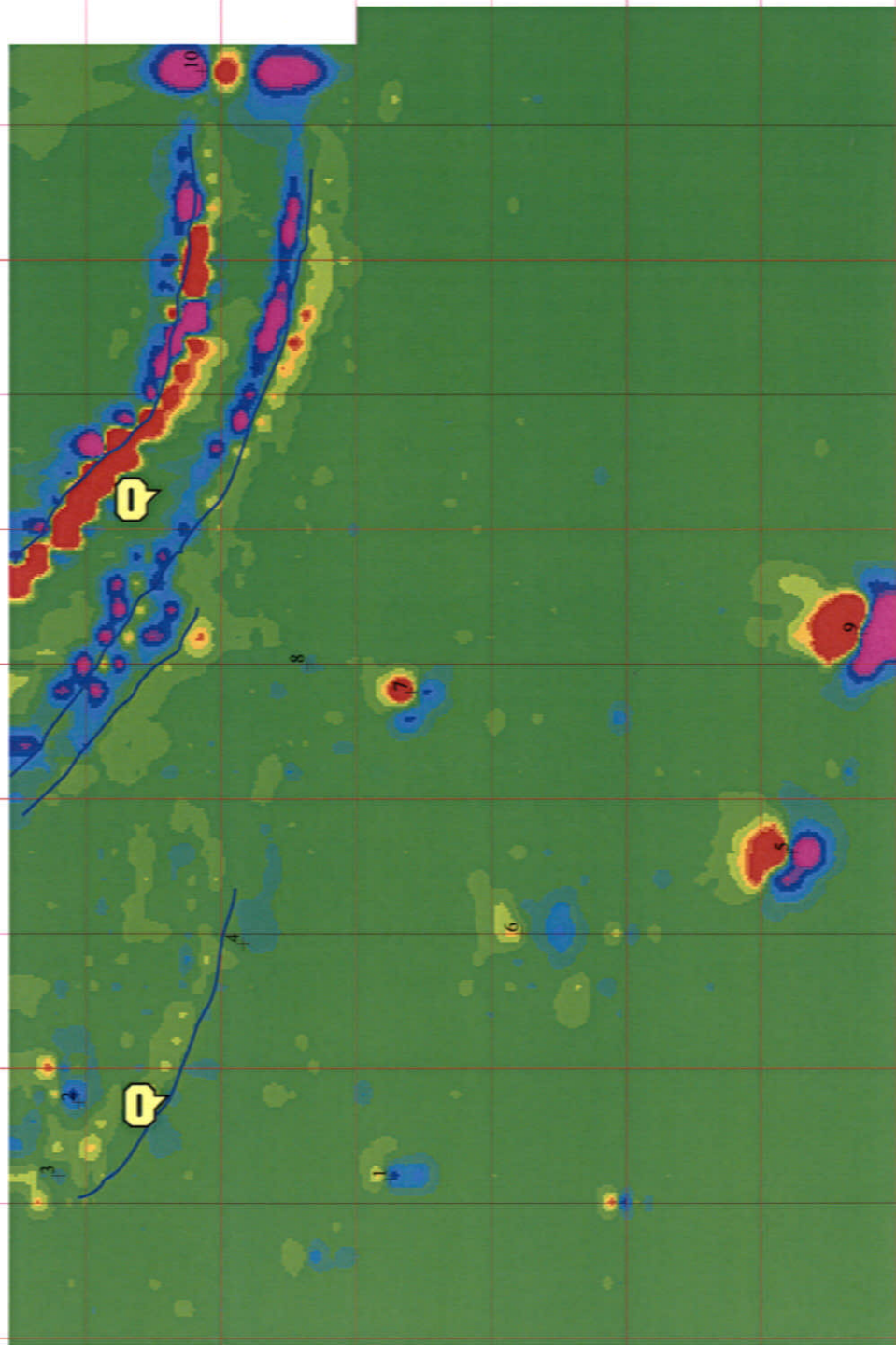
Image Presentation

-1380.00nT -100.00nT 1170.00nT
Histogram bin width: 10.00nT
Colour interval: 100.00nT
Colour mapping: Linear

Colour Image of Total Magnetic Field

Project: Moorebank DNSDC
Project ID: AG-058
Client: Mlsearch
Processed by: Timothy Pippett
Map scale: 1:500
Date printed: 01 October 2002
Program version: AGSProc V1.71

Site 7



Acquisition Parameters

Instrument:	EM61
Sampling mode:	Distance
Sample interval:	0.2 metres
Line spacing:	2 metres
Acq. software:	

Processing Parameters

Data recovery:	AGSProc V1.73
Data gridding:	AGSProc V1.73
method:	Minimum curvature
Grid cell size:	0.20m x 0.20m
Other processing:	

Image Presentation

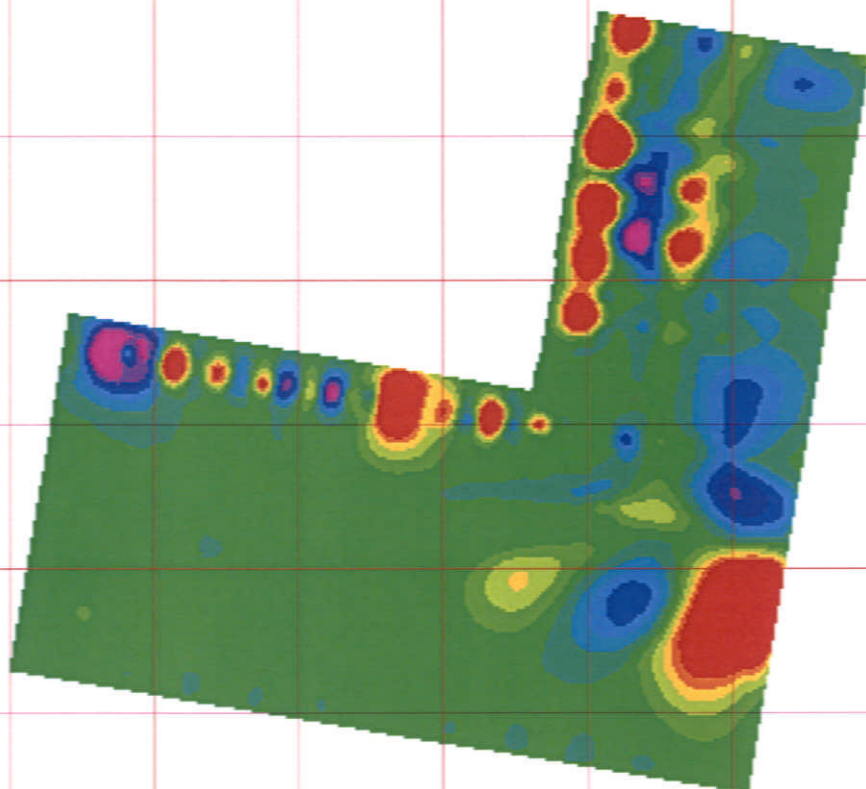
--

-687.45nT	-50.00nT	583.00nT
Histogram bin width:	5.00nT	
Colour interval:	50.00nT	
Colour mapping:	Linear	

Colour Image of EM Field

Project:	DNSDC, Moorebank, NSW.
Project ID:	AG-058
Client:	Milsearch Pty. Ltd.
Processed by:	Timothy Pippett
Map scale:	1:500
Date printed:	28 October 2002
Program version:	AGSProc V1.73

Site_9





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Website www.alpha-geo.com

Acquisition Parameters

Instrument:
Sampling mode:
Sample interval:
Line spacing:
Acq. software:

Processing Parameters

Data recovery: AGSProc V1.71
Data gridding: AGSProc V1.71
Method: Minimum curvature
Grid cell size: 0.20m x 0.20m
Other processing:

Image Presentation

-2760.00nT -200.00nT 2340.00nT
Histogram bin width: 20.00nT
Colour interval: 200.00nT
Colour mapping: Linear

Colour Image of Total Magnetic Field

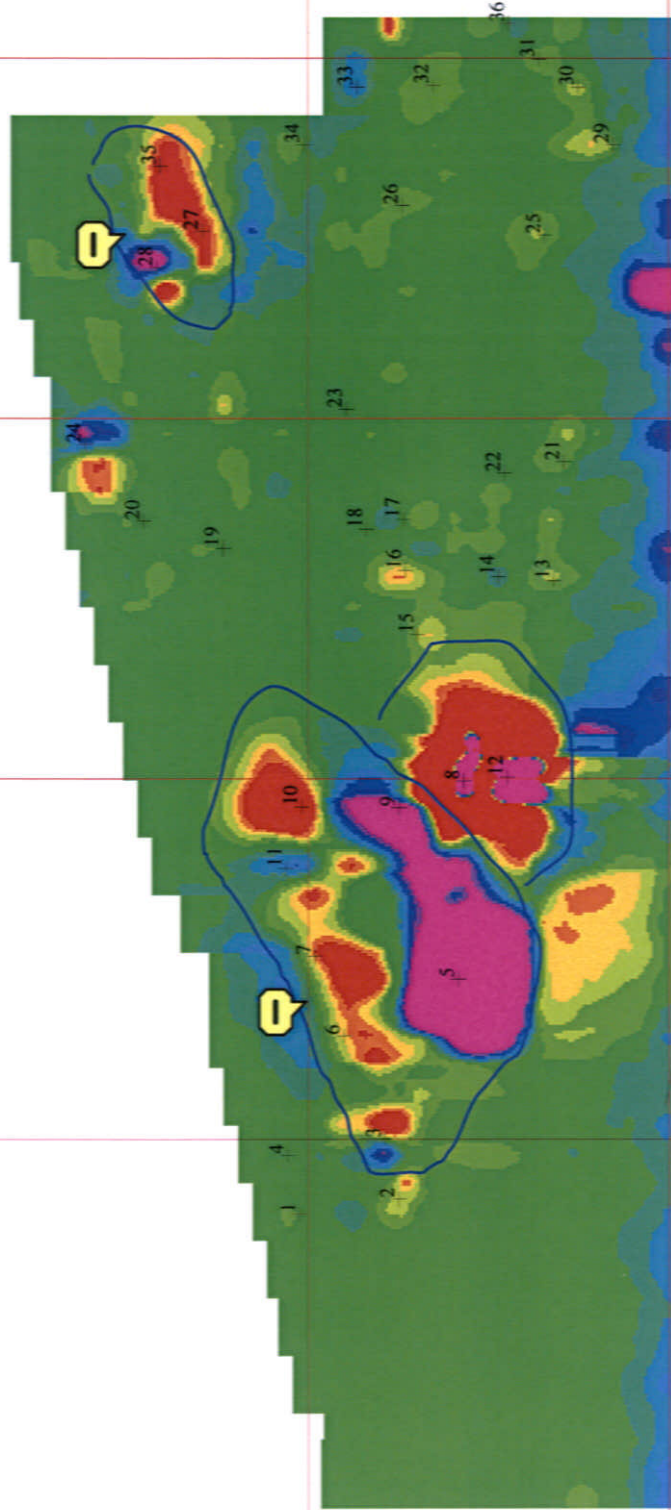
Project: Moorebank DNSDC
Project ID: AG-058
Client: Milsearch
Processed by: Timothy Pippett
Map scale: 1:500
Date printed: 01 October 2002
Program version: AGSProc V1.71

Site 11

50mN

25mN

0mN



Linear Feature along Southern Boundary

10

75

50

25

INVESTIGATION RECORD SHEETS

61 2 6286 8266

**TOTAL FIELD MAGNETIC ORDNANCE DETECTION SURVEY
INTERPRETATION AND EXCAVATION REPORT
ALPHA GEOSCIENCE Pty. Limited**

Interpreter:	Timothy Pippett	Project:	Moorebank DNSDC
Date:	03 October 2002	Project-Id:	AG-058
Sensor-Elevation:	0.60m	Noise Threshold:	200.00nT
Depth is:	Below Ground	Line-Spacing:	2.00m
Page:	1 of 2	Area:	Site 5

No.	COORDINATES Local E(m) N(m)		MASS kg	DEPTH m	SOURCE CONFIRMED OBJECT	DEPTH m	INTERPRETATION COMMENTS
1	8.0	5.1	361.9	1.7			
2	2.1	18.1	889.0	3.1			
3	9.4	21.1	296.8	1.8			
4	-0.2	45.7	4628.9	4.8	Parked Vehicle		
5	9.9	47.5	10559.5	1.5	Immobilised Roller		
6	3.8	49.1	971.0	1.6			
7	5.8	60.8	781.4	1.2	Remains of Burn Pit Area	0.5m	
8	12.0	15.3	1154.2	1.7	Surface Metal		
9	16.5	48.0	490.6	1.1			
10	23.8	5.8	280.6	1.1			
11	23.4	20.0	8874.3	1.5	Metal Grating		
12	22.0	28.7	107.7	1.0			
13	22.0	38.6	260.4	0.6			
14	26.6	42.3	1564.6	2.0	Surface Metal		
15	29.4	63.6	2696.1	1.2	Remains of Burn Pit Area	0.5m	
16	38.9	14.1	5671.8	2.1	Metal Ident Marker		
17	36.1	41.8	178.1	0.9			
18	30.0	44.0	313.9	1.3			
19	34.0	48.9	492.8	0.8			
20	34.1	54.7	375.5	1.0			
21	35.1	63.8	3178.1	2.0	Star Picket		
22	36.0	73.1	174.2	0.7			
23	36.0	78.3	1914.4	1.3	Storm Water Junction		
24	36.0	83.1	4719.5	2.3	Fence Line		
25	41.1	-0.2	1360.9	3.3	Parked Trailer		
26	49.3	11.9	1758.0	1.5	Surface Metal		
27	42.0	19.3	206.8	0.4	Tap Water Line		
28	45.1	59.4	486.6	1.3			
29	48.0	81.3	1031.1	1.4			
30	52.1	0.8	4062.2	1.6	Remains of Burn Pit	0.5m	
31	52.8	6.2	170.8	0.9	Remains of Burn Pit	0.5m	
32	59.8	11.0	1103.5	1.8			
33	60.0	35.5	706.0	1.6	Storm Water		
34	58.0	60.2	1371.0	1.7	Storm Water		
35	56.0	66.5	4750.6	2.4			

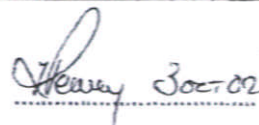
Surveyed:

Date/Signature:

Timothy Pippett

Excavated:

Date/Signature:



61 2 6286 8266
TOTAL FIELD MAGNETIC ORDNANCE DETECTION SURVEY
INTERPRETATION AND EXCAVATION REPORT
ALPHA GEOSCIENCE Pty. Limited

Interpreter:	Timothy Pippett	Project:	Moorebank DNSDC
Date:	03 October 2002	Project-Id:	AG-058
Sensor-Elevation:	0.70m	Noise Threshold:	200.00nT
Depth is:	Below Ground	Line-Spacing:	2.00m
Page:	1 of 2	Area:	Site 11

No.	COORDINATES Local E(m) N(m)		MASS kg	DEPTH m	SOURCE CONFIRMED OBJECT	DEPTH m	INTERPRETATION COMMENTS
-----	-----------------------------------	--	------------	------------	----------------------------	------------	----------------------------

1	19.8	25.6	5524.3	5.6	Surface Metal		
2	20.9	18.8	917.4	2.2	Pit 4		
3	25.0	19.8	1016.8	1.1	Pit 4		
4	23.9	26.4	881.0	3.7			
5	36.1	14.6	378978.6	6.1	Pit 4		
6	32.2	22.5	3630.4	2.8	Pit 4		Linear Feature
7	37.7	24.6	2522.7	2.2	Pit 4		Linear Feature
8	49.8	14.3	14569.9	1.0	Pit 5		
9	48.0	18.8	108879.3	4.9	Pit 5		
10	48.1	25.5	44348.2	4.3	Pit 4		
11	43.8	26.6	2670.0	2.1	Pit 4		
12	50.1	11.3	49637.8	1.4	Pit 5		
13	63.7	8.0	357.9	1.6			
14	64.0	11.9	290.6	1.3			
15	60.0	17.5	244.6	1.2	Pit 5		
16	64.4	18.3	406.2	1.3	Pit 5		
17	68.0	18.4	281.7	1.3	Pit 5		
18	67.3	21.0	315.6	2.1	Pit 5		
19	66.0	30.9	290.2	2.3			
20	67.9	36.4	249.1	1.9			
21	72.0	7.3	1480.7	2.8	Star Picket		
22	71.2	11.4	246.7	1.9			
23	75.6	22.3	455.5	2.6			
24	73.2	40.5	3201.8	1.9	3xStar Pickets		
25	87.7	8.6	728.6	2.3	Surface Metal		
26	89.8	18.5	244.4	1.8			
27	88.0	32.3	3569.9	2.4	Fire Hydrant		
28	85.5	35.5	1782.5	1.2	Fire Hydrant		
29	94.0	3.9	9638.6	4.4	Surface Metal		
30	98.0	6.3	834.4	2.2			
31	99.9	9.0	2032.7	3.4	Star Picket		
32	98.1	16.4	437.3	2.3			
33	98.0	21.6	588.8	1.5	Surface Metal		
34	94.0	25.3	218.2	1.1			
35	92.5	35.3	3462.9	2.8	Fire Hydrant		

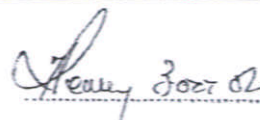
Surveyed:

Date/Signature:

Timothy Pippett

Excavated:

Date/Signature:





POST ACTIVITY REPORT

Hazard Reduction Precinct H, Moorebank Defence Land MOOREBANK, NSW

G-tek Australia Pty Limited
[ABN 47 099 519 034]

REPORT

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Project Reference: URSA03099

Issued by: Sydney Office

POST ACTIVITY REPORT
Hazard Reduction, Precinct H
Moorebank Defence Land
MOOREBANK, NSW

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Prepared by:


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Senior Project Manager

Date: 27/10/03.

Reviewed by:


Greg Guthrie
General Manager – Explosive Ordnance Disposal

Date: 27 Oct 03

DOCUMENTATION CONTROL	
Copy Number	Issued To
1	Department of Defence
2	Department of Defence
3	Department of Defence
4	Department of Defence
5	G-tek Australia Pty Limited

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Appendices

- A. Site Map
- B. Record of Investigations

The following **Definitions** apply within this report:

Ammunition: A device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in connection with defence or offence including demolitions. Certain ammunition can be used for training, ceremonial or other non-operational purposes.

Ammunition Produce: Non-explosive stores and components used in the assembly or the initiation of ammunition.

Explosive Ordnance (EO): All munitions containing explosives, nuclear fission or fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature

Explosive Ordnance Waste (EOW): Inert material remnant from the initiation or functioning of explosive ordnance.

Fragmentation: Metallic fragments of the fractured casing of EO resultant from the initiation of high explosive filling and often projected at high velocities over considerable distances from the point of initiation.

Hazard Reduction Operation (HRO): An operation designed to reduce the EO hazard within the boundaries of an affected area.

Intrusive Sampling: In the context of this Request For Tender, intrusive sampling is taken to mean the excavation and identification of a representative sample of anomalies detected during the initial electronic investigation of the area. The purpose of intrusive sampling is to verify the accuracy of the interpretation of the anomalies located during the initial electronic investigation.

Materials of Military Origin (MOMO): Items of military nature, specifically components of munitions including rounds and spent cartridges of small arms ammunition, safety levers and other devices.
Note: Term not included in IMAS

Military Produce: Any item identified as military in origin that is not ammunition-related.

Munitions: A complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in military operations, including demolitions.
Note: In common usage, "munitions" (plural) can be military weapons, ammunition and equipment.

Small Arms: All arms, including automatic weapons of less than 20 mm in calibre and all gauges of shotguns.

Small Arms Ammunition (SAA): Ammunition for small arms, ie all ammunition of less than 20 mm in calibre, and all gauges of shotgun cartridges.

Small Arms Ammunition Waste (SAAW): Inert material remnant from the transport, packaging, preparation, and use of SAA.

Unexploded Ordnance (UXO): Explosive ordnance that has been primed, fused, armed or otherwise prepared for action and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material but remains unexploded either by malfunction or design or for any cause. UXO includes items of military ammunition or explosives removed from their original resting-place for any reason, including souveniring by members of the public.

Total Magnetic Intensity (TMI): The earths naturally occurring total magnetic field intensity as measured by a magnetometer (on this site the TM4).

Collectively EO, munitions, UXO and MOMO are defined as "**Defence Contamination**".

1.0 INTRODUCTION

1.1 General

As part of general contamination studies within Defence property at Moorebank, NSW, the Department of Defence had a hazard assessment carried out over Precinct H (DNSDC) within the Moorebank Defence Land. This assessment identified an area within which hand grenade fragmentation and components were located. Research indicated that soil was imported to this site to assist with training on earth moving equipment. G-tek Australia Pty Limited (G-tek) was contracted to locate any complete grenades which may remain on the site.

1.2 Authority to Undertake Task

G-tek undertook to carry out the work under the contract: PNI.THS.1296-3606, Tender PDTF 02/03

1.3 Aim of the Project

G-tek Australia Pty Limited (G-tek) was contracted to locate any complete grenades which may remain on the site.

1.4 Nature of Report

This report details the conduct of the investigation, the methodologies used and the results obtained.

1.5 Dates of Conduct

Data collection within the site was conducted between 10th September 2003 and 15th September 2003 and Anomaly Investigation was carried out between 27th September and 30th September. QA of Anomaly investigations were carried out on 1st October 2003.

1.6 Previous Investigations of the Site

G-tek Pty Limited has conducted no previous investigations over this site.

2.0 CONTRACTING FIRM

The firm contracted to conduct this investigation was G-tek Australia Pty Limited (ABN 47 099 519 034). G-tek Australia is a Contractor Member of the Defence Unexploded Ordnance Panel (DUXOP).

2.1 G-tek Staff

The primary G-tek staff involved with the conduct of this investigation were:

Project Director	Greg Guthrie
Project Manager	Paul O'Donnell
Ammunition Technician	Anthony McCreadie
Geophysical QC	Mark Donaldson
Field Assistant	Dean Guthrie

3.0 SITE CHARACTERISTICS

DNSDC is located East of Moorebank Rd and South of Anzac Road, Moorebank, NSW, 2170.

The investigation area is an area of 2.2 Ha in the southeast corner of DNSDC.

The Site is geologically mapped, (NSW Department of Minerals and Energy, Penrith Geological Series Sheet 9030 (Edition 1) 1991) and is determined as being underlain by Tertiary fluvial clayey quartzose, sand and clay. The depth of these fluvial sediments is not known but the sediments are likely to be underlain by Ashfield Shale and possibly Hawkesbury Sandstone.

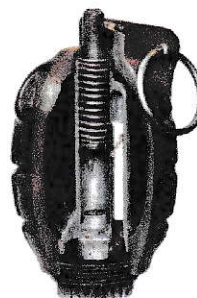
The Site is generally flat with relative ground levels across the Site at approximately 12 m (AHD).

Based on the geology of the Site and water ingress into some of the deeper investigations it is expected that groundwater will be present as a shallow aquifer(s).

4.0 SITE HISTORY

The Site has hosted military activity since early in the 20th century. Activities within Precinct H have included general materiel storage. There is no history of ammunition or explosives storage or use within this Precinct.

During 2002 Milsearch Pty Limited conducted an assessment of this site and found hand grenade fragmentation scattered across the site. During this assessment 5 of large Geophysical anomalies were investigated. They concluded that the soil containing this remnant material had been imported from a former hand grenade range outside the Precinct and had been used as fill and for the training of plant operators. The material located included base plugs and other components from Grenade, Hand, Fragmentation, No 36M, the standard issue hand grenade within the Australian Army between the 1930's and the late 1950's. The soil was considered to have the potential to contain complete, unexploded hand grenades.



The Grenade, Hand, Fragmentation, No 36M has a lemon-shaped cast-iron body filled with high explosive. The body is serrated and relatively thick to give good fragmentation. When new, the body has a shine from being coated in protective varnish and is coded with a green band around the centre and a red band or red crosses around the top. Length is 100mm (4in), Diameter 60mm (2.4in) and Weight approximately 790gm (1lb 11^{1/4} oz).

5.0 METHODOLOGY EMPLOYED

5.1 Induction/Training

Prior to access to the site, project personnel were fully inducted to the G-tek Safety and Emergency Response Plan and the G-tek Environmental Management Plan, which mirrored the relevant aspects of the URS Land access protocol.

5.2 Data Collection, Processing and Interpretation

A Total Magnetic Intensity survey was carried out over the site; Data was collected at 0.1second intervals along traverses spaced 0.375m apart.. Data was processed and grided at 0.1m cell size and interpreted to identify all items of potentially grenade size or larger.

Each interpretation was given a unique identification number and copied to a Microsoft Excel based spreadsheet.

5.3 Investigation of Interpretations

Items selected for investigation were output as investigation sheets and passed to an Ammunition Technical team for intrusive investigation. This investigation generally followed the following sequence:

- Using GPS equipment the position recorded for investigation was relocated on the ground and marked with a flag indicating the interpretation number.
- The flagged location was then searched with a combination of analogue Magnetometer (Ferex 4.021) and EM detector (Minelab) for an area of at least 1 metre around the flag to confirm the presence of the source of the anomaly interpreted for investigation and the point of strongest source signal.
- The location of the strongest signal was then manually investigated and the signal source located. The source was then positively identified and, if possible, removed from the area. The area was then again checked with the analogue search equipment, and the process repeated until the source was fully identified as a pit, or no further aural cue was received.
- On completion of the positive identification process, the investigation results were recorded and completed sheets passed back to the Processing Geophysicist.

One anomalous area showed a clearly delineated high magnetic signal. The significant anomalies were investigated here in accordance with the standard process. The source of the magnetic signal was found to be highly mineralised stones in what appeared to be imported soil. After the investigation of interpreted anomalies, this area was rechecked by applying a 100% analogue Minelab F1A4 survey. The Minelab F1A4 is an electromagnetic based system not affected by mineralised soils.

5.4 QC - Tests Performed

Prior to use each piece of analogue relocation equipment was subjected to manufacturer's performance test to ensure that each was operational. Alternate equipments were available if required, and the G-tek maintenance facility in Armidale, NSW, was prepared for fast response replacement or repair of equipment from this project.

Digital equipment was tested and calibrated prior to the conduct of data collection, by conducting multiple passes across an inert Grenade, No 36M body within a clear area of the site. All equipment performed as expected and no repair or replacement was required during the project.

5.5 QA – Checks

An additional 5% digital data collection was carried out on the site and this data was forwarded to another geophysicist for processing and interpretation, independent of the primary data collection and processing activity. . The resultant interpretations were added to the primary interpretations spreadsheet and investigated with the other investigations.

The Project Manager conducted a review of all processes and activities within the site, and selected 5% of the investigated anomalies to reinvestigate to ensure that they agreed with the recorded find. The Project Manager is satisfied that all processes and methodologies, as defined in G-tek's standard operating procedures and as applied on G-tek's previous task on this site, were accurately and correctly applied within this task.

6.0 RESULTS OF THE INVESTIGATION

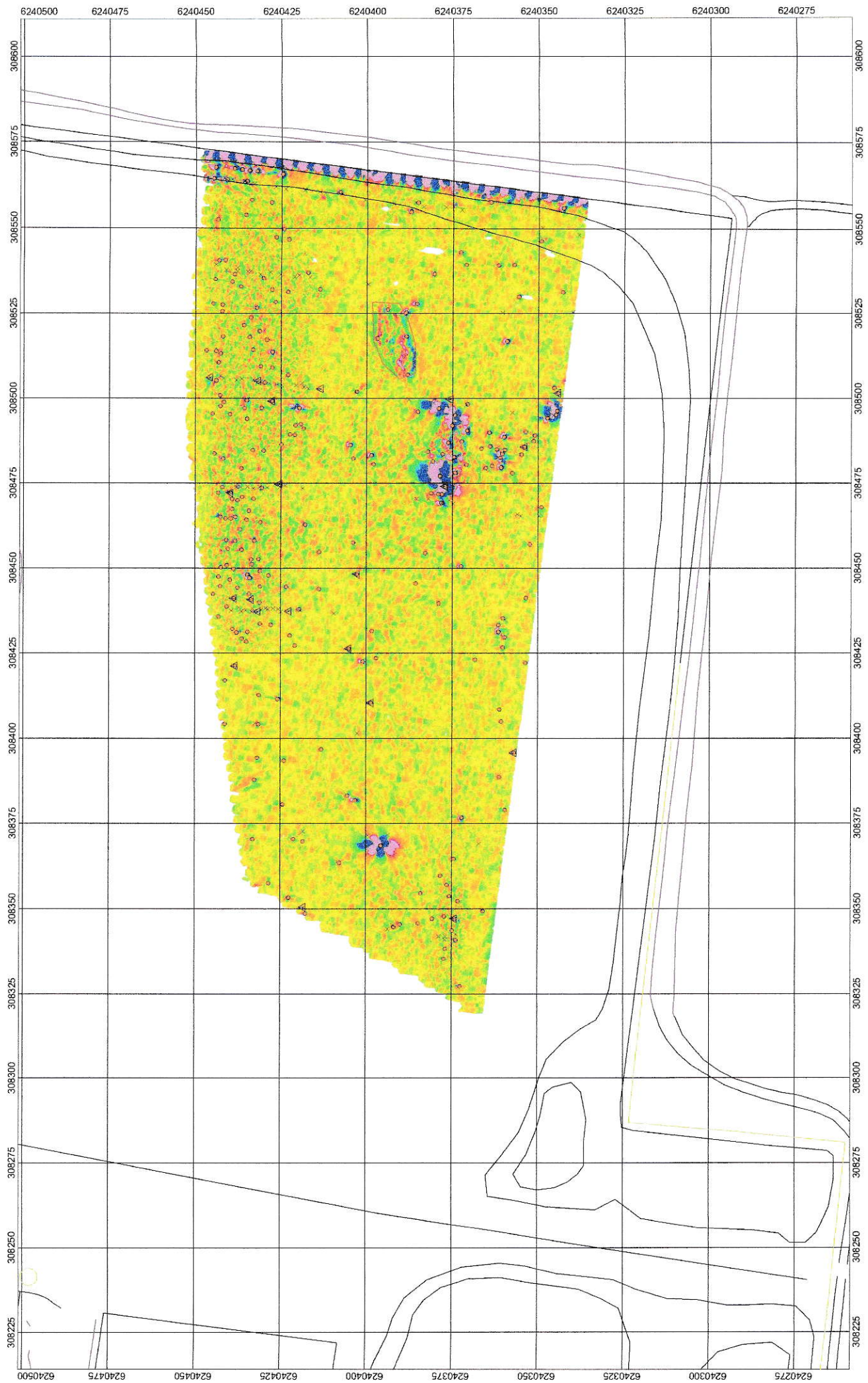
256 magnetometer anomalies were interpreted and investigated from the full data set. A further 112 magnetometer anomalies were interpreted and investigated from the QC data set. 21 interpretations/investigation were rechecked during the investigation QC.

As a result of the investigations conducted:

- 94 items of the size of a grenade were located.
- No grenades or any items that could be perceived as hazardous were located.

A complete list on interpretations selected for investigation, investigation results and incidental finds is included at Appendix B.

APPENDIX A
SITE MAP



INVESTIGATION
INTERPRETATION QC
STANDARD
INVESTIGATION QC
Analogue Search Area

Hazard Reduction
Precinct H
Moorebank Defence Lands

25 0 25
metres
GDA94 / Map Grid of Australia zone 56

APPENDIX B

Record of Investigations

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct H

Investigations

Sensor: TMF
 Sensor Height: 0.3m

File: H_Digs
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	Item
308516.63	6240359.20	1	Scrap Lge LIS
308488.64	6240359.93	3	Scrap Lge
308479.55	6240360.89	5	Scrap Lge LIS
308495.19	6240344.97	6	Scrap Lge LIS
308496.32	6240344.61	8	Scrap Lge LIS
308494.18	6240347.40	10	Scrap Lge LIS
308484.77	6240359.75	11	Scrap Lge LIS
308482.43	6240361.12	12	Scrap Sml
308474.02	6240377.24	13	Scrap Lge LIS
308478.02	6240374.27	14	Scrap Lge LIS
308490.51	6240370.81	15	Scrap Lge LIS
308482.62	6240374.63	16	Scrap Lge LIS
308477.10	6240378.68	17	Scrap Lge
308486.94	6240376.28	18	Scrap Sml
308491.98	6240375.13	19	Scrap Lge
308495.05	6240374.35	20	Scrap Lge LIS
308497.00	6240379.04	21	Scrap Lge
308536.62	6240380.35	22	Scrap Sml
308497.10	6240419.71	23	Scrap Lge LIS
308513.51	6240427.62	24	Scrap Lge LIS
308526.63	6240432.11	25	Scrap Sml
308482.19	6240441.91	26	Scrap Lge
308465.03	6240442.63	27	Scrap Lge
308537.00	6240417.18	28	Scrap Sml
308504.61	6240429.72	29	Scrap Lge
308465.02	6240438.26	30	Scrap Sml
308464.20	6240434.99	31	Scrap Sml
308457.99	6240432.73	32	Scrap Dog Spike
308497.09	6240430.59	33	Scrap Lge LIS
308457.96	6240438.32	34	Scrap Sml
308458.21	6240440.90	35	Scrap Lge
308473.59	6240430.59	36	Scrap Sml
308517.84	6240434.21	37	Scrap Sml
308555.70	6240342.91	38	Scrap Sml
308501.52	6240344.27	49	Scrap Sml
308503.09	6240345.44	50	Scrap Sml
308531.28	6240342.99	53	Scrap Sml
308456.95	6240352.44	58	Scrap Sml
308483.41	6240354.93	59	Scrap Sml
308487.43	6240351.39	60	Scrap Lge
308490.14	6240353.68	61	Scrap Sml
308485.83	6240364.06	62	Scrap Sml
308489.92	6240364.27	63	Geo
308450.53	6240372.53	67	Geo
308529.89	6240355.73	68	Scrap Sml
308525.14	6240388.64	69	Geo
308483.16	6240398.67	70	Geo
308486.25	6240404.76	71	Gren Frag
308501.94	6240402.94	72	Gren Frag
308527.81	6240385.42	73	Scrap Sml

East	North	ID	Item
308480.39	6240371.03	74	Scrap Sml
308479.41	6240365.30	75	Scrap Sml
308469.17	6240378.29	76	Scrap Sml
308498.31	6240370.67	77	Scrap Lge LIS
308496.06	6240385.09	78	Gren Frag
308454.79	6240413.83	79	Geo
308528.37	6240426.70	80	Scrap Sml
308506.84	6240422.98	81	Scrap Sml
308480.52	6240398.06	82	Scrap Sml
308531.35	6240423.09	83	Scrap Dog Spike
308462.72	6240417.92	84	Scrap Sml
308461.35	6240436.85	85	Scrap Dog Spike
308499.42	6240434.96	86	Scrap Lge
308491.13	6240418.41	87	Scrap Sml
308455.39	6240436.37	88	Scrap Dog Spike
308508.88	6240427.63	89	Scrap Lge LIS
308532.11	6240413.70	90	Gren Frag
308498.91	6240441.65	91	Scrap Lge
308470.38	6240432.99	92	Scrap Dog Spike
308466.85	6240434.32	93	Scrap Dog Spike
308506.80	6240388.12	94	Gren Frag
308526.06	6240394.04	95	Geo
308517.47	6240396.96	96	Gren Frag
308518.10	6240388.47	97	Gren Frag
308534.42	6240439.30	98	Scrap Lge LIS
308472.10	6240439.74	99	Scrap Dog Spike
308464.56	6240439.65	100	Scrap Sml
308535.20	6240444.19	101	Scrap Sml
308505.20	6240443.87	102	Scrap Sml
308554.66	6240387.25	103	Scrap Sml
308560.34	6240407.86	104	Gren Frag
308565.44	6240424.74	105	Scrap Lge LIS
308553.74	6240435.40	106	Geo
308540.75	6240441.32	107	Geo
308495.47	6240444.98	108	Scrap Sml
308552.45	6240443.56	109	Scrap Sml
308563.47	6240435.08	110	Scrap Sml
308557.28	6240385.21	111	Ref 805
308557.94	6240433.72	112	Gren Frag
308563.98	6240440.90	113	Ref 811
308566.34	6240432.18	114	Scrap Lge LIS
308567.47	6240444.20	115	Scrap Lge LIS
308564.21	6240444.79	116	Scrap Sml
308566.54	6240434.48	117	Scrap Sml
308539.35	6240357.11	119	Scrap Sml
308539.22	6240361.63	120	Scrap Sml
308485.69	6240354.05	122	Scrap Sml
308557.41	6240364.03	123	Gren Frag
308546.38	6240349.34	125	Gren Frag
308489.09	6240351.03	127	Gren Frag

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct H

Investigations
 Sensor: TMF
 Sensor Height: 0.3m

File: H_Digs
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	Item
308376.54	6240372.21	208	Scrap Lge LIS
308381.67	6240403.25	210	Geo
308368.38	6240395.78	211	Milsearch Dig
308368.38	6240395.78	211	Pit -Id bt Millsearch
308353.22	6240422.59	212	Scrap Lge
308370.28	6240433.06	213	Scrap Lge
308411.52	6240425.93	214	Scrap Lge
308431.20	6240361.58	216	Scrap Lge LIS
308444.47	6240423.43	217	Scrap Lge
308447.06	6240434.10	218	Scrap Lge
308404.14	6240431.46	219	Scrap Lge
308428.34	6240435.00	220	Scrap Sml
308431.01	6240437.86	221	Scrap Lge
308437.83	6240419.69	222	Scrap Lge
308426.57	6240360.27	230	Scrap Sml
308429.61	6240359.69	231	Scrap Lge LIS
308363.36	6240407.81	232	Geo
308422.49	6240401.11	233	Geo
308433.26	6240427.86	234	Scrap Sml
308439.88	6240431.23	235	Geo
308387.82	6240432.61	236	Geo
308348.57	6240417.69	237	Scrap Lge
308404.26	6240441.24	238	Scrap Lge
308431.23	6240434.67	239	Scrap Lge LIS
308438.69	6240440.70	240	Scrap Lge
308442.39	6240434.20	241	Scrap Dog Spike
308383.03	6240405.50	242	Links to 210
308441.04	6240438.63	243	Scrap Sml
308450.86	6240440.71	244	Scrap Lge
308448.07	6240434.81	245	Scrap Sml
308423.01	6240368.35	246	Geo
308327.16	6240372.67	251	Geo
308335.17	6240377.31	257	Geo
308378.87	6240359.57	263	Geo
308349.23	6240366.00	264	Geo
308359.57	6240378.34	267	Geo
308345.34	6240390.05	268	Geo
308347.03	6240380.68	269	Geo
308396.80	6240413.09	270	Scrap Lge
308410.43	6240398.74	271	Scrap Sml
308412.67	6240431.33	272	Scrap Lge
308423.49	6240397.20	273	Geo
308426.27	6240405.16	274	Geo
308430.15	6240422.39	275	Scrap Dog Spike
308449.19	6240431.07	276	Scrap Dog Spike
308422.11	6240353.68	281	Scrap Lge
308340.66	6240373.87	282	Geo
308338.14	6240376.92	284	Geo
308356.93	6240376.48	286	Geo
308344.57	6240391.95	287	Geo

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct H

Investigations
 Sensor: TMF
 Sensor Height: 0.3m

File: H_Digs
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	Item
308354.51	6240384.11	288	Geo
308343.48	6240374.88	289	Scrap Sml
308369.64	6240418.47	290	Geo
308417.01	6240441.23	291	Scrap Sml
308380.45	6240424.39	292	UTL
308443.82	6240413.82	293	Geo
308447.47	6240443.12	294	Scrap Dog Spike
308370.33	6240421.22	295	Scrap Lge
308448.17	6240402.85	296	Scrap Lge
308452.64	6240431.52	297	Scrap Dog Spike
308427.17	6240420.90	298	Scrap Sml
308452.55	6240433.65	299	Scrap Dog Spike
308450.27	6240442.46	300	Scrap Dog Spike
308435.76	6240443.09	301	UTL
308449.73	6240438.79	302	Scrap Dog Spike
308444.73	6240442.65	303	Geo
308440.70	6240433.66	304	UTL
308439.57	6240378.94	305	Scrap Lge LIS
308352.17	6240373.26	312	Geo
308388.60	6240361.27	320	Scrap Sml
308364.55	6240374.50	321	Geo
308395.79	6240356.94	322	Scrap Sml
308404.96	6240360.73	323	Scrap Lge LIS
308435.24	6240360.26	324	Ref 719
308408.47	6240361.22	325	Geo
308431.48	6240398.45	326	Geo
308421.19	6240438.27	327	Scrap Lge
308444.21	6240437.56	328	Scrap Dog Spike
308442.35	6240444.71	329	Geo
308444.54	6240431.06	330	Scrap Dog Spike
308432.08	6240439.09	331	Geo
308451.10	6240433.42	332	Scrap Sml
308566.85	6240436.53	350	Scrap Sml
308518.08	6240442.01	351	Scrap Dog Spike
308567.14	6240438.78	351	Scrap Lge
308536.57	6240438.58	352	Scrap Sml
308540.63	6240443.14	353	Scrap Sml
308535.44	6240430.16	354	Scrap Sml
308527.59	6240442.10	355	UTL
308525.58	6240442.20	356	Scrap Sml
308521.36	6240435.88	357	Scrap Dog Spike
308519.60	6240431.32	358	Scrap Dog Spike
308509.26	6240430.98	359	Scrap Dog Spike
308513.08	6240442.84	360	Scrap Dog Spike
308497.11	6240435.68	362	Scrap Dog Spike
308493.92	6240434.90	363	Scrap Dog Spike
308492.45	6240419.27	364	Scrap Sml
308496.34	6240439.90	365	Scrap Dog Spike
308497.74	6240442.64	366	Geo
308500.88	6240442.79	367	Geo

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct H

Investigations

Sensor: TMF
 Sensor Height: 0.3m

File: H_Digs
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	Item
308484.59	6240430.06	368	Scrap Dog Spike
308484.69	6240433.24	369	Scrap Dog Spike
308473.81	6240442.06	370	Scrap Sml
308464.60	6240441.08	371	Scrap Dog Spike
308455.63	6240440.40	372	Scrap Lge
308470.87	6240436.28	373	Scrap Sml
308470.33	6240439.22	374	Scrap Sml
308479.30	6240436.53	375	Scrap Dog Spike
308486.40	6240424.91	376	Scrap Dog Spike
308489.39	6240422.41	377	Geo
308489.29	6240420.99	378	Geo
308482.19	6240403.96	379	Scrap Sml
308480.04	6240363.51	385	Geo
308483.62	6240360.52	386	Geo
308484.94	6240362.09	387	Scrap Sml
308487.39	6240372.38	388	Scrap Sml
308483.57	6240377.92	389	Scrap Lge
308484.26	6240382.18	390	Scrap Sml
308481.37	6240380.76	391	Milsearch Dig
308481.37	6240380.78	391	Pit - ID by Millsearch
308454.33	6240382.93	392	Geo
308472.02	6240381.26	393	Pit - ID by Millsearch
308472.02	6240381.26	393	Milsearch Dig
308471.73	6240379.15	394	Milsearch Dig
308471.73	6240379.15	394	Pit - ID by Millsearch
308471.68	6240378.12	395	Milsearch Dig
308471.68	6240378.12	395	Pit - ID by Millsearch
308467.88	6240349.09	396	Scrap Sml
308433.24	6240361.57	451	Geo
308347.69	6240377.22	452	Geo
308353.67	6240375.75	453	Scrap Sml
308345.68	6240384.81	454	Geo
308446.57	6240439.80	455	Scrap Sml
308429.23	6240436.32	456	Scrap Dog Spike
308463.44	6240430.99	501	Scrap Sml
308467.35	6240439.17	502	Scrap Lge
308469.93	6240437.66	503	Scrap Sml
308472.15	6240443.26	504	Scrap Sml
308483.70	6240444.41	505	Geo
308492.05	6240420.78	506	Scrap Sml
308499.16	6240427.62	507	Scrap Dog Spike
308510.44	6240443.17	508	Scrap Sml
308514.00	6240446.81	509	Scrap Sml
308513.82	6240443.97	510	Scrap Sml
308514.17	6240433.22	511	Scrap Lge
308517.11	6240429.22	512	Scrap Sml
308523.68	6240433.93	513	Scrap Sml
308532.92	6240436.77	514	Scrap Sml
308527.95	6240444.85	515	Scrap Dog Spike
308532.03	6240427.71	516	Geo

G-tek Australia Pty. Limited
Site: Moorebank
Area: Precinct H

Investigations
Sensor: TMF
Sensor Height: 0.3m

File: H_Digs
Geo: Paul O'Donnell
Process: Oasis Montage

East	North	ID	Item
308457.40	6240403.98	517	Geo
308547.38	6240426.62	518	Scrap Lge
308546.76	6240422.89	519	Scrap Dog Spike
308549.69	6240424.40	520	Scrap Sml
308557.24	6240427.95	521	Scrap Dog Spike
308543.14	6240372.80	522	Scrap Sml
308539.41	6240371.12	523	Scrap Sml
308485.16	6240366.68	524	Geo
308477.97	6240357.62	525	Geo
308347.00	6240374.27	534	Scrap Sml
308357.42	6240428.46	535	UTL
308394.37	6240431.76	536	UTL
308445.49	6240385.69	537	Geo
308393.50	6240423.99	538	UTL
308433.64	6240431.03	539	Scrap Sml
308447.83	6240428.61	540	Scrap Dog Spike
308441.16	6240353.53	541	Scrap Sml

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct H

Investigations

Sensor: TMF
 Sensor Height: 0.6m

File: H_INT_QC
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	Item
308350.41	6240418.36	701	Scrap Sml
308342.39	6240373.80	702	Scrap Sml
308339.33	6240360.61	703	Scrap Lge
308339.31	6240361.76	704	Scrap Lge
308339.10	6240357.93	705	Links to 227
308369.17	6240331.97	706	Geo
308341.80	6240378.79	707	Geo
308340.97	6240374.65	708	Geo
308337.54	6240359.24	709	Scrap Sml
308341.76	6240376.86	710	Geo
308367.32	6240334.14	711	Geo
308368.11	6240349.48	712	Geo
308368.63	6240353.73	713	Geo
308371.52	6240393.71	714	UTL
308372.57	6240418.42	715	Geo
308396.46	6240341.53	717	Geo
308434.48	6240344.11	718	Scrap Sml
308434.83	6240359.53	719	Scrap Sml
308437.70	6240430.76	721	Scrap Sml
308437.14	6240425.03	722	Geo
308437.17	6240431.64	723	Scrap Sml
308437.56	6240435.18	724	Geo
308438.21	6240429.43	725	Geo
308437.24	6240436.48	726	Geo
308438.04	6240427.27	727	Geo
308437.46	6240439.34	728	Scrap Lge
308438.33	6240437.18	729	Geo
308438.08	6240433.21	730	Geo
308437.19	6240433.44	731	Geo
308437.91	6240425.79	732	Geo
308436.70	6240409.50	733	Geo
308474.78	6240437.70	734	Scrap Sml
308473.81	6240437.94	735	Scrap Dog Spike
308472.38	6240440.00	736	Scrap Dog Spike
308473.84	6240431.16	737	Scrap Lge
308473.96	6240434.74	738	Scrap Sml
308473.81	6240436.84	739	Scrap Sml
308474.62	6240424.80	740	Geo
308474.70	6240425.48	741	Geo
308473.82	6240425.28	742	Geo
308474.60	6240426.82	743	Geo
308473.68	6240429.03	744	Geo
308504.90	6240431.04	745	Scrap Sml
308473.42	6240433.11	746	Scrap Sml
308473.42	6240418.73	747	Geo
308474.29	6240423.75	748	Geo
308470.33	6240385.46	749	Geo
308470.34	6240382.00	750	Geo
308469.97	6240376.04	751	Geo
308469.16	6240378.20	752	Scrap Sml

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct H

Investigations

Sensor: TMF
 Sensor Height: 0.6m

File: H_INT_QC
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	Item
308468.94	6240374.75	753	Geo
308465.81	6240356.13	754	Geo
308465.31	6240349.76	755	Geo
308494.94	6240345.59	756	Scrap Lge LIS
308498.13	6240371.03	757	Links to 77
308498.66	6240380.59	758	Scrap Sml
308499.70	6240375.65	759	Scrap Sml
308499.66	6240387.74	760	Geo
308501.96	6240403.14	761	Scrap Sml
308502.77	6240413.47	762	Gren Frag
308502.87	6240417.15	763	Gren Frag
308503.78	6240424.89	764	Scrap Sml
308504.37	6240428.51	765	Scrap Sml
308505.03	6240431.63	766	Scrap Sml
308503.79	6240420.71	767	Gren Frag
308503.28	6240418.37	768	Scrap Sml
308505.37	6240433.07	769	Scrap Sml
308505.28	6240437.99	770	Scrap Sml
308505.66	6240436.47	771	Scrap Sml
308505.85	6240441.68	772	Scrap Sml
308506.06	6240445.69	773	Scrap Sml
308506.57	6240442.69	774	Scrap Sml
308537.85	6240441.03	775	Geo
308537.59	6240433.86	776	Geo
308539.44	6240444.07	777	Geo
308537.43	6240437.82	778	Scrap Dog Spike
308536.50	6240431.14	779	Scrap Sml
308537.16	6240428.22	780	Scrap Sml
308535.88	6240421.18	781	Gren Frag
308537.36	6240434.84	782	Geo
308533.58	6240399.65	783	Geo
308525.12	6240360.53	784	Geo
308525.31	6240340.03	785	Gren Frag
308523.76	6240318.79	786	Geo
308522.70	6240313.63	787	Scrap Sml
308521.16	6240306.17	788	Scrap Sml
308522.75	6240311.22	789	Gren Frag
308543.15	6240301.46	790	Scrap Sml
308543.48	6240303.73	791	Scrap Sml
308544.51	6240308.29	792	Scrap Sml
308543.49	6240311.74	793	Scrap LIS
308544.66	6240315.18	794	Scrap Sml
308544.20	6240310.08	795	Scrap Sml
308544.37	6240317.97	796	Gren Frag
308547.55	6240336.80	797	Geo
308548.28	6240338.41	798	Geo
308546.95	6240334.08	799	Geo
308550.33	6240349.05	800	Scrap Sml
308556.15	6240374.98	801	Scrap Sml
308556.02	6240383.57	802	Geo

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct H

Investigations

Sensor: TMF
 Sensor Height: 0.6m

File: H_INT_QC
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	Item
308557.30	6240385.95	803	Scrap Sml
308556.96	6240392.36	804	Geo + Saa Projs
308560.32	6240408.67	805	Gren Frag
308559.74	6240407.36	806	Scrap Sml
308562.58	6240432.99	807	Geo
308563.42	6240435.82	808	Ref 810
308563.12	6240435.22	809	Gren Frag
308563.46	6240440.53	810	Ref 811
308564.40	6240441.64	811	Scrap Lge
308563.97	6240439.47	812	Scrap Sml
308562.60	6240434.11	813	Geo
308561.82	6240426.73	815	Gren Frag
308560.40	6240413.81	816	Scrap Sml
308560.06	6240412.19	817	Gren Frag
308555.98	6240377.11	818	Geo
308555.21	6240372.54	819	Gren Frag
308334.47	6240344.64	820	Geo
308337.04	6240355.63	821	Geo
308340.80	6240377.02	822	Geo
308343.94	6240393.70	823	Geo
308345.14	6240392.21	824	Geo
308371.37	6240399.53	825	Geo
308368.95	6240367.09	826	Geo
308368.14	6240350.05	827	Geo
308368.03	6240347.98	828	Geo
308401.47	6240402.66	829	Geo
308437.85	6240428.77	830	Geo
308437.30	6240422.60	831	Scrap Sml
308461.75	6240320.43	832	Scrap Sml
308465.28	6240355.12	833	Scrap Sml
308504.01	6240426.12	834	Scrap Lge
308504.40	6240419.00	835	Scrap Sml
308495.76	6240357.58	836	Gren Frag
308492.34	6240310.11	837	Geo
308523.20	6240315.87	838	Geo
308522.65	6240314.43	839	Scrap Sml
308536.29	6240419.86	840	Geo
308535.75	6240416.62	841	Geo
308536.55	6240425.30	842	Scrap Sml
308538.46	6240437.74	843	Geo
308560.94	6240418.25	844	Gren Frag
308558.00	6240400.82	845	Gren Frag
308545.56	6240319.78	846	UTL
308544.26	6240316.55	847	Scrap Sml
308543.24	6240306.87	848	Scrap Sml
308544.53	6240313.72	849	Scrap Sml

G-tek Australia Pty. Limited
Site: Moorebank
Area: Precinct H

QC Investigations

Sensor: TMF
Sensor Height: 0.3m

File: H_QC
Geo: Paul O'Donnell
Process: Oasis Montage

East	North	ID	Item
308474.02	6240377.24	13	Scrap Lge LIS
308501.52	6240344.27	49	Checked Nil Found/Old Dig
308472.10	6240439.74	99	Checked Nil Found/Old Dig
308485.69	6240354.05	122	Surface Scrap Old Dig
308441.04	6240438.63	243	Scrap Dog Spike
308410.43	6240398.74	271	Checked Nil Found/Old Dig
308426.27	6240405.16	274	Checked Nil Found/Old Dig
308448.17	6240402.85	296	Checked Nil Found/Nil Dig
308440.70	6240433.66	304	Checked Nil Found/Nil Dig
308421.19	6240438.27	327	Checked Nil Found/Old Dig
308499.16	6240427.62	507	Checked Nil Found/Old Dig
308347.00	6240374.27	534	Checked Nil Found/Old Dig
308350.41	6240418.36	701	Checked Nil Found/Old Dig
308437.17	6240431.64	723	Checked Nil Found/Old Dig
308474.70	6240425.48	741	Checked -Geo
308499.70	6240375.65	759	Checked Nil Found/Nil Dig
308502.77	6240413.47	762	Checked Nil Found/Old Dig
308505.03	6240431.63	766	Checked Nil Found/Old Dig
308506.06	6240445.69	773	Checked Nil Found/Old Dig
308437.30	6240422.60	831	Checked Nil Found/Old Dig



POST ACTIVITY REPORT

Hazard Reduction Precinct I, Moorebank Defence Land MOOREBANK, NSW

G-tek Australia Pty Limited
[ABN 47 099 519 034]

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Project Reference: URSA03099

Issued by: Sydney Office

POST ACTIVITY REPORT
Hazard Reduction, Precinct I
Moorebank Defence Land
MOOREBANK, NSW

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Prepared by:


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Date:

27/10/03.

Reviewed by:


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Date:

27 Oct 03

DOCUMENTATION CONTROL	
Copy Number	Issued To
1	Department of Defence
2	Department of Defence
3	Department of Defence
4	Department of Defence
5	G-tek Australia Pty Limited

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Appendices

- A. Site Map – Precinct I
- B. Record of Investigations – Precinct I
- C. Site Map – Additional Area

The following **Definitions** apply within this report:

Ammunition: A device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in connection with defence or offence including demolitions. Certain ammunition can be used for training, ceremonial or other non-operational purposes.

Ammunition Produce: Non-explosive stores and components used in the assembly or the initiation of ammunition.

Explosive Ordnance (EO): All munitions containing explosives, nuclear fission or fusion materials and biological and chemical agents. This includes bombs and warheads; guided and ballistic missiles; artillery, mortar, rocket and small arms ammunition; all mines, torpedoes and depth charges; pyrotechnics; clusters and dispensers; cartridge and propellant actuated devices; electro-explosive devices; clandestine and improvised explosive devices; and all similar or related items or components explosive in nature

Explosive Ordnance Waste (EOW): Inert material remnant from the initiation or functioning of explosive ordnance.

Fragmentation: Metallic fragments of the fractured casing of EO resultant from the initiation of high explosive filling and often projected at high velocities over considerable distances from the point of initiation.

Hazard Reduction Operation (HRO): An operation designed to reduce the EO hazard within the boundaries of an affected area.

Intrusive Sampling: In the context of this Request For Tender, intrusive sampling is taken to mean the excavation and identification of a representative sample of anomalies detected during the initial electronic investigation of the area. The purpose of intrusive sampling is to verify the accuracy of the interpretation of the anomalies located during the initial electronic investigation.

Materials of Military Origin (MOMO): Items of military nature, specifically components of munitions including rounds and spent cartridges of small arms ammunition, safety levers and other devices.
Note: Term not included in IMAS

Military Produce: Any item identified as military in origin that is not ammunition-related.

Munitions: A complete device charged with explosives, propellants, pyrotechnics, initiating composition, or nuclear, biological or chemical material for use in military operations, including demolitions.
Note: In common usage, "munitions" (plural) can be military weapons, ammunition and equipment.

Small Arms: All arms, including automatic weapons of less than 20 mm in calibre and all gauges of shotguns.

Small Arms Ammunition (SAA): Ammunition for small arms, ie all ammunition of less than 20 mm in calibre, and all gauges of shotgun cartridges.

Small Arms Ammunition Waste (SAAW): Inert material remnant from the transport, packaging, preparation, and use of SAA.

Unexploded Ordnance (UXO): Explosive ordnance that has been primed, fused, armed or otherwise prepared for action and which has been fired, dropped, launched, projected or placed in such a manner as to constitute a hazard to operations, installations, personnel or material but remains unexploded either by malfunction or design or for any cause. UXO includes items of military ammunition or explosives removed from their original resting-place for any reason, including souveniring by members of the public.

Total Magnetic Intensity (TMI): The earth's naturally occurring total magnetic field intensity as measured by a magnetometer (on this site the TM4).

Collectively EO, munitions, UXO and MOMO are defined as "**Defence Contamination**".

1.0 INTRODUCTION

1.1 General

As part of general contamination studies within Defence property at Moorebank, NSW, the Department of Defence had a hazard assessment carried out over Precinct I within the Moorebank Defence Land. This assessment identified an area within which hand grenade fragmentation and components were located.. Research indicated that soil was imported to this site to assist with training on earth moving equipment. G-tek Australia Pty Limited (G-tek) was contracted to locate any complete grenades which may remain on the site.

1.2 Authority to Undertake Task

G-tek undertook to carry out the work under the contract: PNI.THS.1296-3606, Tender PDTF 02/03

1.3 Aim of the Project

G-tek Australia Pty Limited (G-tek) was contracted to locate any complete grenades which may remain on the site.

1.4 Nature of Report

This report details the conduct of the investigation, the methodologies used and the results obtained.

1.5 Dates of Conduct

Data collection within the site was conducted between 10th September 2003 and 15th September 2003 and Anomaly Investigation was carried out between 27th September and 30th September. QA of Anomaly investigations were carried out on 1st October 2003.

1.6 Previous Investigations of the Site

G-tek Pty Limited has conducted no previous investigations over this site.

2.0 CONTRACTING FIRM

The firm contracted to conduct this investigation was G-tek Australia Pty Limited (ABN 47 099 519 034). G-tek Australia is a Contractor Member of the Defence Unexploded Ordnance Panel (DUXOP).

2.1 G-tek Staff

The primary G-tek staff involved with the conduct of this investigation were:

Project Director	Greg Guthrie
Project Manager	Paul O'Donnell
Ammunition Technician	Anthony McCreadie
Geophysical QC	Mark Donaldson
Field Assistant	Dean Guthrie

3.0 SITE CHARACTERISTICS

Precinct I is located East of Moorebank Rd and South of Defence National Storage Distribution Centre (DNSDC), Moorebank, NSW.

The investigation area is an area of some 1.14 Ha in the southeast corner of Precinct I.

The Site is geologically mapped, (NSW Department of Minerals and Energy, Penrith Geological Series Sheet 9030 (Edition 1) 1991) and is determined as being underlain by Tertiary fluvial clayey quartzose, sand and clay. The depth of these fluvial sediments is not known but the sediments are likely to be underlain by Ashfield Shale and possibly Hawkesbury Sandstone.

The Site is generally flat with relative ground levels across the Site at approximately 12 m (AHD).

Based on the geology of the Site and water ingress into some of the deeper investigations it is expected that groundwater will be present as a shallow aquifer(s).

4.0 SITE HISTORY

The Site has hosted military activity since early in the 20th century. Activities within Precinct I have included general materiel storage. There is no history of ammunition or explosives storage or use within this Precinct.

During 2002 Milsearch Pty Limited conducted an assessment of this site and found hand grenade fragmentation scattered across the site. During this assessment 1 large Geophysical anomaly was investigated. They concluded that the soil containing this remnant material had been imported from a former hand grenade range outside the Precinct and had been used as fill and for the training of plant operators. The material located included base plugs and other components from Grenade, Hand, Fragmentation, No 36M, the standard issue hand grenade within the Australian Army between the 1930's and the late 1950's. The soil was considered to have the potential to contain complete, unexploded hand grenades.



The Grenade, Hand, Fragmentation, No 36M has a lemon-shaped cast-iron body filled with high explosive. The body is serrated and relatively thick to give good fragmentation. When new, the body has a shine from being coated in protective varnish and is coded with a green band around the centre and a red band or red crosses around the top. Length is 100mm (4in), Diameter 60mm (2.4in) and Weight approximately 790gm (1lb 11^{1/4} oz).

5.0 METHODOLOGY EMPLOYED

5.1 Induction/Training

Prior to access to the site, project personnel were fully inducted to the G-tek Safety and Emergency Response Plan and the G-tek Environmental Management Plan, which mirrored the relevant aspects of the URS Land access protocol.

5.2 Data Collection, Processing and Interpretation

A Total Magnetic Intensity survey was carried out over the site; Data was collected at 0.1second intervals along traverses spaced 0.375m apart. Data was processed and grided at 0.1m cell size and interpreted to identify all items of potentially grenade size or larger.

Each interpretation was given a unique identification number and copied to a Microsoft Excel based spreadsheet.

5.3 Investigation of Interpretations

Items selected for investigation were output as investigation sheets and passed to an Ammunition Technical team for intrusive investigation. This investigation generally followed the following sequence:

- Using GPS equipment the position recorded for investigation was relocated on the ground and marked with a flag indicating the interpretation number.
- The flagged location was then searched with a combination of analogue Magnetometer (Ferex 4.021) and EM detector (Minelab) for an area of at least 1 metre around the flag to confirm the presence of the source of the anomaly interpreted for investigation and the point of strongest source signal.
- The location of the strongest signal was then manually investigated and the signal source located. The source was then positively identified and, if possible, removed from the area. The area was then again checked with the analogue search equipment, and the process repeated until the source was fully identified as a pit, or no further aural cue was received.
- On completion of the positive identification process, the investigation results were recorded and completed sheets passed back to the Processing Geophysicist.

One anomalous area showed a clearly delineated high magnetic signal. The significant anomalies were investigated here in accordance with the standard process. The source of the magnetic signal was found to be highly mineralised stones in what appeared to be imported soil. After the investigation of interpreted anomalies, this area was rechecked by applying a 100% analogue Minelab F1A4 survey. The Minelab F1A4 is an electromagnetic based system not affected by mineralised soils.

5.4 QC - Tests Performed

Prior to use each piece of analogue relocation equipment was subjected to manufacturer's performance test to ensure that each was operational. Alternate equipments were available if required, and the G-tek maintenance facility in Armidale, NSW, was prepared for fast response replacement or repair of equipment from this project.

Digital equipment was tested and calibrated prior to the conduct of data collection, by conducting multiple passes across an inert Grenade, No 36M body within a clear area of the site. All equipment performed as expected and no repair or replacement was required during the project.

5.5 QA – Checks

An additional 5% digital data collection was carried out on the site and this data was forwarded to another geophysicist for processing and interpretation, independent of the primary data collection and processing activity. . The resultant interpretations were added to the primary interpretations spreadsheet and investigated with the other investigations.

The Project Manager conducted a review of all processes and activities within the site, and selected 5% of the investigated anomalies to reinvestigate to ensure that they agreed with the recorded find. The Project Manager is satisfied that all processes and methodologies, as defined in G-tek's standard operating procedures and as applied on G-tek's previous task on this site, were accurately and correctly applied within this task.

6.0 RESULTS OF THE INVESTIGATION

132 magnetometer anomalies were interpreted and investigated from the full data set. A further 37 magnetometer anomalies were interpreted and investigated from the QC data set and 10 interpretations/investigation were rechecked during the investigation QC.

As a result of the investigations conducted:

- 24 items of the size of a grenade were located.
- No grenades or any items that could be perceived as hazardous were located.

A complete list on interpretations selected for investigation, investigation results and incidental finds is included at Appendix B.

7.0 ADDITIONAL AREA

In addition to the works conducted in Precinct I, G-tek was requested to conduct a digital imaging survey and investigation over a 0.6 ha triangular shaped area in the northwest portion of Precinct A as part of ongoing environmental works.

A Total Magnetic Intensity survey was carried out over the site; Data was collected at 0.1second intervals along traverses spaced 1.0m apart. Data was processed, grided and interpreted to identify all items of potentially 20 litre drum size or larger.

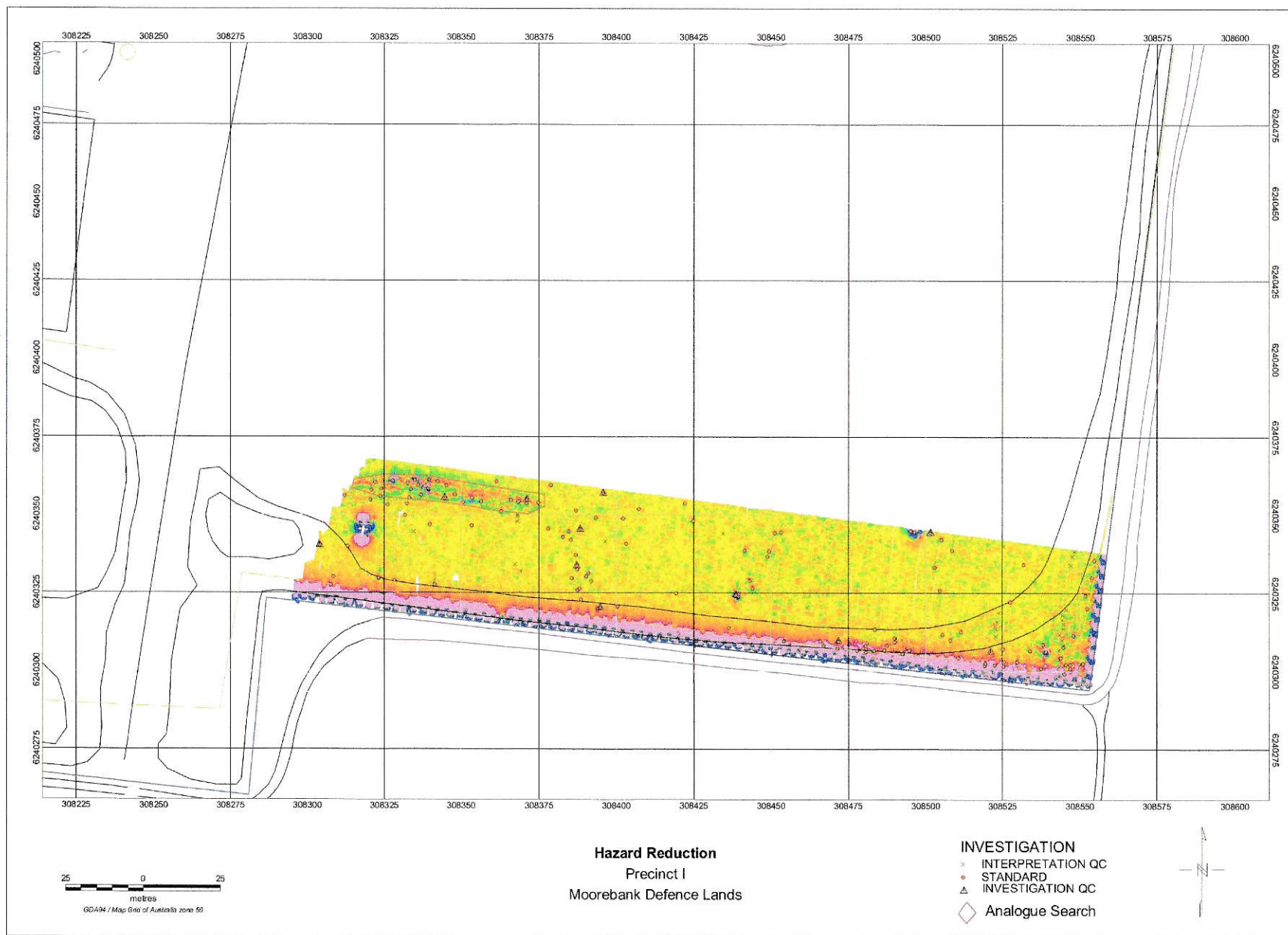
On investigation, the majority of items interpreted were metallic surface debris or identifiable infrastructure items. One exception occurred at the western edge of the site where a deep magnetic anomaly was interpreted.

Following discussions with the Client, it was decided that G-tek should have the area investigated as a potentially contaminated area. Morris Services Pty Ltd was selected as a competent service provider for the task, and with G-tek and URS staff present, the area was opened by backhoe and investigated.

Residual scrap metal was found, and the area characterised as a tip/fill area along a former minor re-entrant line.

A map of the investigated area is included at Appendix C.

APPENDIX A
Site Map – Precinct I



APPENDIX B

Record of Investigations – Precinct I

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct I

Investigations

Sensor: TMF
 Sensor Height: 0.3m

File: idigs.xls
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	ITEM
308504.53	6240325.84	2.00	Scrap Sml
308439.45	6240323.92	4.00	Scrap Lge LIS
308495.19	6240344.97	6.00	Scrap Lge LIS
308483.33	6240306.59	7.00	Geo
308496.32	6240344.61	8.00	Scrap Lge LIS
308529.66	6240303.09	9.00	Scrap Dog Spike
308547.92	6240311.55	39.00	Scrap Lge
308539.05	6240306.36	40.00	Scrap Sml
308483.61	6240313.42	41.00	Geo
308443.09	6240328.98	42.00	Scrap Lge
308443.96	6240326.47	43.00	Scrap Lge
308487.46	6240308.28	44.00	Geo
308507.93	6240309.96	45.00	Scrap Lge
308502.90	6240333.32	46.00	Gren Frag
308508.55	6240338.78	47.00	Scrap Sml
308505.09	6240342.13	48.00	Scrap Sml
308501.52	6240344.27	49.00	Scrap Sml
308527.46	6240322.20	51.00	Gren Frag
308489.93	6240310.65	52.00	Scrap Sml
308525.15	6240307.23	54.00	Scrap Sml
308533.92	6240306.64	55.00	Scrap Lge
308453.25	6240344.51	56.00	Scrap Lge
308451.27	6240344.26	57.00	Scrap Lge
308441.47	6240338.65	64.00	Scrap Sml
308449.43	6240338.40	65.00	Geo
308448.89	6240336.76	66.00	Geo
308554.64	6240335.58	118.00	Scrap Lge
308551.77	6240324.29	121.00	Scrap Sml
308544.70	6240307.78	124.00	Gren Frag
308545.41	6240302.22	126.00	Scrap Sml
308323.16	6240329.76	201.00	Scrap Lge LIS
308341.44	6240327.61	202.00	Scrap Lge
308303.90	6240340.34	203.00	Scrap Lge
308327.80	6240360.94	204.00	Scrap Lge
308333.58	6240358.19	205.00	Scrap Lge
308336.09	6240359.59	206.00	Scrap Sml
308334.89	6240361.10	207.00	Scrap Lge
308339.37	6240358.20	209.00	Scrap Lge
308438.59	6240324.40	215.00	Scrap Lge LIS
308332.63	6240360.03	223.00	Scrap Sml
308320.54	6240354.80	224.00	Scrap Lge
308339.65	6240361.26	225.00	Scrap Lge
308362.88	6240351.10	226.00	Geo
308339.38	6240358.25	227.00	Scrap Lge
308424.76	6240348.12	228.00	Scrap Sml
308368.44	6240354.23	229.00	Geo
308386.86	6240337.18	247.00	Scrap Sml
308347.98	6240356.45	248.00	Geo
308339.81	6240346.92	249.00	Scrap Sml
308342.41	6240360.67	250.00	Scrap Sml

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct I

Investigations

Sensor: TMF
 Sensor Height: 0.3m

File: idigs.xls
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	ITEM
308333.13	6240355.45	252.00	Scrap Sml
308311.94	6240356.16	253.00	Geo
308322.00	6240360.44	254.00	Scrap Lge
308328.32	6240329.14	255.00	Scrap Sml
308374.79	6240353.90	256.00	Geo
308326.05	6240353.24	258.00	Scrap Lge
308390.98	6240331.34	259.00	Scrap Sml
308390.16	6240330.34	260.00	Scrap Sml
308391.95	6240328.78	261.00	Scrap Sml
308393.38	6240349.09	262.00	Scrap Sml
308378.87	6240359.57	263.00	Geo
308353.46	6240355.45	265.00	Scrap Sml
308371.13	6240354.85	266.00	Geo
308371.04	6240353.84	277.00	Geo
308403.16	6240340.81	278.00	UTL
308387.33	6240332.59	279.00	Geo
308385.56	6240329.74	280.00	Scrap Sml
308422.11	6240353.68	281.00	Scrap Lge
308336.92	6240356.34	283	Geo
308387.16	6240333.78	285	Geo
308366.05	6240354.77	306	Geo
308407.39	6240351.97	307.00	Scrap Lge LIS
308387.39	6240325.85	308.00	Geo
308388.12	6240326.43	309.00	Geo
308384.59	6240344.76	310.00	Geo
308382.71	6240342.92	311	Geo
308313.03	6240339.99	313	Geo
308378.00	6240345.57	314.00	Geo
308388.33	6240345.43	315.00	Geo
308402.23	6240348.90	316.00	Scrap Lge
308400.41	6240320.63	317.00	Scrap Sml
308386.92	6240351.44	318	Scrap Sml
308361.37	6240360.62	319.00	Geo
308395.79	6240356.94	322.00	Scrap Sml
308531.89	6240334.27	397.00	Scrap Sml
308553.90	6240330.10	398.00	Scrap Sml
308552.26	6240320.15	399.00	Scrap Sml
308538.10	6240308.64	400.00	Scrap Sml
308544.96	6240299.23	401.00	Scrap Sml
308546.77	6240300.90	402	Scrap Lge
308546.82	6240302.17	403.00	Scrap Sml
308543.83	6240304.42	404.00	Scrap Sml
308550.94	6240302.51	406.00	Scrap Sml
308537.42	6240300.95	407.00	Scrap Sml
308525.31	6240301.68	408.00	Scrap Sml
308525.51	6240303.13	409.00	Scrap Sml
308522.42	6240302.07	410.00	Scrap Sml
308519.24	6240301.88	411.00	Scrap Lge
308519.43	6240302.61	412	Scrap Sml
308510.60	6240304.35	413	Scrap Sml

G-tek Australia Pty. Limited
 Site: Moorebank
 Area: Precinct I

Investigations

Sensor: TMF
 Sensor Height: 0.3m

File: idigs.xls
 Geo: Paul O'Donnell
 Process: Oasis Montage

East	North	ID	ITEM
308494.72	6240306.60	414	Scrap Sml
308492.57	6240305.62	415.00	Geo
308486.64	6240306.75	416	Scrap Sml
308490.02	6240309.39	417.00	Scrap Sml
308480.95	6240309.00	418.00	Geo
308480.61	6240308.17	419.00	Geo
308480.66	6240306.16	420	Geo
308477.82	6240306.85	421.00	Geo
308471.50	6240307.34	422	Geo
308467.09	6240308.22	423.00	Geo
308466.01	6240309.64	424.00	Geo
308454.11	6240309.68	425.00	Geo
308307.47	6240327.50	426.00	Geo
308308.35	6240330.19	427.00	Geo
308320.85	6240357.92	428.00	Geo
308323.74	6240355.96	430.00	Geo
308324.04	6240358.31	431.00	Geo
308332.32	6240353.56	439	Geo
308350.61	6240353.96	440.00	Geo
308353.36	6240346.57	450.00	Geo
308505.39	6240311.70	526.00	Gren Frag
308511.45	6240312.65	527.00	Geo
308471.82	6240309.63	528.00	Scrap Sml
308331.72	6240349.86	529.00	UTL Under Tree
308385.27	6240342.05	530.00	Geo
308356.46	6240354.25	531.00	Scrap Sml
308344.69	6240355.35	532.00	Geo
308345.24	6240359.42	533.00	Geo
308419.27	6240324.94	542.00	UTL
308436.31	6240313.85	543.00	Geo
308394.85	6240320.34	544.00	Geo
308388.58	6240322.87	545.00	Geo

G-tek Australia Pty. Limited
Site: Moorebank
Area: Precinct I

QC Investigations

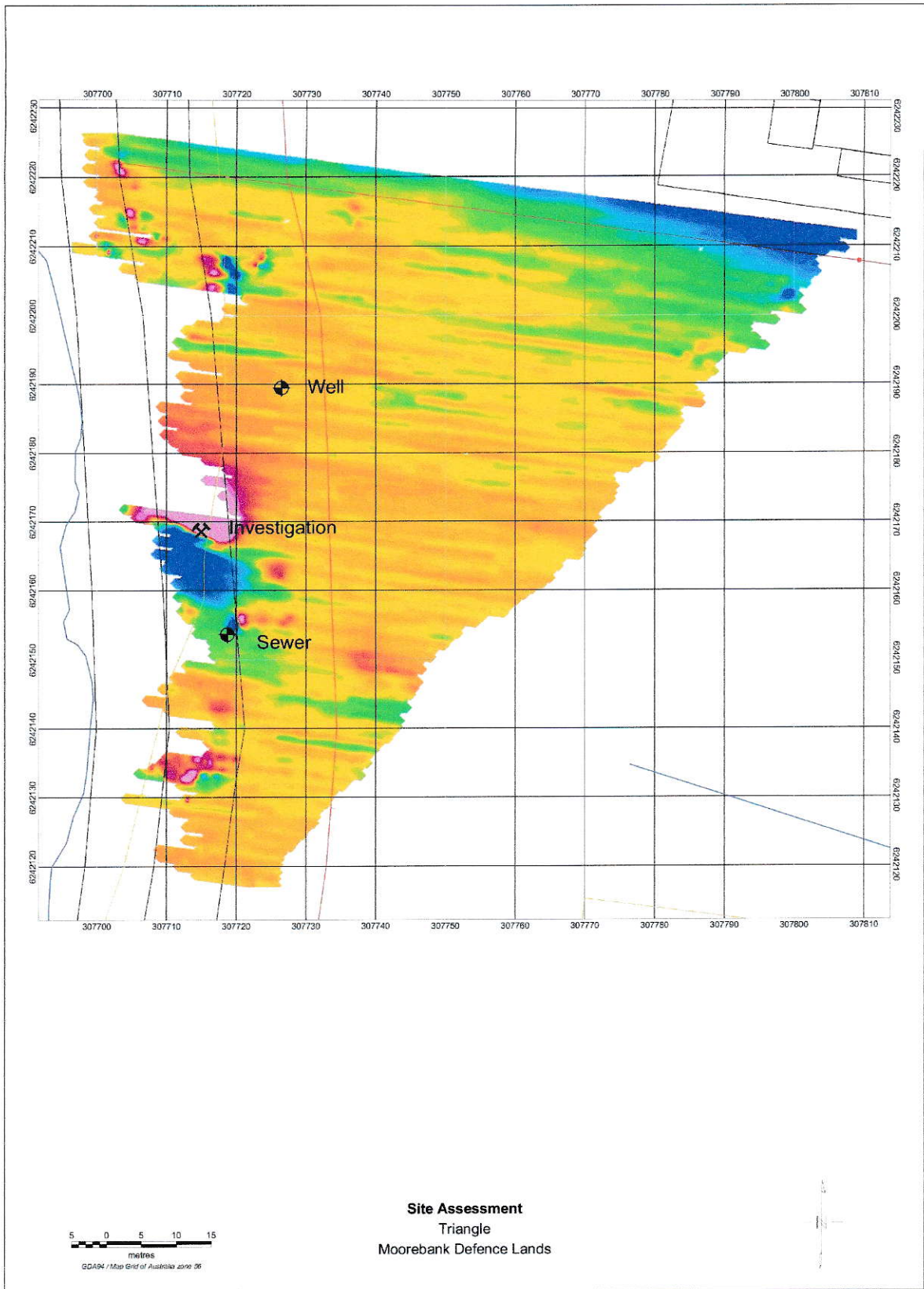
Sensor: TMF
Sensor Height: 0.3m

File: I_QC
Geo: Paul O'Donnell
Process: Oasis Montage

East	North	ID	Item
308303.90	6240340.34	203	Checked Nil Found/Old Dig
308438.59	6240324.40	215	Scrap Lge LIS
308371.13	6240354.85	266	Checked Nil Found/Old Dig
308387.16	6240333.78	285	Nail / Nil Dig
308388.33	6240345.43	315	Checked Nil Found/Old Dig
308395.79	6240356.94	322	Checked Nil Found/Old Dig
308471.82	6240309.63	528	Checked -Geo
308344.69	6240355.35	532	Checked Nil Found/Old Dig
308394.85	6240320.34	544	Checked -Geo
308521.16	6240306.17	788	Checked Nil Found/Old Dig

APPENDIX C

Site Map – Additional Area



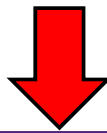
Appendix D

UFP FLOW CHARTS

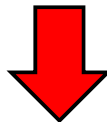
Potential Site Hazards



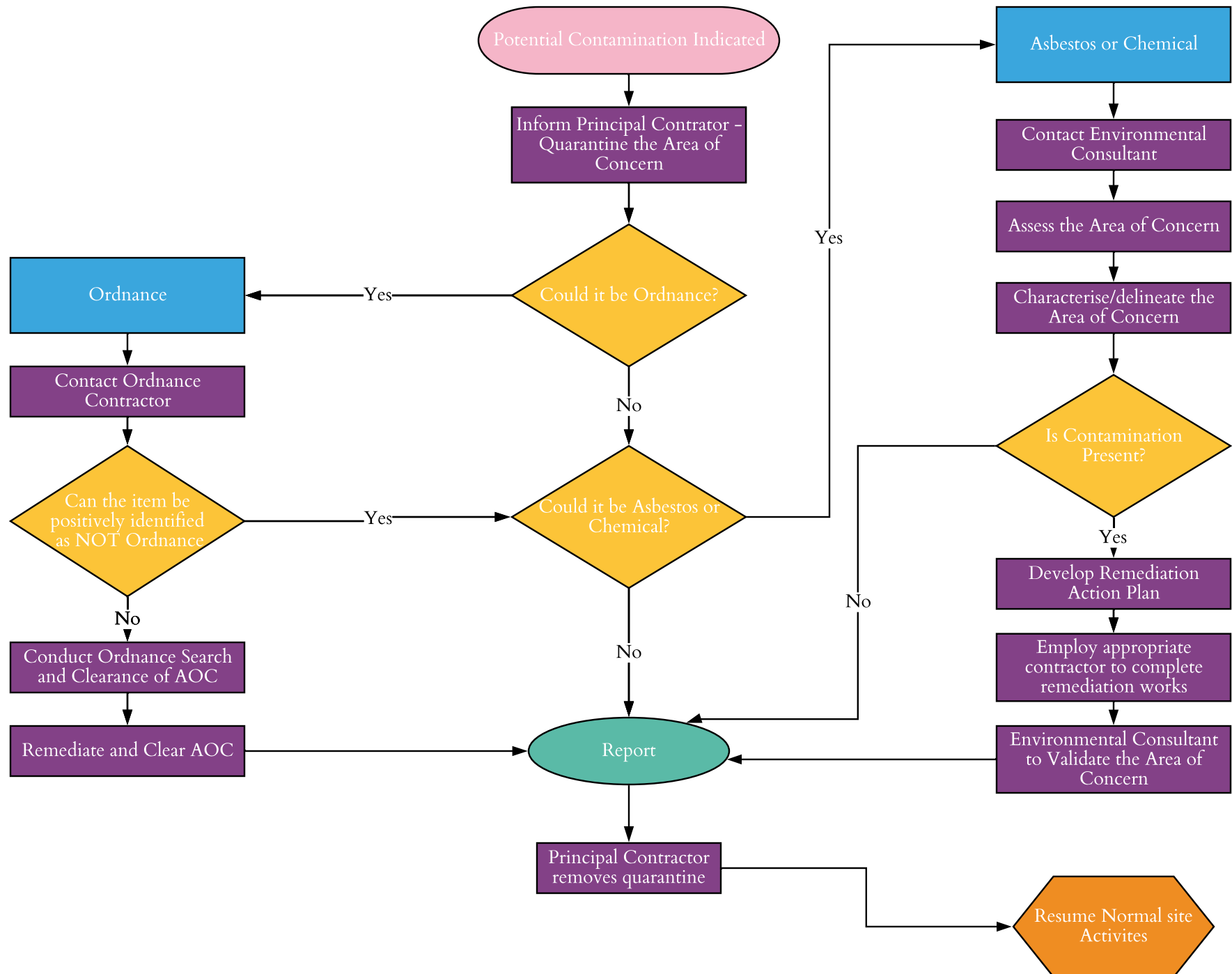
If you **SEE** or **SMELL** anything unusual



STOP WORK & contact Site Foreman



Do not restart work before
the area has been investigated
and cleared by an
Environmental Consultant



Appendix E

NSW EPA ACCREDITED SITE AUDITOR ENDORSEMENT

6th March 2018

Ref: IA 0301-1613-4_09

Elliot Ingram
Tactical Group/Qube
Level 15, 124 Walker Street
NORTH SYDNEY NSW 2060

Via Aconex: eingram@tacticalgroup.com.au

Dear Mr Ingram,

RE: Site Audit Interim Advice #09 – Review of the revised Contamination Management Plan (CMP) for the Moorebank Precinct East Stage 2, Moorebank, NSW.

James Davis of Enviroview Pty Ltd has been engaged to provide the services of a NSW EPA Contaminated Land Accredited Site Auditor, to conduct a Site Audit in relation to the land to be developed for the Moorebank Intermodal Terminal located at Moorebank Avenue, Moorebank, NSW, in accordance with the *Contaminated Land Management Act 1997* and relevant guidelines made or approved under s.105 of that Act.

The objective of the Site Audit is to provide a Site Audit Report and Site Audit Statement to certify, in relation to contaminated land, the Auditor's opinion of whether the site is suitable for the proposed commercial/industrial development.

A Site Audit Interim Advice is provided by a Site Auditor to assist in the management of contamination issues in regard to the requirements of the Audit at a particular stage, prior to issuing the Site Audit Statement. An interim advice does not constitute a Site Audit Statement or a Site Audit Report, and does not pre-empt the final Site Audit conclusions. A Site Audit Report and Site Audit Statement will be prepared at the conclusion of the Site Audit.

The purpose of this interim advice is to provide approval on the appropriateness of the Contamination Management Plan (CMP) that has been submitted to the Site Auditor for review:

EP Risk (March 2018) *Contamination Management Plan Moorebank Precinct East Stage 2, 400 Moorebank Avenue, Moorebank NSW Report*. Ref: EP0716_CMP01 v5, 2 March 2018.

In order to provide an opinion on the appropriateness of the CMP a number of assessment and associated reports have been made available to the Site Auditor.

The CMP also includes, as appendices the following additional management plans:

Golder Associates (August 2016) *Contamination Summary Report, Remedial and Site Management Plan– Butchers Knife, Moorebank Intermodal Terminal*. Document No.147623070-055-R-Rev2, 10 August 2016

Golder (July 2016) *Moorebank Avenue Site Management Plan*. Report Ref. 147623070_052-Rev1, 4 July 2016

Golder (August 2016) *Moorebank Intermodal Company Property West Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan*. 9 August 2016.

Gtek Australia (October 2003) *Post Activity Report Hazard Reduction Precinct H, Moorebank Defence Land Moorebank NSW*, G-tek Australia Pty Ltd, October 2003

Gtek Australia (October 2003) *Post Activity Report Hazard Reduction Precinct 1, Moorebank Defence Land Moorebank NSW*, G-tek Australia Pty Ltd, October 2003

The CMP has been revised following a recent review by the Site Auditor and further revision for minor typographical corrections.

The Site Auditor considers that the CMP is appropriate in relation to the contamination issues identified for the site.

General Comments

1. The CMP does not include the management of PFAS. At this point in time no PFAS contamination has been identified from the past assessment works that require management. However it has been indicated in those works that further assessment is required for areas associated with the known storage of PFAS containing materials in the past, this assessment is ongoing and subject to review by the Site Auditor. If PFAS is identified this will managed with the development of a separate Remediation Action Plan.
2. Insufficient information has been provided with regards to the final remediation, validation, multiphase soil vapour extraction and risk assessment that was required for soil and groundwater associated with the plume of light non-aqueous phase liquid (LNAPL) that extends from the stage 1 area, under Moorebank Avenue and into the stage 2 area on the western side of Moorebank Avenue. Whilst the CMP contains sufficient guidance on the management of works in this area, it cannot be determined whether the remediation works that were required to be undertaken have been conducted satisfactorily and whether those parts of the site may present an unacceptable risk to human health and/or the environment and therefore Site Suitability. It is required that reports relating to those works and or addition assessment is undertaken to provide the level of information required to assess this risk.

Thank you for your time regarding this matter. If you require additional information or clarification, please do not hesitate to contact me.

Yours sincerely



James Davis
NSW EPA Contaminated Land Site Auditor
Enviroview Pty Ltd

