Contamination Management Plan

Moorebank Precinct West, 400 Moorebank Avenue, Moorebank NSW

Prepared for: Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd

EP1489.002_MPW_CMP v11.0 30 July 2020

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

EP RISK

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30 July 2020

Qube Property Management Services Pty Ltd c/o Tactical Group Pty Ltd
Via email: feichen@tacticalgroup.com.au

Ref: EP1489.002_MPW_CMP v11.0

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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 *Model Code of Practice: How to Manage and control asbestos in the workplace* (Safe Work Australia 2018).
AF	Asbestos Fines	AF includes free fibres, small fibre bundles and small fragments of bonded ACM that pass through a 7 mm x 7mm sieve. Equivalent to "friable" asbestos in *Model Code of Practice: How to Manage and control asbestos in the workplace* (Safe Work Australia 2018).
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 **(Golder 2016b).**
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
BioBanking Agreement Area	See also Offset Area	Vegetated areas which are to be conserved and no construction to occur.
BTEX	-	Benzene, Toluene, Ethylbenzene and Xylenes
Cd	-	Cadmium
CLM	-	Contaminated Land Management
CMP	Contamination Management Plan	This Plan.
CoC	Conditions of Consent	Conditions of Consent SSD 5066
Conservation Area	Same as BioBanking Area	See BioBanking Area
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
DNAPL	-	Dense Non-Aqueous Phase Hydrocarbons
DPI&E	-	NSW Department of Planning, Industry 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.
EEC	Endangered Ecological Communities	Vegetated areas inaccessible during SSD 5066 development works. Located within both the Construction and Offset Areas.
EIL	-	Ecological Investigation Level
EO	-	Explosive Ordnance
EOW	-	Exploded Ordnance Waste
EPA	-	Environment Protection Authority
ESL	-	Ecological Screening Level

Abbreviations and Terminology		
Abbreviations	**Term**	**Definition**
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 *How to Manage and control asbestos in the workplace* (Safe Work Australia 2018).
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 *Work Health and Safety Act 2011* (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 Site to understand the site-specific risks.
LGA	-	Local Government Area or Agency
LNAPL	-	Light Non-Aqueous Phase Hydrocarbons
Metallic Debris	Metallic Debris	Debris comprising metal (ferrous) items. May include fragments of former ordnance items.
MIC	-	Moorebank Intermodal Company
MPE Project	Moorebank Precinct East 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 Consent (14_6766).
MPE Stage 1 Site	Moorebank Precinct East Stage 1 Site	Moorebank Precinct East Stage 1 Site, including 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 Site	Moorebank Precinct East Stage 2 Site	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.
MPW Project	Moorebank Precinct West Project	The subject of this CMP. The MPW Intermodal Terminal Facility as approved under the MPW Concept and Early Works Consent (SSD_5066), MPW EPBC Approval (No. 2011/6086) and MPW Stage 2 (SSD_7709).
MPW Site	Moorebank Precinct West Site	The site which is the subject of the MPW Concept and Early Works Consent, MPW EPBC Approval and MPW Stage 2 SSD 7709. The MPW Site does not include the rail link as referenced in the MPW Concept Consent or MPE Concept Plan Approval.
Ni	-	Nickel
OCP	-	Organochlorine Pesticides
Offset Area	BioBanking Agreement Area	Vegetated areas which are to be conserved and no construction to occur.
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.

Abbreviations and Terminology		
Abbreviations	**Term**	**Definition**
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
QUBE	QUBE Holdings Ltd	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
SAQP	-	Sampling Analysis and Quality Plan
SIMTA	-	Sydney Intermodal Terminal Alliance - a consortium comprising Qube and Aurizon Holdings.
Site	Site	MPW Project, excludes the Rail Corridor
SME	-	School of Military Engineering
SMP	-	Site Management Plan
SSD	-	State Significant Development
SSFL	-	South Sydney Freight Line
SVOC	-	Semi Volatile Organic Compounds
Tactical	Tactical Group	Project Managers of the Moorebank Precinct for Qube
MAUW	Moorebank Avenue Upgrade Works	The extent of construction works to facilitate the construction of the Moorebank Avenue upgrade. Raising of the vertical alignment of Moorebank Avenue for 1.5 kilometres of its length by approximately 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.
Vegetated Areas	EEC	Refers only to those areas inaccessible during SSD 5066 works.
VOC	-	Volatile Organic Compounds
Zn	-	Zinc

1 Introduction

EP Risk Management Pty Ltd (EP Risk) was engaged by Qube Property Management Services Pty Ltd (Qube) c/o Tactical Group Pty Ltd (Tactical), to prepare the Contamination Management Plan (CMP) for the Moorebank Precinct West (MPW) Site located at 400 Moorebank Avenue, Moorebank NSW (the Site) **Figure 1 (Attached Figures).**

The Site is approximately 190 hectares (ha) in area and legally described as:

- Lot 1 DP 1197707;
- Lot 101 DP 1049508;
- Lot 100 DP 1049508;
- Lot 2 DP 1197707;
- Part Lot 3 DP 1197707; and
- Part Anzac Road and Moorebank Avenue public road reserves.

The Site is divided into two main areas, the Construction Area and the Offset Area (see **Figure 1, Attached Figures).** This CMP refers only to vegetated areas (mapped as endangered ecological communities (EEC)) requiring management within the Construction Area where vegetation removal is required for construction purposes only.

It is understood the Site has been owned by the Commonwealth Government since 1913 and used as a Defence site since the 1940s.

The Site is under construction and will comprise the Moorebank Intermodal Terminal Development (MITD) and access roads (Proposed Development).

Project approval for the MPW Stage 1 Early Works was provided under planning consent (SSD 5066) where remediation was required in accordance with the approved Remediation Action Plan (RAP) prepared by Golder (2016a)[1].

Remediation was undertaken at the Site in accordance with Golder (2016a) and has been completed and reported in JBS&G Australia Pty Ltd (2020[2]). However, some areas within the Construction Area, mapped as endangered ecological communities (EEC) areas could not be disturbed for remediation (**Figure 2**) in advance of retirement of species credits under the Site's BioBanking Agreement. It should be noted, an Offset Area, comprising the BioBanking Agreement and EECs is located along the western Site boundary (**Figure 2**) and predominantly comprises the riparian area adjacent the Georges River. No construction work is currently proposed for the Offset Area. However, there are some EEC areas within the Construction Area proximal to the Georges River which will need to be cleared for the construction of Onsite Detention (OSD) basins, see **Figure 2.**

[1] Golder (2016a) *Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan*.
[2] JBS&G (2020) *Validation Report Land Preparation Work – Demolition and Remediation Moorebank Intermodal Company Property West, Moorebank, NSW,* 17 March 2020.

This CMP is intended to satisfy the requirements of Condition 164 (b) and (c) of the State Significant Development (SSD) 7709, whereby a CMP is required, prior to vegetation clearing (**Figure 2**) for the purposes of remediation under MPW Stage 2 (SSD 7709) and MPW Early Works (SSD 5066).

This CMP has been prepared for management of residual contaminated areas identified by JBS&G (2020) within the Construction Area that could not be previously be remediated until vegetation clearing was completed. The CMP details the location and nature of the residual contamination areas identified by JBS&G (2020) and the proposed remediation, management and validation measures required in accordance with the Golder (2016a) RAP.

For the purposes of the implementation of the CMP, vegetation areas to which the CMP applies are provided in **Figure 2** and include areas containing endangered ecological communities (EEC).

1.1 Background

Numerous contamination assessments have been undertaken at the Site, the findings of which are summarised in **Appendix A**.

To render the Site suitable for the proposed land use, remedial works for the Site were undertaken in accordance with the requirements of the RAP (Golder 2016a), and the outcomes provided in the Validation Report for Land Preparation Work – Demolition and Remediation MPW, Moorebank, NSW (JBS&G 2020).

In summary, JBS&G (2020) concluded in some areas of the Site, the scope of the RAP (Golder 2016a) was constrained by areas mapped as EECs which could not be disturbed and are fenced/barricaded to prevent access (see **Figure 2, attached**).

1.2 Purpose and Application

This plan is intended to satisfy the requirements of Condition 164 (b) and (c) of the State Significant Development (SSD) 7709 under the Environmental Planning and Assessment Act 1979 which states:

Prior to vegetation clearing:

(b) where remediation requires prior vegetation clearing, an appropriate assessment of the impact of clearing on contaminated land must be prepared by a suitably qualified and experienced consultant; and

(c) where contamination is identified as occurring within those areas where vegetation is proposed to be cleared, a Contamination Management Plan must be prepared in consultation with the Site Auditor detailing the location and nature of the contamination and the proposed remediation and/ or management measures that will be undertaken to address the on-site and potential off-site impacts.

Additionally, the CMP must also meet the relevant EPBC Act conditions of approval for EPBC 2011/6086.

The CMP has been developed to enable completion of the remediation works within vegetated areas as previously identified in the Golder (2016a) RAP and JBS&G (2020) Validation Report following the vegetation clearance within these areas.

The successful implementation of the CMP requires the appropriate briefing and Specific Work Health and Safety (WHS) induction of site workers who may uncover existing and potential contamination (including potential asbestos containing materials) and/or explosive ordnance during vegetation clearance. It is proposed this briefing will include the review of this CMP.

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

The approaches included in this CMP are intended for use only during the MPW Project where vegetation needs to be removed.

1.3 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 relevant planning consents, NSW legislation, NSW EPA, and Safe Work NSW Codes of Practice.

2 Legal and Other Requirements

Key legislation, standards and guidance / technical notes related to the management of contaminated land include the following:

Protection of the Environment Operations (POEO) Act 1997.

The proposed management activities are unlikely to involve significant quantities of contaminated soil treatment and are therefore not required to be licensed under the *Protection of the Environment Operation Act 1997*. The aggregate area requiring management within this CMP are estimated to be less than 3 hectares in total. Furthermore, it is unlikely that greater than 30,000 m^3 of soils will need to be managed or stored, and hence do not trigger the licensing requirements.

Chapter 5, Part 5.6 Division 3, Section 144AAA Unlawful disposal of asbestos waste stipulates a person disposing of asbestos waste off the site at which it is generated must do so at a place that can lawfully receive the waste. Additionally, Section 144AAB states a person must not or permit asbestos waste in any form to be re-used or recycled.

Environmental Planning and Assessment (EP&A) Act 1979 / State Environmental Planning Policy 55 – Remediation of Land (SEPP55), 1998.

Consent for the development and management works is provided under the Moorebank Precinct West Concept Approval and Stage 1 Consent (SSD 5066) and the Stage 2 Consent (SSD 7709).

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.

NSW Environmental Protection Authority (EPA) 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) before the transportation of the load commences:

- the address of the site at which the asbestos waste has been generated (by its removal from the site), if known to the transporter,
- the name, address and contact details of the premises from which the load is proposed to be transported,
- the date on which it is proposed that the transportation commence,
- the name, address and contact details of the premises to which the waste is proposed to be transported,
- the approximate weight (in kilograms) of each class of asbestos waste in the load (rounded to the nearest kilogram and, if the amount to be rounded is 0.5 kilogram, rounded up), and
- any other information specified in the Asbestos and Waste Tyres Guidelines.

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

- 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; and
- The following persons must ensure that when a person unloads or disposes of asbestos waste at a landfill site (regardless of whether the site is subject to an environment protection licence) no dust is generated from the waste:
    - the person unloading or disposing of the asbestos waste,
    - the occupier of the landfill site.

The Regulation and EPA (2014) guidelines for the NSW EPA provide for the approval for the immobilisation of contaminants in waste (if required with unexpected finds).

Contaminated Land Management (CLM) Act 1997.

The *Contaminated Lands Management Act 1997* (CLM Act) controls the assessment of contamination and requirement of remediation of soils and groundwater. The Act also contains guidance for the determination of whether a site presents a significant risk of harm and allows for accreditation of Site Auditors.

The Site has not been assessed as significantly contaminated, requiring management by the NSW EPA under Section 60 of this Act. Contamination on the Site is being managed as part of the development process and SEPP 55.

Guidelines made or approved under Section 105 or the Contaminated Land Management Act 1997

- Sampling Design Guidelines (NSW EPA 1995);
- Consultants reporting on contaminated land, Contaminated land guidelines (EPA 2020);
- Guidelines for the NSW Site Audit Scheme, 3rd Edition (NSW EPA 2017);

- Guidelines for the Assessment and Management of Groundwater Contamination, 2007 (DEC 2007);
- Guidelines on the duty to report contamination under the *Contaminated Land Management Act 1997* (NSW EPA 2015);
- Australian Water Quality Guidelines for Fresh and Marine Waters (ANZECC, October 2000), are replaced as of 29 August 2018 by the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, August 2018), subject to the same terms with the exception of the Water quality for primary industries component which still refer to the ANZECC 2000 guidelines;
- National Environment Protection Council (NEPC), National Environmental Protection Measure (NEPM) (Assessment of Site Contamination) 1999 (April 2013), (ASC NEPM 2013);
- Heads of EPAs Australia and New Zealand (HEPA), PFAS National Environmental Management Plan, January 2020 (HEPA 2020); and
- NSW EPA Waste Classification Guidelines 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 of the general resource recovery exemptions and resource recovery orders 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.

2.1 Compliance Matrix

The Development Consent made under *Section 89E of the Environmental Planning and Assessment Act 1979* has listed the conditions of consent (CoC) for SSD 7709 in **Appendix B** in relation to the CMP.

Additionally, the *Environment Protection and Biodiversity Conservation Act* 1999 (EPBC Act) approval for the MPW development was granted by Department of the Environment and Energy (DotEE) number (No.) EPBC 2011/6086. This approval was provided to address the impact of the MPW Project on matters of national environmental significance and proposals involving the Commonwealth.

The construction and operation of the development has been designed to be consistent with the EPBC Act Approval conditions. EPBC Act Approval conditions for the Project include specific conditions and commitments.

Upon review of the approval EPBC 2011/6086 and variation dated 17 September 2019 the relevant conditions of approval are listed within **Appendix B** in relation to the CMP.

The MPW Stage 2 Environmental Impact Statement ((MPW Stage 2 EIS) Arcadis, 2016a[3]) identified a range of environmental impacts and recommended management and mitigation measures to avoid, remedy or mitigate these impacts. These mitigation measures were revised as part of the MPW Stage 2 Response to Submissions Report (RtS). The Final Compilation of Mitigation Measures (FCMM) presents the mitigation measures previously presented separately in the MPW Stage 2 EIS and Response to Submissions (RtS). A list of the relevant FCMMs relevant to the CMP and how they have been addressed within this plan are provided in **Appendix B.**

Condition A3 d) of the MPWS2 SSD 7709 recommended conditions state "*The development may only be carried out: in accordance with the management and mitigation measures in Appendix 2"*. The Revised Environmental Management Measures (REMM) as per Arcadis (2016b[4]) Table 3 was reviewed and the relevant REMM to this plan are discussed and identified as part of the compliance matrix review of relevant and applicable conditions.

2.2 Roles and Responsibilities

This CMP has been developed to provide an environmental framework for short to medium term contamination management within the EEC during MPW Stage 2 construction activities in the Construction Area defined in **Figure 2**. The terminology, roles, and responsibilities relevant to the CMP are provided in **Table 1**.

[3] *Moorebank Precinct West Stage 2 Environmental Impact Statement,* Arcadis 2016 (Arcadis 2016).
[4] *Moorebank Precinct West (MPW) – Stage 2 Proposal SEARs, CoAs and REMMS Compliance Tables*, Arcadis. October 2016 (Arcadis 2016b).

Table 1 – Responsibilities for CMP Implementation

Position	Company/Entity	Responsibilities
Site Owner (or their representative)	Qube Holdings Pty Ltd	The Site owner is responsible for: • The engagement of the Principal Contractor (during construction). • Management of the operation of the Site post construction or engagement of the Operational Managing Entity. • Ensuring that the Principal Contractor or Managing Operational Entity implement the CMP.
Principal Contractor (during Stage 2 construction)	Georgiou	• Responsible for the implementation of the CMP during Stage 2 construction works. Means the contractor is in primary control of the Site. Responsible for inductions, training, notifying the owner, appropriate consultant, or contractor in relation to unexpected finds. Also responsible for quarantining unexpected finds requiring management with suitable barricades and informing other workers of its location. • Persons and/or company appropriately qualified to undertake the required management works and has the appropriate insurances and licences. • Responsible for undertaking or coordinating works in accordance with this CMP.

Environmental Consultant	To be appointed	• 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.
		• The environmental consultant is to have a certified practitioner (Site Contamination) recognised by one of the certifying bodies recognised by the NSW EPA. Any reports prepared should be 'signed off' by the individual certified practitioner (Site Contamination).
		• Responsible for the following:
		  ○ notifying the Client and Principal Contractor of any unexpected finds.
		  ○ Undertaking the assessment, remediation, and validation of an unexpected find.
		  ○ Engaging the Ordnance Contractor should UXO or EOW be identified as an unexpected find.
		  ○ Notifying the Principal contractor once unexpected finds have been validated and can be reoccupied.
		  ○ Any environmental monitoring required under the CMP.

Construction Worker	Commercial industrial worker during construction	Any worker on the Site, including any contractor or sub-contractor. Must adhere to the requirements of the CMP during short to medium term construction. Responsible for undertaking their tasks in a safe manner and notifying the Principal Contractor if they see any items/conditions which may constitute and unexpected find.
Operational worker	Commercial industrial worker during operation	To adhere to the requirements of the CMP during long-term operation of the Proposed Development post construction.

2.3 Training

Personnel directly involved in implementing the CMP at the Site will be given specific training in the various measures to be implemented; the procedure is detailed in **CMP08** and **CMP09** in **Appendix E.**

3 Site Identification

The site identification details are presented in **Table 2**.

Table 2 – Site Identification

Item	Description
Site Address	MPW Project, 400 Moorebank Avenue, Moorebank, NSW (see **Figure 1, Attached Figures**)
Legal Description	Lot 1 DP 1197707; Lot 101 DP 1049508; Lot 100 DP 1049508; Lot 2 DP 1197707; Part Lot 3 DP 1197707; and Part Anzac Road and Moorebank Avenue public road reserves.
Approximate Site Area	190 Hectares
Site Owner	Qube Holdings Pty Ltd
Municipality	Liverpool City Council
Site Zoning	IN1 General Industry E3- Environmental Management

3.1 Proposed Development

The Proposed Development at the Site comprises an intermodal terminal (IMT), connecting to a rail link to the Southern Sydney Freight Line (SSFL) within the rail corridor, construction of warehouse and distribution facilities with ancillary offices, a freight village (including ancillary site maintenance and operational services), stormwater and drainage infrastructure, landscaping, servicing and associated works on the western side of Moorebank Avenue, Moorebank, NSW.

Construction and 24/7 operation of an intermodal terminal (IMT) facility to support a container freight throughput volume of 500,000 twenty-foot equivalent units (TEUs) per annum, including:

- A rail terminal with nine rail sidings and associated locomotive shifter.
- A rail link connection from the sidings to the rail link constructed under MPE Stage 1 (SSD 6766) to the Southern Sydney Freight Line (SSFL).
- rail and truck container loading and unloading and container storage areas.
- Truck waiting area and emergency truck storage area.
- Container wash-down facilities and degassing area.
- Mobile locomotive refuelling station.
- Engineer’s workshop, administration facility and associated car parking.

Operation of the IMT facility includes operation of the rail link to the SSFL and container freight movements by truck to and from the Moorebank Precinct East (MPE) site.

Construction and 24/7 operation of a warehousing estate on the northern part of the site servicing the IMT facility and including:

- six warehouses with a total gross floor area (GFA) of 215,000 m^2 and, for each warehouse, associated offices, staff amenities, hardstands and truck and light vehicle parking.
- 800 m^2 freight village (operating from 7am to 6pm, 7 days/ week) including staff/ visitor amenities.
- internal roads, noise wall (if required), landscaping, lighting, and signage.

Intersection upgrades on Moorebank Avenue at:

- Anzac Road providing site access.
- Bapaume Road for left turn only out of the site.

Construction and operation of on-site detention basins, bioretention/ biofiltration systems and trunk stormwater drainage for the entire site.

Construction works and temporary ancillary facilities, including:

- Vegetation clearing, topsoil stripping and stockpiling and site earthworks and temporary on-site detention.
- Importation of up to 1,600,000 m^3 of uncompacted fill, temporary stockpiling, and placement over the entire site to raise existing ground levels by up to 3 m.
- Materials screening, crushing, and washing facilities.
- Importation and placement of engineering fill and rail line ballast.
- Installation and use of a concrete batching plant.
- Utilities installation/ connection.

Prior to the commencement of construction activities within vegetated areas, vegetation clearance and remediation of residual contamination identified by JBS&G (2020) in accordance with the Golder (2016a) RAP will be required in accordance with the CMP.

4 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 and boundary of the Site and EEC are shown in **Figure 2 (Attached Figures)**.

4.1 Site History Summary

The Site has been owned by the Commonwealth Government since 1913 to present day and was used by the Australian Defence Force (ADF) circa 1940s as a training facility and base for the Army. Prior to Defence operations, the Site comprised predominantly vacant gazing and bushland. The Site was developed as a Defence facility between the 1930s and 1940s and between 1956 and circa 1995 the Site had undergone various phases of development. The Site was vacated by Defence circa 2015, with the relocation of military units to new facilities at the nearby Holsworthy base.

4.2 Site Description and Surrounding Land Use

The Site is presently under Stage 1 of redevelopment as part of the Early Works construction of the MITD. Buildings previously used by the ADF have been demolished and remedial works in accordance with the Golder (2016a) RAP have been completed to the extent practicable and a validation assessment prepared (JBS&G 2020).

The Site comprised grassed open space, former defence building footprints and former training areas including open grassed/concrete areas used for specialist training.

Access to the Site was off Moorebank Avenue on the eastern boundary and to Lot 100 via Bapaume Road. The Site comprised vacant land with several swales and basins excavated to manage stormwater throughout early works.

The land surrounding the Site comprises:

- **North:** Industrial facility, the M5 motorway, small pockets of remnant bushland and further industrial and residential properties beyond. The Georges River bends to the north east.
- **South:** Rail corridor, Holsworthy Defence land, and residential properties to the west of the Georges River.
- **East:** Moorebank Avenue, MPE, general industrial properties and infrastructure (Defence), Liverpool Fire Station (north-east), Anzac Creek, low density, and medium density residential properties beyond.
- **West:** The Georges River (which flows north), Glenfield Tip, rail corridor and Casula Station, Leacock Regional Park, and low and medium density residential properties beyond.

4.3 Topography

The topography of the Site was generally level in the eastern portion and gradually sloped down towards the Georges River in the western portion.

Drainage at the Site is anticipated to follow the general topography of the land as overland flow or via drainage channels, swales, and detention basins to the Georges River. Several surface water bodies were located on and within the vicinity of the Site including:

- The head waters of Anzac Creek, which flows through the golf course in the southern portion of the Site and discharges off-site to the east.
- Lake Sisinyak to the north east of the Dust Bowl.
- Several excavated swales and sediment basins (excavated as part of the early works).

4.4 Hydrology

The closest significant body of water to the Site is the Georges River, immediately west of the Site. The Georges River flows north towards Lake Moore, 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 the 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.

The head waters of Anzac Creek are in the southern portion of the Site within the former Royal Australian Engineers (RAE) Golf Course on the western side of Moorebank Avenue (within the MPW Project). The creek appears to have been modified during occupancy by Defence into a series of water features (dams/ponds). Anzac Creek is east-west aligned and flows generally east and north-east to its confluence with the Georges River, approximately 5 km north of the Site. Anzac Creek is an ephemeral water body.

A strip of land (up to approximately 250 m wide) along the western edge of the Site lies below the 1% annual exceedance probability ('AEP') flood level.

4.5 Geology

EP Risk (2018) reported a review of the NSW Government Planning and Environment Resources and Energy Penrith 1:100,000 Geological Map (Sheet 9030, First Edition) (1991), indicated the majority of the Site was underlain by Fluvial, clayey quartzose sand and clay from the Tertiary period. The western portion of the Site adjoining the Georges River was underlain by fluvial and estuarine quartz sand, silty sand, and clay from the more recent Quaternary aged Holocene epoch. The underlying bedrock was underlain by interbedded Hawkesbury Sandstone and Ashfield Shale (Wianamatta) from the middle Triassic period.

4.6 Hydrogeology

Alluvial sediments adjacent to the Georges River in the western portion of the Site reported higher horizontal hydraulic conductivities and groundwater velocities than the predominately clay aquifer in the eastern portion of the Site.

Groundwater flow is towards the west and the nearest surface water body, the Georges River. Groundwater ranged from 1.784 m Australian Height Datum (AHD) to 14.055 m AHD.

Groundwater is predominantly fresh to brackish water (relatively low electrical conductivity, EC) with the exception of six (6) groundwater monitoring wells (GMWs) which indicated an area of high salinity (> 10,000 µS/cm) in the central portion of the Site. Dissolved oxygen (DO) measurements indicated generally anaerobic conditions. The oxidation-reduction potential (ORP) indicated reducing conditions and the pH measurements were generally slightly acidic.

4.7 Conceptual Site Model

The Conceptual Site Model (CSM) outlined within this Section was developed based on all currently known information in relation to the remaining areas of environmental concern (AEC) located within EECs which are to be cleared as part of the Stage 2 construction works.

The information in this section together with the figures presents the environmental aspects, impacts, and risks the CMP aims to manage.

ASC NEPM (2013) identifies a CSM as a representation of site related information regarding contamination sources, receptors, and exposure pathways between those sources and receptors.

ASC NEPM (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).
- Potential and complete exposure pathways.
- Human and ecological receptors.
- Any potential preferential pathways for vapour migration (if potential for vapours identified)

Known and Potential Sources of Contamination

Historical operation of the Site as a defence facility has resulted in contamination of soil, soil vapour, sediment, surface water and groundwater. Remediation works were undertaken in accordance with the Golder (2016) RAP and a validation report prepared by JBS&G (2020). The remaining sources of contamination situated within vegetated areas are presented within **Appendix C** and summarised in **Figure 2 (attached Figures**), additional details on site environmental investigations are provided in **Appendix A.**

In summary, the remaining contaminant source areas located within vegetated areas at the Site are as follows:

- AEC 1 - Chlorinated hydrocarbon impact in the north west portion of the Site to the south of the ABB Building. Predominately groundwater, the contaminants of potential concern (CoPCs) include Trichloroethene (TCE) and Cis-dichloroethene (Cis DCE).
- AEC 2 – Light Non-aqueous phase liquid (LNAPL) Area located to the south, on the corner of Chatham and Moorebank Avenue. Predominantly groundwater, the CoPCs include LNAPL, total recoverable hydrocarbons (TRH), benzene, toluene, ethylbenzene and xylene (BTEX), naphthalene, lead and Polycyclic aromatic hydrocarbons (PAH).
- AEC 3 – Former firefighting training areas where aqueous film forming foam (AFFF) was used and surrounding land. The CoPCs include per- and poly-fluoroalkyl substances (PFAS).
- AEC 4 - Underground services, those associated with high risk utilities and Anthropogenic fill. The CoPCs include asbestos, anthropogenic materials, and potential unexploded ordnance (UXO). A number of these are remaining unexpected finds from the Stage 1 remediation works (JBS&G 2020).

The objective of the CMP is to manage vegetation clearing at the Site and subsequent remediation of AEC 4 per the Golder (2016a) RAP and JBS&G (2020) Validation Report. Minimal soil disturbance is proposed during vegetation clearing, and localised soil disturbance during remediation of AEC 4 once the vegetation has been removed. It is noted some vegetation clearing will be required in AEC 3 to enable the construction of the OSDs, in particular Basin 6 and 8. Some additional management measures are required and included in the CMP.

Long term management of AEC 1, AEC 2 and AEC 3, post vegetation clearing is proposed to be achieved through the implementation of the LTEMP. Clearing of vegetation is not required to effect management of these areas in the LTEMP. The management controls proposed in the LTEMP are applied to proposed construction activities within these areas only.

The residual contamination areas (AEC 4) identified by JBS&G (2020) that will require management through the implementation of the CMP include:

- Unexpected finds: UF07; UF55-5; UF67-4; UF77-4; UF79-3; UF95; UF123-5; UF150-4; UF179 1; UF222-2; UF227-2; UF230; UF251; and CPT134A.
- Former stockpiles – SP1; SP2; SP3; SP4; and SP5.
- Asbestos impacted areas – TP071_C; TP060_C; TP061_C; and TP064.
- Former NBC Bunker.
- Anthropogenic fill – Golf Course SP1; Former Lake Sisinyak North; Former Lake Sestina South; Former lake Sisinyak East; LSE-V11, LSE-V12; LSE-V13; ANTHRO-2 (Zone B Excavation); Anthro2-V02; Anthro2-V03; Anthro2-V04; Anthro2-V05; Anthro2-V06; Anthro2-V07; Anthro2-V08; Anthro2-V09; Anthro2-V10; Anthro2-V11; Anthro2-V12; and Anthro2-V13.

The location of the residual contamination areas in AEC 4 are provided in **Figure 2**.

Type and Extent of Contamination

The summary and type and extent (where available) of contamination is provided within **Appendix A and C**. Additionally, each area is summarised on **Figure 2**. **Appendix D** provides detailed figures from the consultant reports (see references).

Management of any unidentified contamination is to be managed in accordance with an unexpected finds protocol.

Affected Media

General vegetation clearing within vegetation areas is anticipated to include minimal soil disturbance. Localised soil disturbance is proposed during remediation of residual contamination areas (AEC 4) once vegetated areas have been cleared.

Therefore, the CMP has been prepared to manage contamination associated with localised soil disturbance during remediation of AEC 4.

It is understood that general erosion and sediment controls will be implemented during vegetation clearance in accordance with the Construction Soil and Water Management Plan (CSWMP)[5]. Additional erosion and sediment controls to those provided in the CSWMP which are required to manage residual contamination during the implementation of the CMP are provided where relevant.

Human and Ecological Receptors

Sensitive receptors identified at and near the EECs are:

- On-site receptors:
  - Construction, remediation and subsurface maintenance workers and future commercial / industrial site users.
  - Terrestrial flora and fauna including threatened species in the Offset Area.
  - Future terrestrial flora and fauna in proposed landscaped areas located within the Developable Portion.
- Off-site receptors:
  - Recreational users of the Georges River.
  - Terrestrial and aquatic flora and fauna dependent upon the Georges River and Anzac Creek.

[5] Costin Roe Consulting (2020) Construction Soil and Water Management Plan, Moorebank Logistic Park Precinct West Stage 2, Moorebank Avenue, Moorebank, NSW, dated 16 March 2020 (ref: 13455.07-03_10.rpt).

Potential and Complete Exposure Pathways

The potential and complete exposure pathways for the Site are summarised on **Figure 3,** details are provided in **Appendix A.** The potential exposure pathways in the CMP to be managed during vegetation clearance are as follows:

- Inhalation of asbestos fibres during asbestos removal works by remediation workers.
- Visual impact for future land users associated with the presence of anthropogenic materials.
- Leaching and erosion of PFAS from soil to surface water during vegetation clearing AEC 3, for OSD Basin 6 and 8.
- Leaching and erosion of PFAS from soil to surface water during remediation of AEC 4, where the remediation occurs in AEC 3.

Based upon a review of **Figure 2**, remediation of AEC 4 will not occur in AEC 1 or AEC 2. Vegetation clearing of AEC 1 and AEC 2 is not required to facilitate remediation of AEC 4. Management of any unidentified contamination is to be managed in accordance with an unexpected finds protocol.

4.8 Construction Impacts

Vegetation clearing requiring management cannot occur under the SSD 7709 consent or the SSD 5066 consent until this plan, the CMP, is approved. The CMP has been prepared to assess the impact of clearing of vegetation on contaminated land (CoC B164(b)) and to identify appropriate management measures where contamination is identified as occurring in those areas (CoC B164(c)).

4.9 Objectives and Targets

The objectives and targets set out for the Project in relation to the management of contamination in the vegetated areas requiring clearing during construction are outlined in **Table 3**.

Table 3 – Objectives and Targets

Objective	Target	Frequency	Accountability	Source Reference
To minimise exposure of contractors and site personnel to impacted soils during remediation and validation of potentially impacted services and soils.	No harm to personnel undertaking vegetation clearing or remediation of residual contamination in vegetation areas.	As required in the event of soil disturbance during remediation of AEC 4	Site owner (or representative)	**CMP01**, **CMP02**, **CMP03** and **CMP05** **(Appendix E)**
To ensure that material which exceed the adopted site criteria (including in-situ fill material) is appropriately characterised for off-site removal and lawfully disposed from the site, where required.	Characterisation of all waste materials resulting from excavation during construction activities.	Ongoing	Site owner (or representative)	**CMP04** (**Appendix E**) Where the Site Owner (or nominated representative) identifies the requirement to remove material from the site, the material is required to be characterised by an Environmental Consultant to evaluate potential off-site removal options.
Appropriately manage unexpected finds - to minimise exposure of contractors and site personnel to contaminated soil that had not previously been identified	No harm to site personnel resulting from an unexpected find.	Ongoing	Site owner (or representative)	The CEMP[6], RAP Section 10.4.2.1 (Golder 2016a), and **CMP06** (**Appendix E**)
To ensure that only material fit for purpose and lawfully able to be brought onto the Site is used to backfill remediation excavations in AEC 4 (where required).	Only VENM, ENM or materials approved by the EPA are brought to site.	Ongoing	Site owner (or representative)	**CMP07** (**Appendix E**)
Suitably trained personnel will be available to implement the requirements of the CMP.	No non-compliances with the CMP.	As required.	Site owner (or representative)	**CMP08** and **CMP09** (**Appendix E**)
Ensure that all persons who may be exposed to	All relevant staff are trained/inducted in	As required.	Site owner (or representative)	**CMP08** and **CMP09** **(Appendix E)**

[6] Construction Environmental Management Plan.

Table 3 – Objectives and Targets

Objective	Target	Frequency	Accountability	Source Reference
contaminated material are suitably aware of conditions and requirements of this CMP.	CMP requirements and implementation.			
Ensure that in the event of unplanned exposure of impacted materials all appropriate measures are implemented to minimise the risk to on-site personnel and the environment.	No harm from impacted materials to personnel or the environment.	As required.	Site owner (or representative)	**CMP10** (**Appendix E**)
Ensure impacts associated with residual issues requiring management at the Site during vegetation clearing, remediation and validation of AEC 4 have been appropriately resolved to ensure the ongoing suitability of the Site for the proposed land use.	No restrictions to proposed land use.	Prior to commencing construction works within former vegetation areas	Site owner (or representative)	**CMP11** (**Appendix E**)
Appropriately track any impacted materials.	All excavated and waste materials on Site to be appropriately classified, labelled, tracked and recorded.	As required	Site owner (or representative)	**Section 5.16**

5 Management Activities

This section describes the remaining areas requiring management and the overall approach to managing and mitigating risks to human health and the environment from the remaining contamination within vegetated areas requiring clearing prior to construction works progressing on the Site.

5.1 Implementation of the CMP

The following activities will require management within the CMP:

- Clearing of vegetation.
- Remediation of residual contamination within former vegetated areas (AEC 4).

5.2 CMP Management and Monitoring Procedures

The approach to managing the residual contamination (AEC 4) (**Appendix C**) addressed within the CMP is provided below and is consistent with the RAP (Golder 2016) and *Asbestos in Soils Management Plan* (Golder 2016b)[7], as well as the *Assessment of High Risk Services* (JBS&G 2017)[8].

The environmental management procedures provided in **Appendix E** are as follows:

- CMP01– Land use Restrictions.
- CMP02 – Vegetation clearing.
- CMP03 – Excavation/Handling of Potentially Impacted Services and Soils.
- CMP04 - Off-site Disposal of Excavated/Unsuitable Material.
- CMP05 – Stockpile Management
- CMP06 - Unexpected Finds.
- CMP07 - Importation of Fill Materials/Aggregate.
- CMP08 – Training.
- CMP09 – Contractor and Subcontractor management.
- CMP10 – Contingency plan.
- CMP11 – Non-compliances with the CMP.
- CMP12 – Record Keeping.
- CMP13 – Audit/Review of CMP Implementation.
- CMP14 – CMP Review.
- CMP15 – Cessation of Construction CMP Application.

[7] *Asbestos in Soils Management Plan. Moorebank Intermodal Terminal*. Ref. 1416224-035-R-Rev1. Golder Associates (Golder 2016b)
[8] *L022 Assessment of High-Risk Services*. JBS&G Australia. 26 May 2017. Ref: JBS&G 51997-108969. (JBS&G 2017)

The specification of the CMP for each of the areas within the EEC requiring management is provided in **Appendix C.**

A summary of the validation criteria and program is provided in **Section 5.8** and **Appendix E**.

Management of any unidentified contamination during vegetation removal is to be managed in accordance with the Unexpected Finds Protocol provided as **CMP06** in **Appendix E**.

5.3 Control of Access

The management process will include restriction of access to areas of active contamination management (as currently occurs via flagging/fencing for the EEC areas) until works are complete and reported.

5.4 Supervision

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

5.5 Approvals Licences and notifications

Excavation, management, 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 or friable asbestos is detected a Class A licence will 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.

All excavation works would be undertaken by a licensed contractor experienced in the handling of contaminated soils.

5.6 Site Establishment

All safety and environmental controls are to be implemented as the first stage of management 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; and
- Stormwater runoff sediment controls.

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

5.7 Air Monitoring

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

Where required, air monitoring will be conducted in accordance with **CMP03.**

5.8 Adopted Remediation Criteria

Soil Criteria

For the purposes of assessing the results of validation 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);
- Friebel, 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; and
- Heads of EPAs Australia and New Zealand (HEPA), *PFAS National Environmental Management Plan*, January 2020 ('HEPA NEMP 2020').

In accordance with the decision-making process for assessing urban redevelopment sites (Appendix C, 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'); and
- **Aesthetics**: The consultant should also consider the need for management 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.

Asbestos Assessment Criteria

Asbestos Forms

Asbestos contamination can occur in a range of forms, sizes and degrees of deterioration. ASC NEPM (2013) separates asbestos contamination into the following forms:

- Bonded (non-friable) ACM – Asbestos bound in a matrix, and in sound condition e.g. vinyl floor tiles, cement sheeting;
- Fibrous Asbestos ('FA') – Friable asbestos material such as weathered ACM and loose fibrous material (insulation products); and
- Asbestos Fines ('AF') – Free fibres of asbestos, small fibre bundles and ACM fragments that can pass through a 7 mm x 7 mm sieve.

Asbestos - Health Screening Levels

ASC NEPM (2013) (Schedule B1 *Guideline on the Investigation Levels for Soil and Groundwater*, Section 4.8 and Table 7) provides HSLs for the five exposure settings 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,* May 2009.

A HSL of 0.05% w/w asbestos for bonded ACM was adopted as the remediation criteria for bonded ACM validation based on the intended commercial / industrial land use.

ASC NEPM (2013) states a criterion of 0.001% for FA and AF (< 7 mm) for all site uses to screen the analytical results. It should be noted that in accordance with Australian Standard AS4964-2004 and the laboratories NATA accreditation, the LOR for AF/FA in soil is 0.1 g/kg (0.01 % w/w). The risk assessment of FA and AF in soil to 0.001 % for FA and AF for assessment with ASC NEPM 2013 is reported as a non-NATA accredited result.

Consequently, NATA accredited laboratories provide additional commentary on visual observations made during analysis relating to the presence of visible FA and AF (if present). These observations are noteworthy, based on the weight of evidence approach, in accordance with ASC NEPM (2013).

For the purposes of this assessment a qualitative criterion was adopted (i.e. the laboratory's observation of visible FA/AF in the soil samples) to apply professional judgement and a risk-based approach.

The adopted remediation criteria provided by Golder (2016a) and JBS&G (2020) are provided in **Table 4**.

Table 4 – Adopted Soil Remediation Criteria

	Commercial Industrial HIL-D	HSL-D Vapour Intrusion Sand 0-1m	HSL-D Vapour Intrusion Sand 0-1m	ESL[9] - Coarse	EIL[10]	Mgt Limits[11]
Metals						
Arsenic	3,000	-	-	-	160	-
Cadmium	900	-	-	-	-	-
Chromium (VI)	3,600[12]	-	-	-	-	-
Chromium (III)	-	-	-	-	930	-
Copper	240,000	-	-	-	140	-
Lead	1,500	-	-	-	1,800	-
Mercury (inorganic)	730[13]	-	-	-	-	-
Nickel	6,000	-	-	-	40	-
Zinc	400,000	-	-	-	430	-
Polycyclic Aromatic Hydrocarbons (PAHs)						
Carcinogenic PAHs (as B(a)P TEQ)[14]	40	-	-	-	-	-
Benzo(a)pyrene	-	-	-	1.4	-	-
Total PAHs[15]	4,000	-	-	-	-	-
BTEXN						
Benzene	-	3	3	75	-	-
Toluene	-	NL[16]/99,000[17]	NL[18]	135	-	-
Ethylbenzene	-	NL[16]/27,000[17]	NL	165	-	-
Total Xylenes	-	230	NL	180	-	-
Naphthalene	-	NL[16]/11,000[17]	NL	-	370	-
Total Recoverable Hydrocarbons (TRH)						
F1 C_6-C_{10}	-	260[19]	370	215[20]	-	700
F2 >C10-C16	-	NL[19]/20,000[17]	NL	170[20]	-	1,000
F3 >C16-C34	-	NL/27,000[17]	NL	1,700	-	3,500
F4 >C34-C40	-	NL/38,000[17]	NL	3,300	-	10,000
Phenols						
Phenol	240,000	-	-	-	-	-
Pentachlorophenol	660	-	-	-	-	-

[9] ESLs are of low reliability except where indicated.
[10] EILs 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.
[11] Management limits are applied after consideration of relevant HSLs and ESLs.
[12] Guideline values presented are for Chromium (VI) in absence of total Chromium values. Where total Chromium results are elevated, samples will be analysed for Chromium (VI).
[13] Guideline values are for inorganic mercury. Where elevated mercury concentrations are encountered and/or site information suggests the potential presence of elemental mercury and/or methyl mercury, consideration of applicability would be needed.
[14] Carcinogenic PAHs calculated as per Benzo(a)pyrene Toxicity Equivalent Factor requirements presented in NEPC 2013.
[15] Total PAHs calculated as per requirements presented in NEPC 2013.
[16] Soil Health Screening Levels for Vapour Intrusion: Clay Soils. Values presented are those for 0 to <1 mBGL for the various land use. Reference should be made to NEPC 2013 for further detail of levels at greater depths.
[17] Direct Contact criteria (CRCCARE 2011).
[18] NL – not limiting.
[19] Values for F1 C6-C9 are obtained by subtracting BTEX (Sum) from laboratory result for C6-C9 TRH. Naphthalene is not subtracted as there is separate limits for Naphthalene.
[20] ESLs are of moderate reliability.

Table 4 – Adopted Soil Remediation Criteria

	Commercial Industrial HIL-D	HSL-D Vapour Intrusion Sand 0-1m	HSL-D Vapour Intrusion Sand 0-1m	ESL[21] - Coarse	EIL[22]	Mgt Limits[23]
Organochlorine Pesticides (OCPs)						
DDT + DDD + DDE	3,600	-	-	-	-	-
Aldrin + Dieldrin	45	-	-	-	-	-
Chlordane	530	-	-	-	-	-
Endosulfan	2,000	-	-	-	-	-
Endrin	100	-	-	-	-	-
Heptachlor	50	-	-	-	-	-
Methoxychlor	2,500	-	-	-	-	-
HCB	80	-	-	-	-	-
DDT	-	-	-	-	-	-
Organophosphorus Pesticides (OPPs)						
Chlorpyrifos	2,000	-	-	-	-	-
Polychlorinated Biphenyls (PCBs)						
PCBs	7	-	-	-	-	-
Asbestos						
Bonded Asbestos	0.05% w/w	-	-	-	-	-
AF/FA	0.001% w/w	-	-	-	-	-

5.9 Validation Sampling Program

The summary validation sampling program for verifying the implementation of the CMP is provided in **Table 5** and the assessment criteria is discussed above, with procedures provided in the relevant management plans provided as **Appendix E**.

Overall, validation will be undertaken as per Section 8 of the RAP (Golder 2016a) and the summary and procedures are based on the RAP. The usability of the data collected during the program will be assessed in accordance with Section 8.7 of the RAP (Golder 2016a). Reporting will be undertaken in accordance with the *Consultants reporting on contaminated land: contaminated land guidelines* (EPA 2020).

[21] ESLs are of low reliability except where indicated.
[22] EILs 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.
[23] Management limits are applied after consideration of relevant HSLs and ESLs.

Table 5 – Summary Validation Sampling Program

Item	Sampling Frequency			Analytes
	Excavation Floors	Excavation walls (if present)	Materials	
Known Hot Spots validated per **CMP03: Excavation/Handling of Potentially Impacted Services and Soils**	10 x 10m base, with a minimum of 2 base samples.	1/10 linear metres at 1 m depth interval	NA	Based on assessment, potentially asbestos, heavy metals, TRH, benzene, toluene, ethylbenzene, xylenes, naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), organochlorine pesticides (OCPs), phenols and PFAS
High Risk Utilities validated per **CMP03: Excavation/Handling of Potentially Impacted Services and Soils**	One per 50 m pipe length. For smaller lengths, a minimum rate of one sample per trench less than 10 m and two samples for trenches between 10 and 50 m length.	NA	NA	Based on assessment, potentially asbestos, heavy metals, TRH, BTEXN, PAHs, VOCs, SVOCs, OCPs, phenols and PFAS
Anthropogenic Fill validated per **CMP03: Excavation/Handling of Potentially Impacted Services and Soils**	10 x 10m base, with a minimum of 2 base samples.	1/10 linear metres at 1 m depth intervals	NA	Based on assessment, potentially asbestos, heavy metals, TRH, BTEXN, PAHs, VOCs, SVOCs, OCPs, phenols and PFAS
CMP06: Unexpected Finds: Hot Spots, High Risk Utilities and Anthropogenic Fill	See above	See Above	NA	Based on assessment, potentially asbestos, heavy metals, TRH, BTEXN, PAHs, VOCs, SVOCs, OCPs, phenols and PFAS
Imported Materials see **CMP07: Importation of Fill Materials/Aggregate**	NA	NA	Minimum 3 samples per source site	Heavy metals, TPH/BTEX, PAHs, OCPs/PCBs, Asbestos

Should the analytical results of the validation sampling program in **Table 6** exceed that adopted remediation criteria in **Section 5.8**, the impacted wall/s or base of the excavation will be excavated further in the direction of the exceedance and the validation process repeated until validation is achieved.

Following validation of the excavation either backfill the excavation with suitably validated engineered fill sourced from elsewhere on the development site or proceed with development works taking note of the remaining requirements within **CMP06** for unexpected finds.

A validation report will be prepared in accordance with NSW EPA 2020 for all management and validation works conducted on the Site.

5.10 Waste Classification

Contaminated soils requiring disposal off-site shall be assessed in accordance with **CMP04** (**Appendix E**).

5.11 Contingency Plan

In the event a significant volume of impacted materials is identified without prior preparation the procedure in **CMP11** (**Appendix E**) will be followed.

5.12 UXO, EO and EOW Management Plan

Within the vegetated areas requiring clearing based on the former use of the Site for Defence purposes there is a low risk for Unexploded Ordnance (UXO), Exploded Ordnance (EO) and EOW (Exploded Ordnance Waste) to be present within the southern portion of the Site (**Appendix F**).

Prior to vegetation clearing, the management plan (G-tek 2019[24]) provided as **Appendix F** should be implemented and followed as part of the CMP.

Where management 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 management works. Management works will be carried out in accordance with the remediation action plan (RAP) (G-Tek 2019a[25]) (**Appendix F**).

5.13 Unexpected Finds Protocol

Unexpected finds will be managed in accordance with the RAP (Golder 2016a), SIMTA (2018) and **CMP06** (**Appendix E**).

5.14 Imported Fill Materials

As per the Conditions of Consent (A7) only Virgin Excavated Natural Materials (VENM), Excavated Natural Materials (ENM) or other imported fill material approved in writing by the EPA is to be placed on the Site (**CMP07**, **Appendix E**). It is anticipated that imported fill material may be required to backfill excavations associated with remediation of the residual contamination areas (AEC 4) or to be used as cover to minimise PFAS leachate generation.

5.15 Stockpile Management

All stockpiles will be managed in accordance with **CMP05** (**Appendix E**).

5.16 Soil Classification, Treatment and Tracking

All soils will be managed in accordance with the CEMP and sub-plans, the RAP (Golder 2016a) and the EPBC Act conditions of approval for 2011/6086.

No hazardous or regulated wastes would be disposed of onsite.

The handling, stockpiling, and assessment of any impacted materials will be undertaken in a Contamination Assessment and Treatment Area (CATA), to be established, as per the RAP (Golder 2016a). The CATA will be capable of receiving, assessing, and subsequently treating impacted soils. The process undertaken at the CATA will include:

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[24] *Unexploded Ordnance (UXO) Risk Review and Management Plan Moorebank Precinct West Stage 2 (MPW2) incorporating Moorebank Avenue Upgrade Works (MAUW) Moorebank, NSW*, G-Tek Australia Pty Limited, 9 October 2019 (G-Tek 2019).
[25] *Remediation Action Plan Unexploded Ordnance Moorebank Precinct West Moorebank Avenue Upgrade Works (MPW_MAUW)*, G-Tek Australia Pty Limited, 8 November 2019 (G-Tek 2019a).

- 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);
- Dispatching materials classified for offsite disposal or onsite isolation. Contaminated materials and wastes generated from the Project construction works would be taken to suitable licensed offsite disposal facilities; and
- Offsite disposals will be carried out by approved transport operators and to approved facilities.

The material processed through the CATA can be reused on the site subject to being classified as suitable to be reused onsite. Before the reuse of any material on-site, it would be validated for the intended use.

Materials Tracking

All materials generated as part of the management works within the vegetated areas under the CMP will be tracked via a Materials Tracking Plan (MTP) by the Principal Contractor. 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 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.
- Monitoring and Review.

5.17 Site Dis-establishment

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

6 Implementation and Monitoring

6.1 Contamination Management Plan Periodic Review

A periodic review of the CMP should be undertaken for the following (**CMP13** and **CMP1**4, **Appendix E**):

- If there are any regulatory changes relevant to the implementation of the CMP.
- 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 (**CMP13**, **Appendix E**).

Where the CMP is revised, copies should be provided to all current stakeholders, training provided, and induction procedures updated where necessary.

6.2 Period of Implementation

The CMP is to be implemented until construction earthworks are complete and the site permanent pavements installed (**CMP15**, **Appendix E**).

6.3 Managing and Reporting

Incidents and Non-compliances

The requirement is for the owner of the Site to be compliant with conditions of consent and undertake the development in accordance with all consent and planning documentation, including this CMP. However, in the event of an incidents and/or non-compliance, these will be managed in accordance with **CMP11** (**Appendix E**).

Complaints

All complaints will be managed in accordance with the relevant section of the CEMP.

Non-Compliances with statutory requirements

Non-compliances with statutory requirements will be managed in accordance with **CMP11** (**Appendix E**).

Continual Improvement

Review and improvement of this CMP will be undertaken in accordance with the CEMP and **Section 6.1.** 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.

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

6.4 Record Keeping

All documents in relation to the CMP will be managed in accordance with **CMP12** (**Appendix E**).

6.5 Environmental Monitoring

Environmental monitoring specific to this CMP, as discussed throughout the document, is summarised in **Table 6** below.

Table 6 – Summary of Environmental Monitoring under the CMP

Monitoring Type	Frequency	Responsibility	Relevant Procedure and/or Reference Standard/s	Record
Asbestos Removal	Where works are required for the management of asbestos impacted soils or during asbestos removal works.	Principal Contractor	A Class A (friable) or Class B (non-friable) licensed asbestos removal contractor shall be engaged if ACM is identified. Completion of required SafeWork NSW permits (friable asbestos removal) or notifications (non-friable asbestos removal).	Copies of licences and permits maintained on project file.
Asbestos Air Monitoring	Where management works are required for the management of asbestos impacted soils or during asbestos removal works. Required for Class A works only however may be needed during Class B works for best practice	Licensed Asbestos Assessor	NOHSC Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Fibres 2nd Edition (NOHSC:3003 [2005]). How to Safely Remove Asbestos (2018). **Appendix E.**	Daily Letter Report where required.
Asbestos Clearances	Where ACM are removed infrastructure or soils.	Licensed Asbestos Assessor	Detailed in **Appendix E** and Golder 2016b.	Letter Report.
Validation Sampling	Where management works are required after vegetation clearing for the remaining impacted areas as detailed in this CMP	Environmental Consultant	**Appendix E** **Section 5.9.** The adopted sampling approach should be consistent with ASC NEPM (2013) and AS4482.1 (2005).	Validation Report as per NSW EPA 2020.
Waste Classification	Where materials require disposal to an appropriately licensed waste facility.	Environmental Consultant	Must be completed in accordance with *Waste Classification Guidelines Part 1: Classifying Waste* EPA 2014.	Classification Report as per EPA 2014.
Chemical unexpected Finds Sampling	Where a chemical unexpected find is located.	Environmental Consultant	Detailed as per the RAP (Golder 2016a) and **CMP06** (**Appendix E**). The adopted sampling approach should be consistent with ASC NEPM (2013) and any NSW EPA endorsed guidelines.	Report as per NSW EPA 2020.
Ordnance unexpected Finds	Where an ordnance unexpected find is located.	Qualified contractor listed on the Defence	The UXO, EO and EOW Management and Remediation Plan is provided in **Appendix F.**	Report as per **Appendix F**.

Table 6 – Summary of Environmental Monitoring under the CMP

Monitoring Type	Frequency	Responsibility	Relevant Procedure and/or Reference Standard/s	Record
		Environment and Heritage Panel (DEHP) as a D2 and F2.		
Materials Tracking	During the movement of excavated materials during remediation works within and off the Site, within former vegetation areas.	Principal Contractor	Detailed in **Section 5.16**	Daily Tracking Sheets.
Inspections	Weekly during dry weather and daily during wet weather.	Principal Contractor	Areas within AEC 3 that have been cleared of vegetation and had cover placed prior to OSD construction. Area should be walked and checked for possible erosion.	Daily tracking Sheets.

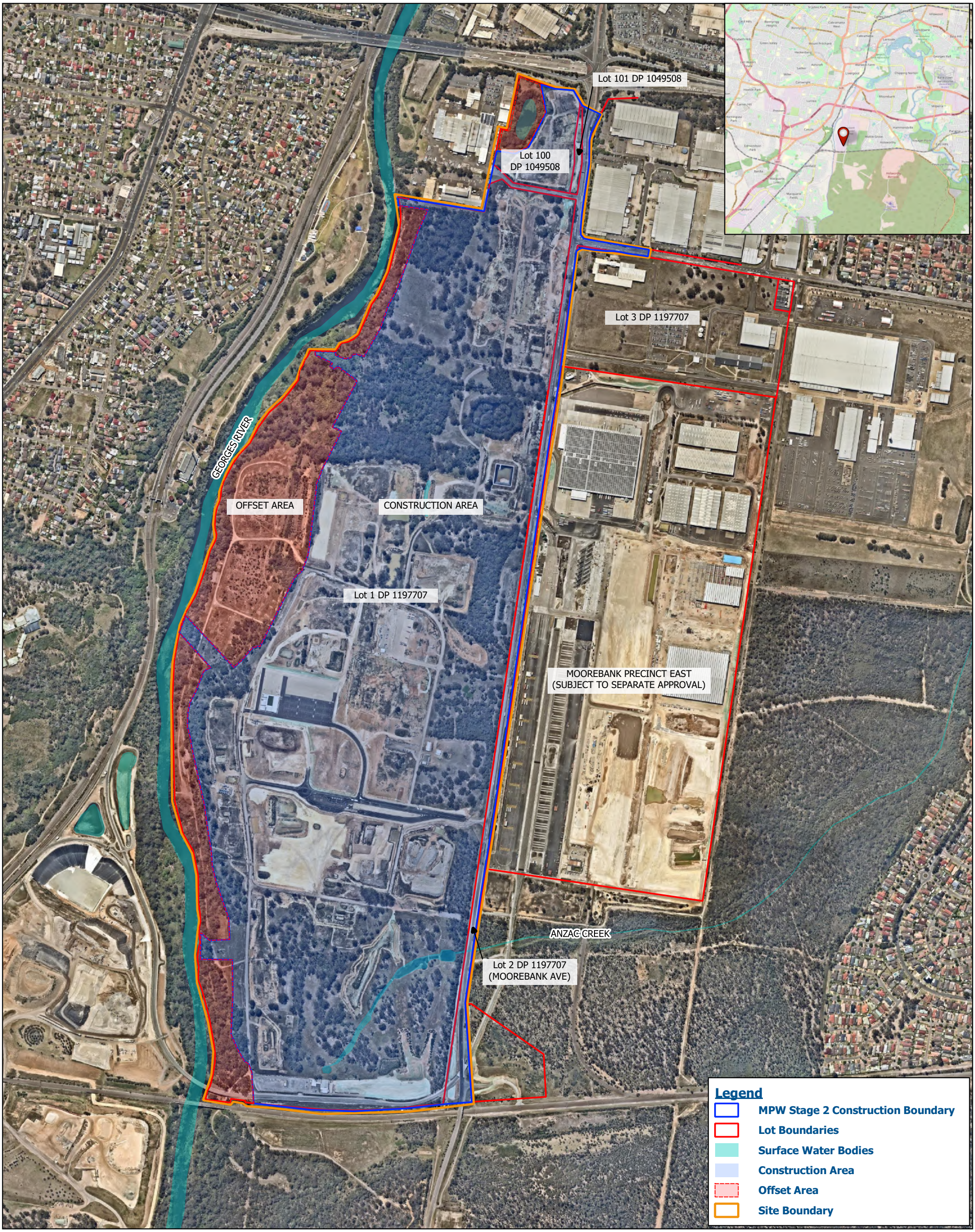
7 References

- Site Audit Report and Site Audit Statement Moorebank Intermodal Terminal, Moorebank, NSW, AECOM Australia Pty Ltd Mr Frank Mohen NSW EPA Accredited Site Auditor No.9801, 10 July 2014 (AECOM 2014).
- Coffey (2017) PFAS Assessment Report – Royal Australian Engineers (RAE) Golf Course, dated 29 September 2017 (ref: GEOTLCOV24072AF CD) Coffey.
- DIPNR (2004) Department of Infrastructure, Planning and Natural Resources, Guidelines for the preparation of Environmental Management Plans.
- EnRiskS (2019) Land Human Health and Ecological Risk Assessment (Land HERA), dated 6 May 2019 (ref: MICL/19/BIOR001, Revision B – Revised Draft).
- EnRiskS (2019a) Waterway Human Health and Ecological Risk Assessment (Waterway HHERA), dated 10 May 2019 (ref: MICL/18/GRR001, Revision E – Revised Draft).
- EP Risk (2017) Literature Review, Criteria for Assessment of PFAS and Risk Assessment, Moorebank Intermodal Terminal Development (ref: EP0448.001, v3, 03.10.17) EP Risk Management Pty Ltd.
- EP Risk (2017a) Per- and Poly-fluoroalkyl Substances (PFAS) Data Gap Investigation (ref: EP00464.002, v2, 20.11.17) EP Risk Management Pty Ltd.
- EP Risk (2017b) Per- and Poly-fluoroalkyl Substances (PFAS) Nested Well Investigation (ref: EP00561.002, v1, 10.07.17) EP Risk Management Pty Ltd.
- EP Risk (2018) Moorebank Precinct West Site-Wide Per- and Poly- Fluoroalkyl Substances (PFAS) Assessment (ref: EP0748.008 v1, 22.08.18) EP Risk Management Pty Ltd.
- EP Risk (2020) Long Term Environmental Management Plan, Moorebank Precinct West, 400 Moorebank Avenue, Moorebank, NSW (ref: EP1489.001, v4, 18.06.20).
- Enviroview (2016) Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan, Letter to Tactical Group dated 22 August 2016 from Mr James Davis.
- Enviroview (2019) Site Audit Interim Advice 29 – Review of Human Health and Ecological Risk Assessment (HHERA): PFAS in Georges River Adjacent to Proposed Moorebank Intermodal Terminal prepared by EnRiskS. Letter to Tactical Group dated 29 January 2019 from Mr James Davis.
- Enviroview (2019a) Site Audit Interim Advice 30 – Review of Land and Waterway Human Health and Ecological Risk Assessments (HHERAs) prepared by EnRiskS. Letter to Tactical Group dated 17 July 2019 from Mr James Davis.
- Enviroview (2020) Site Audit Interim Advice 31 – Review of JBS&G Report – Remediation Validation Report for Moorebank Precinct West. Letter to Tactical Group dated 20 February 2020 from Mr James Davis.

- Enviroview (2020a) Site Audit Interim Advice 32 – Review of EP Risk Reports – Long-Term Environmental Management Plan (LTEMP) and Contamination Management Plan (CMP) for Moorebank Precinct West. Letter to Tactical Group dated 5 March 2020 from Mr James Davis.
- Enviroview (2020b) Site Audit Interim Advice 33 – Review of JBS&G Report – Revised Remediation Validation Report for Moorebank Precinct West. Letter to Tactical Group dated 6 May 2020 from Mr James Davis.
- GHD (2014) Stage 1 contamination assessment and data gap analysis report (report reference 21/24133/204711), December 2014.
- GHD (2015) Intrusive site investigations (Ref 21/24133/207651), November 2015.
- GHD (2015a) Additional site investigations and remedial options evaluation (report reference 21/24133/209789), November 2015.
- GHD (2015b) DNSDC Moorebank – Refuelling Area Remedial Action Plan (21/24133/211259).
- GHD (2016) Validation Report – Phase A (report reference 21/25471/217655), September 2016.
- GHD (2016a) Former DNSDC Refuelling Area, Moorebank NSW, Human Health and Ecological Risk Assessment (report reference 21/25471/217592), October 2016.
- GHD (2018) Former DNSDC Refuelling Area Remediation Validation Report - Phase C (report reference 21\25471\WP\220903), March 2018.
- Golder (2015) Post Phase 2 Environmental Site Assessment. Golder Associates.
- Golder (2015a) Onsite Quantitative Human Health Risk Assessment, Moorebank Intermodal Terminal (ref: 147623070-043-R-Rev1).
- Golder (2015b) Preliminary Aqueous Film Forming Foam Investigation (ref: 147623070-035-M-Rev0, FINAL, 28.10.15) Golder Associates Pty Ltd.
- Golder (2016) Land Preparation Works Stage 1 and Stage 2 – Remediation Action Plan.
- Golder (2016a) Moorebank Avenue – Site Management Plan, dated 4 July 2016 (ref: 147623070-052-Rev1).
- (Golder 2016b) Moorebank Intermodal Terminal, Per- and Poly-fluoroalkyl Substances Investigations: Stage 1 Onsite Screening Assessment (ref: 147623070-059-R-Rev0, FINAL, 29.10.16) Golder Associates Pty Ltd.
- Golder (2016c) Perfluoroalkyl Substances Surface Water and Sediment Investigation Georges River, dated 22 March 2016 (ref: 147623070-047-R-Rev0).
- Golder (2016d) Moorebank Intermodal Terminal, Per- and Poly-fluoroalkyl Substances Investigation: Stage 2 Onsite Delineation (ref: 147623070-064-R-Rev1, FINAL, 29.10.2016) Golder Associates Pty Ltd.

- Golder (2016e) Moorebank Intermodal Terminal, Preliminary PFAS in Groundwater Remedial Options Appraisal, Moorebank Intermodal Terminal, Moorebank, NSW (ref: 147623070-065-R-Rev0, 01.09.16) Golder Associates Pty Ltd (Golder 2016c).
- Golder (2017) Moorebank Intermodal Terminal, Per-fluoroalkyl Substances Surface Water and Sediment Investigation Georges River, dated 22 March 2017 (ref: 147623070-047-R-Rev0) Golder Associates Pty Ltd.
- Heads of EPA Australia and New Zealand (2020) PFAS National Environmental Management Plan Version 2.0 ('HEPA (2020) NEMP 2.0').
- Site Audit Report 0503-1907 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW. 30 October 2018 JBS&G Australia Pty Ltd (ref. 51732-114653)
- JBSG (2019) Validation Report for Land Preparation Work – Demolition and Remediation MPW, Moorebank, NSW, February 2019.
- JBSG (2019a) Environmental Management Plan for Land Preparation Work – Demolition and Remediation MPW, Moorebank, NSW February 2019.
- National Environment Protection (Assessment of Site Contamination) Measure 1999 (the ASC NEPM 2013).
- NSW EPA (2017) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme.
- NSW EPA (2020) Contaminated Land Guidelines: Consultants Reporting on Contaminated Land.
- PB (2012) Moorebank Intermodal Remediation Action Plan (RAP) Stage 1A Development Moorebank Avenue, Moorebank, NSW.
- PB (2014) Phase 2 Environmental Site Assessment Moorebank Intermodal Terminal, dated 28.05.14 (ref: 2103829A-CLM_REP-1 Rev B) Parsons Brinkerhoff Pty Ltd.
- SEPP 55 – Remediation of Land.

Figures



EP RISK

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Contamination Management Plan
Moorebank Precinct West

Figure 1 - Site Location

Job No: EP1490.002
Date: 10/06/2020
Drawing Ref: Fig 1
Version No: v1

N

0 130 260 390 m

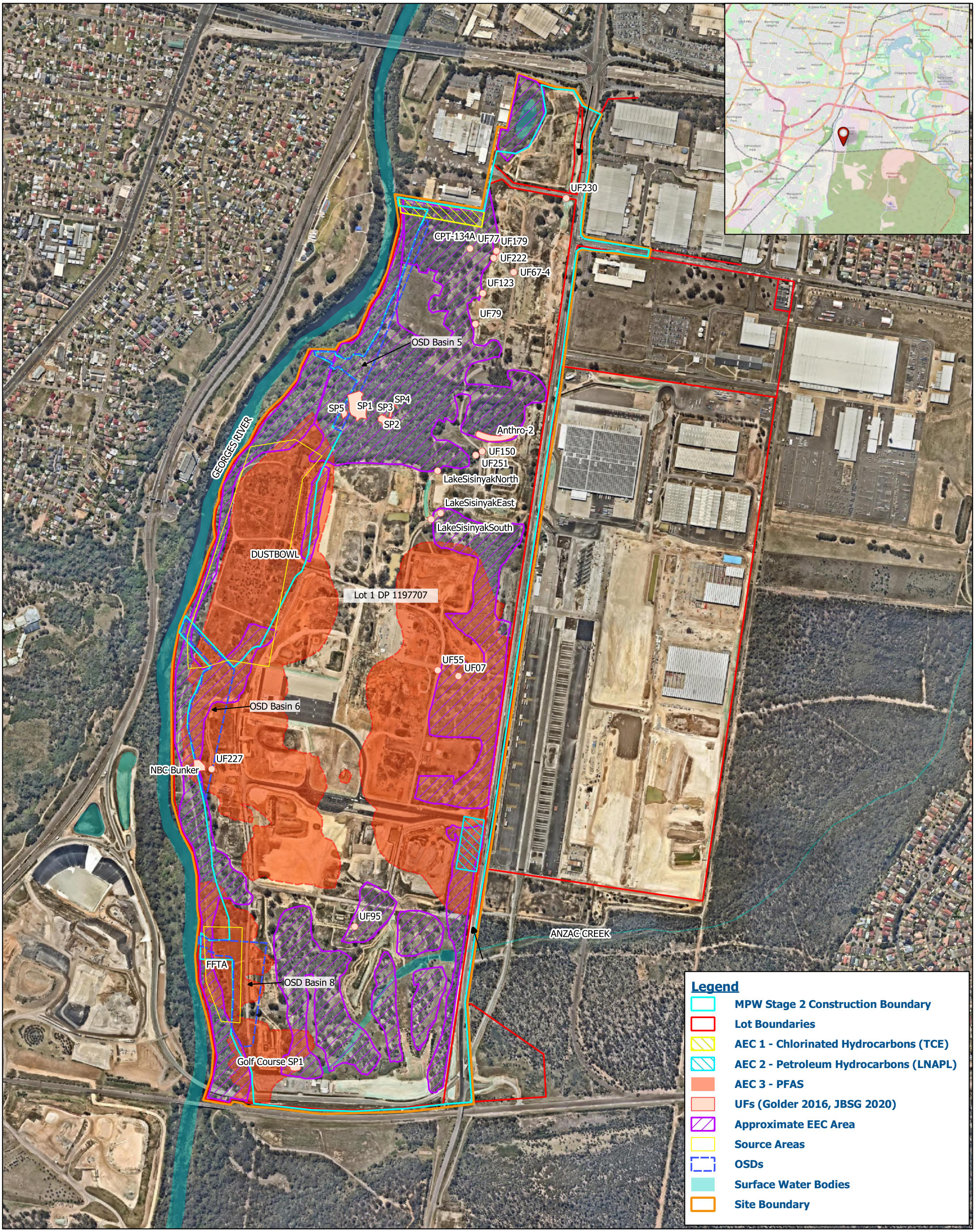
Approximate Scale Only

Coordinate System: WGS 84
Drawn by: OG **Checked by:** PS
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services



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Contamination Management Plan
Moorebank Precinct West

Figure 2 - Areas of Environmental Concern

Job No: EP1490.002
Date: 10/06/2020
Drawing Ref: Fig 2
Version No: v1

N

0 130 260 390 m

Approximate Scale Only

Coordinate System: WGS 84
Drawn by: OG Checked by: PS
Scale of regional map not shown
Source: Near Maps

APPROVED COMPANY ISO 9001 Quality Management Systems QMS Certification Services

APPROVED COMPANY AS/NZS 4801 OH&S Management Systems QMS Certification Services

APPROVED COMPANY ISO 14001 Environmental Management Systems QMS Certification Services

SOURCE

1. FFTA/Dust bowl
2. Asbestos
3. Anthropogenic materials
4. Residual PFAS in soil and sediment

EXPOSURE PATHWAY

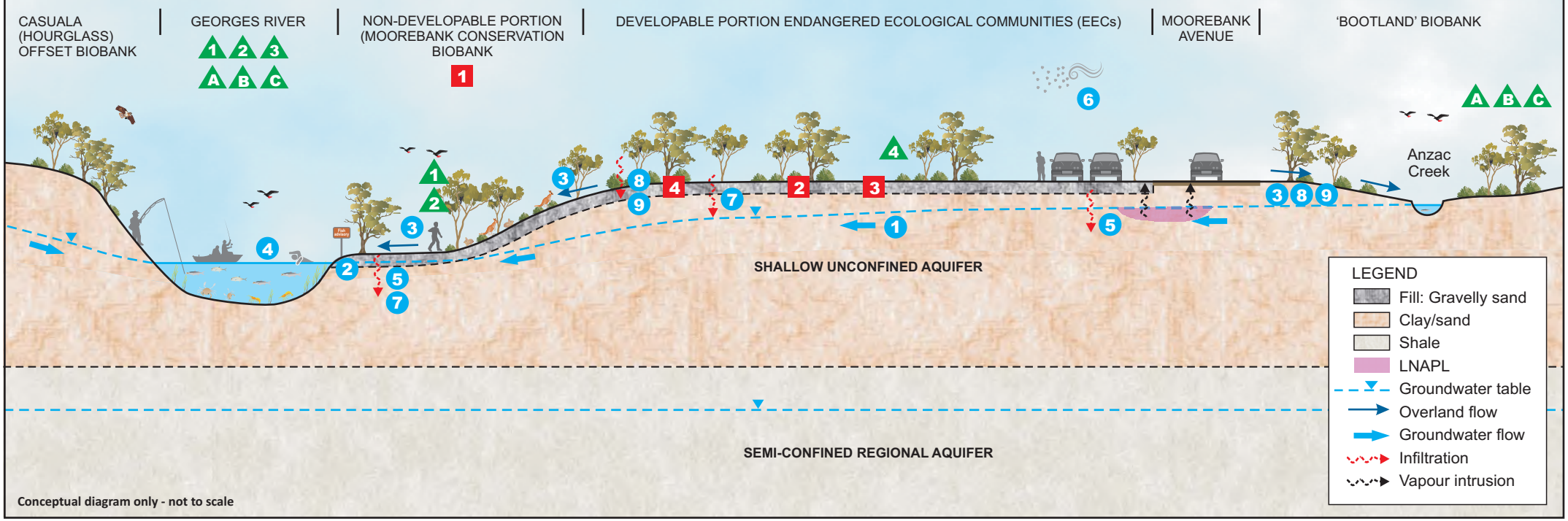
1. Lateral migration of groundwater
2. Groundwater entering surface water bodies
3. Surface water runoff
4. Direct contact/uptake by ecological receptors - aquatic and terrestrial
5. Vertical migration through soil profile
6. Wind erosion of impacted surface soils
7. Infiltration and leaching from soils and sediments to groundwater
8. Leaching from soil, sediments to surface water
9. Adsorption to soil or sediment from surface water

HUMAN EXPOSURE PATHWAY

1. Direct contact and incidental ingestion of soil and/or sediment
2. Direct contact and incidental ingestion of water (surface water or groundwater)
3. Consumption of flora (including homegrown produce outside of project area) and fauna already impacted contaminated soils, sediment, groundwater and/or surface water
4. Inhalation of dust from impacted soils

ECOLOGICAL EXPOSURE PATHWAY

A. Direct contact and incidental ingestion of soil and/or sediment
B. Direct contact and incidental ingestion of surface water
C. Consumption of flora and fauna already impacted via contaminated soils, sediment. groundwater and/or surface water



Conceptual diagram only - not to scale

EP RISK

Contamination Management Plan
Moorebank Precinct West

Figure 3 - Conceptual Site Model Pre-MPW Development

Job No: EP1489
Date: 5/5/2020
Drawing Ref: EP1489_002.cdr
Version No: v1

Drawn By: B.W.
Checked By: P.S.

Appendix A

SUMMARY OF ENVIRONMENTAL INVESTIGATIONS

Site Description

At the time of writing, the Site had undergone significant redevelopment as part of the Early Works (Stage 1) of the Proposed Development (construction Area). Access to the Site was off Moorebank Avenue on the eastern boundary. The Site included an Offset Area, which included the riparian zone along the western portion of the Site, located adjacent to the Georges River.

Buildings, roadways, and services previously used by Defence had been demolished and removed. Exposed soils were present across much of the Site, apart from areas within the Offset Area. EEC areas have been identified on-site within the Construction Area and Offset area.

Soil had been imported to raise site levels within the Construction Area. Exposed soils had been sprayed with a polymer to reduce erosion and extensive shallow soil works had been undertaken over much of the area including the removal of underground services and installation of swales and sediment basins by the Principal Contractor.

Proposed Development

The Site is currently being redeveloped into the Moorebank Intermodal Terminal Development. Activities associated with construction of the Proposed Development are limited to the Construction Area of the Site as follows:

- **Construction Area**: Encompasses the portion of the Site inside the MPW Stage 2 Construction Boundary and includes the proposed onsite stormwater detention basins (ref: **Figure 1**).
- **Offset Area**: Comprises the riparian area adjacent the Georges River which is located outside the MPW Stage 2 Construction Boundary in the western portion of the Site and is subject to a BioBanking Agreement (ref: **Figure 1**).

Construction work is not proposed for the Offset Area to protect environmental values, where they occur. Minor low disturbance works are proposed for the Offset Area which include re-vegetation in accordance with WSP (2018) Biobanking Assessment Report[26].

Summary of Environmental Investigations

In July 2014, the Site Auditor at the time, Frank Mohen issued a part B Audit Statement[27] stating the Moorebank Land Preparation Work – Demolition and Remediation ('LPWDR') site could be made suitable for commercial/industrial use subject to implementation of the Parsons Brinkerhoff ('PB') Moorebank Intermodal Terminal RAP (2012)[28].

Subsequent to the issuing of the part B Site Audit Statement, the development consent (SSD 5066) for the intermodal development required the subject site be remediated in accordance with the RAP, SEPP 55[29] and guidelines in force under the Contaminated Land Management (CLM) Act. Amendments

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[26] WSP (2018) BioBanking Assessment Report, BioBanking Agreement - Wattle Grove Offset Area, Casula Offset Area and Moorebank Conservation Area, dated 25/05/2018 (ref: 2189293E-ECO-REP-001 RevE).

[27] AECOM (2014) *Site Audit Report and Site Audit Statement Moorebank Intermodal Terminal, Moorebank, NSW*, AECOM Australia Pty Ltd Mr Frank Mohen NSW EPA Accredited Site Auditor No.9801, 10 July 2014.

[28] Parsons Brinckerhoff (2012) Moorebank Intermodal Remediation Action Plan (RAP) Stage 1A Development Moorebank Avenue, Moorebank, NSW, dated 31 October 2012.

[29] *State Environmental Planning Policy No 55 – Remediation of Land*. 31 August 2018 (SEPP 55).

to the approved RAP as a result of further site investigations would require approval by a Site Auditor, in consultation with the NSW EPA.

Investigations of a petroleum hydrocarbon refuelling facility located on the Moorebank Precinct East ('MPE') site to the east was undertaken by GHD (2014[30], 2015[31] and 2015a[32]) reported that LNAPL had migrated onto the eastern portion of the MPW Site. Remediation of the refuelling facility was undertaken in accordance with the GHD (2015b[33]) RAP and GHD (2016[34]) technical specification and included removal of underground storage tanks (USTs), excavation of impacted soil, removal of LNAPL by multi-phase vacuum extraction (MPVE), preparation of a human health and ecological risk assessment (2016b[35]) and preparation of staged validation reports (GHD 2016a[36]and GHD 2018[37]). Residual LNAPL is present at the refuelling facility and the impacted portion of the Site requiring on-going management in accordance with the GHD (2018a [38]) EMP. Recent gauging of LNAPL concentrations within this portion of the Site was undertaken by JBS&G (2020)[39] where increased LNAPL apparent thicknesses were reported in some wells. These increases were attributed to the low saturations of LNAPL within the effective porosity of the fine-grained soils at the Site, consistent with the low recoverability of LNAPL reported by GHD (2018). JBS&G (2020) undertook a detailed risk assessment that reported the LNAPL does not pose a potential health risk subject to the implementation of a CMP.

Andrew Lau of JBS&G was commissioned as the Site Auditor for the MPE Site and prepared a Site Audit Statement (SAS) and Site Audit Report[40] (SAR) in 2018 for the MPE Site concluding the LNAPL plume was stable or declining and residual contamination could be appropriately managed by the GHD (2018a) Environmental Management Plan (EMP).

James Davis of Enviroview was subsequently engaged as the Site Auditor of the IMEX Terminal portion of the MPE Site (which included the refuelling facility) and issued a SAS and SAR[41]. The SAS concluded that the IMEX Site was suitable for commercial / industrial land use subject to compliance with the GHD (2018a) EMP and excluding the construction of basements.

A Site Management Plan (SMP) was prepared by Golder (2016a)[42] for Moorebank Avenue to inform management of LNAPL that had migrated off-site from the refuelling facility at the MPE Site to Moorebank Avenue.

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[30] GHD (2014) *Stage 1 contamination assessment and data gap analysis report* (report reference 21/24133/204711), December 2014.
[31] GHD (2015) *Intrusive site investigations* (Ref 21/24133/207651), November 2015.
[32] GHD (2015a) Additional site investigations and remedial options evaluation (report reference 21/24133/209789), November 2015.
[33] GHD (2015b) DNSDC Moorebank – Refuelling Area Remedial Action Plan (21/24133/211259).
[34] GHD (2016) DNSDC Refuelling Area Technical Specification (2125471), May 2016.
[35] GHD (2016b) Former DNSDC Refuelling Area, Moorebank NSW, Human Health and Ecological Risk Assessment (report reference 21/25471/217592), October 2016.
[36] GHD (2016a) Validation Report – Phase A (report reference 21/25471/217655), September 2016.
[37] GHD (2018) Former DNSDC Refuelling Area Remediation Validation Report - Phase C (report reference 21\25471\WP\220903), March 2018.
[38] GHD (2018a) Former DNSDC Refuelling Area, Moorebank NSW, Environmental Management Plan (report reference 21/25471), October 2018.
[39] JBS&G (2020) Qube Property Management Services, Site Wide Groundwater Assessment Report, Land Preparation Work – Demolition and Remediation, Moorebank Intermodal Company Property West, Moorebank, NSW, dated 17 March 2020 (ref: 51997-120679 (rev 0)).
[40] JBS&G (2018) Site Audit Report 0503-1907 Former Defence National Storage and Distribution Centre (DNSDC) – Licensed Area Moorebank Avenue, Moorebank NSW. 30 October 2018 (ref. 51732-114653).
[41] Enviroview (2019) Site Audit Report, IMEX Terminal Site Moorebank Precinct East, Sydney Intermodal 402 Moorebank Avenue, Moorebank, NSW (ref: 600099_0301-1613-2), dated August 2019.
[42] Golder (2016a) Moorebank Avenue – Site Management Plan, dated 4 July 2016 (ref: 147623070-052-Rev1).

Ongoing management and monitoring is being undertaken for the IMEX land to close out the IMEX audit. The auditor requires the information in GHD (2018a) EMP and Golder (2016) SMP to be considered in the MPW documentation as there is off-site migration of LNAPL from IMEX to MPW Stage 2 land. Management actions relevant for MPW Stage 2 are provided in the LTEMP and no management or remediation is required for this area in the CMP as there are no deep excavations proposed during vegetation clearing.

Golder Associates Pty Ltd (Golder) was commissioned by the Moorebank Intermodal Company (MIC) to undertake a data gap investigation (Golder 2015[43]) and Quantitative Human Health Risk Assessment (Golder 2015a[44]) of chlorinated hydrocarbon impacted soil and groundwater in the north western portion of the Site to the south of the ABB Building. Trichloroethylene (TCE) and Cis-1,2-dichlorothene (cis-DCE) was reported in soil and groundwater in this portion of the Site and the health risk to onsite workers was assessed to be low and acceptable for the proposed open space land use including road verges and woodland / riparian conservation areas with no buildings. Subsequent testing of shallow soil and soil gas by Golder (2018)[45] in this portion of the Site did not detect any chlorinated hydrocarbon soil concentrations above the adopted criteria, however soil vapour concentrations of TCE were reported above the adopted HIL C (recreational open space) and HIL D (commercial / industrial) criteria and cis-1,2-dichloroethene above the adopted HIL D (commercial / industrial) criteria. Groundwater assessment of this portion of the Site by JBS&G (2020) reported TCE groundwater concentrations were stable when compared to the results reported by Golder (2015).

Golder was commissioned to amend the RAP (Golder 2016) with the objective to remediate and/or manage contamination risks at the Site, to render the Site suitable for the proposed commercial / industrial and conservation / open space land use.

James Davis of Enviroview Pty Ltd was engaged in 2016 as the Site Auditor in relation to the Moorebank Intermodal Terminal and reviewed the RAP (Golder 2016a) for the MPW Site. 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[46]).

Based on the data available, risks associated with clearing of vegetation, where required for construction, are negligible. Management of residual chlorinated hydrocarbon impacts will be managed via the implementation of the LTEMP prepared to the satisfaction of the Site Auditor.

The Golder (2016) RAP contained recommendations that PFAS be assessed and where required, a routine monitoring regime be established as part of the LTEMP. Numerous investigations at the Site have been undertaken for per- and poly-fluoroalkyl substances (PFAS) (PB 2014[47], Golder 2015b[48],

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[43] Golder (2015) *Post Phase 2 Environmental Site Assessment*. Golder Associates.
[44] Golder (2015a) Onsite Quantitative Human Health Risk Assessment, Moorebank Intermodal Terminal (ref: 147623070-043-R-Rev1).
[45] Golder (2018) Technical Memorandum, Results – Additional Soil and Soil Vapour Investigation of TCE Contamination (ref: 147623070-078-M-Rev0).
[46] Enviroview (2016) *Site Audit Interim Advice – Golder Associates, Moorebank Intermodal Terminal Stage Specific Remediation Action Plan*, Letter to Tactical Group dated 22 August 2016 from Mr James Davis.
[47] PB (2014) *Phase 2 Environmental Site Assessment Moorebank Intermodal Terminal*, dated 28.05.14 (ref: 2103829A-CLM_REP-1 Rev B) Parsons Brinkerhoff Pty Ltd.
[48] Golder (2015b) *Preliminary Aqueous Film Forming Foam Investigation* (ref: 147623070-035-M-Rev0, FINAL, 28.10.15) Golder Associates Pty Ltd.

Golder 2016b[49], Golder 2016c[50], Golder 2016d[51], Golder 2016e[52], Golder 2017[53], Coffey 2017[54], EP Risk 2017[55], EP Risk 2017a[56], EP Risk 2017b[57], EP Risk 2017c[58], JBS&G 2019[59] and JBS&G 2020). The findings of these reports have identified PFAS concentrations in soil below the human health-based guidelines for commercial / industrial land use but exceeding the indirect ecological criteria. Impacted sediment, groundwater and surface water was reported at the Site sourced from historical firefighting activities undertaken at the former FFTA and Dust Bowl in the eastern portion of the Site. EP Risk (2017)[60]was engaged by Qube to prepare a Tier 2 PFAS human health and ecological risk assessment for the development and identified the potential human health risk to workers through dermal exposure to PFAS impacted water and a potential risk to ecological receptors in the Georges River from PFAS impacted soil, sediments, surface water and groundwater at the Site.

MIC as the responsible party for PFAS contamination sourced from the Site, subsequently engaged EnRiskS (2019[61] and 2019a[62]) to prepare updated risk assessments for the Site and the Georges River. The risk assessments included sampling of biota in the Georges River to assess the risk of PFAS exposure to both on-site and off-site receptors. EnRiskS (2019) reported the risk to human health at the Site was low and acceptable, but bioaccumulation and the effects on higher order ecological consumers were unable to be excluded. EnRiskS (2019a) reported additional unknown sources of PFAS to biota in the Georges River, but the location of these additional sources could not be identified. However, EnRiskS (2019a) reported a potential health risk to children who consume more than two serves of fish per month sourced from the Georges River and potential adverse effects to the aquatic environment by bioaccumulation and the effects on higher order ecological consumers.

MIC engaged GHD (2019) [63] to prepare a summary report of historical PFAS investigations and prepare a conceptual site model. Based upon the findings by EnRiskS (2019 and 2019a) and GHD (2019), MIC engaged GHD to prepare a PFAS Management Plan (2019a) to outline the strategy for long term

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[49] (Golder 2016b) *Moorebank Intermodal Terminal, Per- and Poly-fluoroalkyl Substances Investigations: Stage 1 Onsite Screening Assessment* (ref: 147623070-059-R-Rev0, FINAL, 29.10.16) Golder Associates Pty Ltd.

[50] Golder (2016c) *Perfluoroalkyl Substances Surface Water and Sediment Investigation Georges River*, dated 22 March 2016 (ref: 147623070-047-R-Rev0).

[51] Golder (2016d) *Moorebank Intermodal Terminal, Per- and Poly-fluoroalkyl Substances Investigation: Stage 2 Onsite Delineation* (ref: 147623070-064-R-Rev1, FINAL, 29.10.2016) Golder Associates Pty Ltd.

[52] Golder (2016e) *Moorebank Intermodal Terminal, Preliminary PFAS in Groundwater Remedial Options Appraisal, Moorebank Intermodal Terminal, Moorebank, NSW* (ref: 147623070-065-R-Rev0, 01.09.16) Golder Associates Pty Ltd (Golder 2016c).

[53] Golder (2017) *Moorebank Intermodal Terminal, Per-fluoroalkyl Substances Surface Water and Sediment Investigation Georges River*, dated 22 March 2017 (ref: 147623070-047-R-Rev0) Golder Associates Pty Ltd.

[54] Coffey (2017) *PFAS Assessment Report – Royal Australian Engineers (RAE) Golf Course*, dated 29 September 2017 (ref: GEOTLCOV24072AF-CD) Coffey.

[55] EP Risk (2017) *Literature Review, Criteria for Assessment of PFAS and Risk Assessment, Moorebank Intermodal Terminal Development* (ref: EP0448.001, v3, 03.10.17) EP Risk Management Pty Ltd.

[56] EP Risk (2017a) *Per- and Poly-fluoroalkyl Substances (PFAS) Data Gap Investigation* (ref: EP00464.002, v2, 20.11.17) EP Risk Management Pty Ltd.

[57] EP Risk (2017b) *Per- and Poly-fluoroalkyl Substances (PFAS) Nested Well Investigation* (ref: EP00561.002, v1, 10.07.17) EP Risk Management Pty Ltd.

[58] EP Risk (2018) *Moorebank Precinct West Site-Wide Per- and Poly- Fluoroalkyl Substances (PFAS) Assessment* (ref: EP0748.008 v1, 22.08.18) EP Risk Management Pty Ltd.

[59] JBS&G (2019b) Moorebank Precinct West, Moorebank Intermodal Terminal, NSW – Dust Bowl Assessment, dated 8 November 2019 (ref: JBS&G 51997-125644 L342 (Dust Bowl Assessment) Rev A).

[60] EP Risk (2017c) *Literature Review, Criteria for Assessment of PFAS and Risk Assessment, Moorebank Intermodal Terminal Development* (ref: EP0448.001, v.3, 03.10.17).

[61] EnRiskS (2019) *Land Human Health and Ecological Risk Assessment (Land HERA)*, dated 6 May 2019 (ref: MICL/19/BIOR001, Revision B – Revised Draft).

[62] EnRiskS (2019a) *Waterway Human Health and Ecological Risk Assessment (Waterway HHERA)*, dated 10 May 2019 (ref: MICL/18/GRR001, Revision E – Revised Draft).

[63] GHD (2019) Moorebank Precinct West, Report Summarising PFAS Investigations to February 2019, dated April 2019 (ref: 2128111).

management of the off-site migration of PFAS from the Site to the Georges River. The GHD (2019a) PFAS Management Plan was not implemented and has/will be superseded.

To render the Site suitable for the Proposed Development, remedial works were undertaken in accordance with the requirements of the RAP (Golder 2016), and the outcomes provided in the Remediation Validation Report for Land Preparation Work (JBS&G 2020a)[64]. In summary, JBS&G (2020a) concluded that in some areas of the Site, the scope of the RAP (Golder 2016) was constrained by areas mapped as endangered ecological communities (EECs) which could not be disturbed and are fenced / barricaded to prevent access. Management of these restricted areas during construction is the objective of this CMP. JBS&G (2020a) concluded that the Site is suitable for the intended Intermodal Terminal subject to the implementation of a CMP for restricted access areas during the construction phase and biobanking areas with restricted access.

Summary of Contamination

Historical operation of the Site as a defence facility has resulted in contamination of soil, soil vapour, sediment, surface water and groundwater. Remediation works were undertaken in accordance with the Golder (2016) RAP and a validation report prepared by JBS&G (2020).

AEC 1 – Chlorinated Hydrocarbon Impacted Area

A summary of the historical chlorinated hydrocarbon analytical results compiled by Golder 2015, Golder 2015a, Golder 2018 and JBS&G 2020 identified the following contaminants of potential concern (COPC) in AEC 1:

- TCE;
- Cis-DCE; and
- TRH.

Golder (2015a), Golder (2018) and JBS&G (2020a) provided a summary of historical chlorinated hydrocarbon concentrations reported at AEC 1 as follows:

- Groundwater concentrations of volatile organic compounds (VOCs) and TRH above the laboratory limit of reporting (LOR) were historically reported at MWBHB1 – MWBHB11, MWBHB14 and concentrations of TCE, cis-DCE and TRH were reported above the laboratory LOR in groundwater collected from MWBHB1, MWBHB2, MWBHB3 and MWBHB7.
- The maximum TCE and cis-DCE concentrations of 0.419 mg/L and 0.028 mg/L at MWBHB1 and a TCE concentration of 0.303 mg/L at MWBHB3.
- Shallow soil chlorinated hydrocarbon concentrations were below laboratory LOR with the exception of GA-HA13 with a TCE concentration of 0.6 mg/kg.
- Screening of deeper soil with the membrane interface probe (MIP) identified elevated XSD responses between 3 and 7 m BGL, indicative of vertical migration through the soil profile.

[64] JBS&G (2020) *Qube Property Management Services, Remediation Validation Report, Land Preparation Work – Demolition and Remediation, Moorebank Intermodal Company Property West, Moorebank, NSW*, dated 17 March 2020 (ref: 51997-120265 (rev 0)).

- Elevated soil vapour TCE concentrations at two locations, screened in the unsaturated zone.

A summary of groundwater and soil vapour concentrations reported in AEC 1 is provided in **Table A1** and **Table A2**.

Table A1 – Summary of Historical Groundwater Chlorinated Hydrocarbon Concentrations (AEC 1)

Constituent	Adopted Criteria (mg/L)	Maximum Concentration (mg/L)	Exceedance
Cis-1,2-dichloroethene (cis-1,2- DCE)	0.06	0.028	No
Trichloroethene (TCE)	0.07	0.419	Yes
Tetrachloroethene	0.05	0.003	No

Table A2 – Summary of Historical Soil Vapour Chlorinated Hydrocarbon and Petroleum Hydrocarbon Concentrations (AEC 1)

Constituent in Soil Vapour	Criteria (µg/m^3)		Maximum Concentration (µg/m^3)	Exceedance
	HSL / HIL C	HSL / HIL D		
Cis-1,2-dichloroethene (cis-1,2- DCE)	2000	300	2900	Yes
Trans 1,2-Dichloroethene (trans-DCE)	2000	300	120	No
Chloroform	430	430	120	No
Benzene	2,400,000	10,000	19.2	No
Trichloroethene (TCE)	400	80	280,000	Yes
Toluene	NL	16,000,000	74.2	No
Tetrachloroethene (PCE)	40,000	8,000	440	No
Tetrachloroethene (PCE)	NL	2,800,000	110,000	No

Figures illustrating the locations of elevated chlorinated hydrocarbon concentrations is provided at the end of **Appendix D**.

AEC 2 –Petroleum Hydrocarbon Impacted Area

A summary of the historical petroleum hydrocarbon gauging and analytical results reported by Golder 2016a, GHD 2018 and JBS&G 2020 identified the following COC at AEC 2:

- TRH;
- Benzene, toluene, ethylbenzene, and xylene (BTEX);
- Naphthalene;
- Lead; and
- Polycyclic aromatic hydrocarbons (PAH).

A summary of petroleum hydrocarbon exceedances at AEC 2 are as follows:

- One soil sample reported a TRH ($C1_0$-C_{16}) concentration more than the adopted management limit.
- LNAPL in three monitoring wells (GW119, GW120 and GW146) located in the eastern portion of the Site, downgradient of the former DNSDC refuelling facility located on the MPE Site to the east.
- LNAPL thickness was gauged in November 2016 and October 2017 as follows:
    - GW19: 0.032 m – 1.937 m;
    - GW20: 0.061 m - 1.47 m; and
    - GW146: 0.007 m – 1.980 m.

Figures illustrating the locations of petroleum impacted groundwater are provided at the end of **Appendix D**.

AEC 3 - Summary of PFAS Contamination in Affected Media Onsite

The historical soil, soil leachate sediment, surface water and groundwater PFAS analytical results reported by PB (2014), Golder (2015), Golder (2016b), EP Risk (2017a, 2017b and 2018a) and JBS&G (2019b) are presented in **Table A3, Table A4**, **Table A5**, **Table A6** and **Table A7** respectively. Ecological criteria were only compared to the data set from 0 to 2 m BGL in accordance with the requirements of the ASC NEPM (2013) as this horizon corresponds with the root zone and habitation zone of many species. Figures illustrating the locations of PFAS impact are provided in **Appendix D**.

Table A3 – Summary of Historical Soil PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth (m BGL)	Analyte	No. of samples	Min. Conc. (mg/kg)	Max. Conc. (mg/kg)	Mean Conc. (mg/kg)	Standard Deviation (mg/kg)	No. Samples >LOR	No. Samples > Criteria[65]	No. Samples > 250% Criteria	95% UCL_{mean} (mg/kg)[66]	95% UCL_{mean} Exceedance of Criteria[67]
Construction Area	<2	PFOS	212	<0.0001	1.6	0.035	0.14	122	EC (ind.)[68] - 13	3[69]	0.035	No
		PFOS + PFHxS	212	<0.0001	1.612	0.038	0.15	128	0	0	-	-
		PFOA	212	<0.0001	0.014	-	-	48	0	0	-	-
	>2	PFOS	94	<0.0001	0.29	0.16	0.046	36	-	0	-	-
		PFOS + PFHxS	94	<0.0001	0.2987	0.019	0.052	42	0	0	-	-
		PFOA	94	<0.0001	<0.005	-	-	13	0	0	-	-
Offset Area	<2	PFOS	184	<0.0001	2.3	0.1	0.22	159	EC (dir.) – 1 EC (ind.) - 132	EC (dir.) – 0 EC (ind.) – 109	EC (dir.) – 0.17 EC (ind.) – 0.011[70]	EC (dir.) – no EC (ind.) – yes
		PFOS + PFHxS	184	<0.0002	2.338	0.12	0.23	163	HC[71] - 1	0	HC – 0.194	No
		PFOA	184	0.0001	0.011	-	-	9	0	0	-	-
	>2	PFOS	43	<0.0001	1.8	0.14	0.36	26	0	0	-	-
		PFOS + PFHxS	43	0.0001	2.06	0.19	0.41	31	HC - 2	0	HC - 0.586	No
		PFOA	43	<0.0001	0.0269	-	-	8	0	0	-	-

[65] Health based criteria assuming commercial / industrial land use for the Construction Area and recreational / open space criteria for the Offset Area and for soil <2m and >2m (HEPA 2020 NEMP 2.0). Ecological criteria assuming industrial commercial for the Construction Area and public open space / residential for the Offset Area for soil <2m (HEPA 2020 NEMP 2.0).
[66] Excluding samples results greater than 250% of the adopted criteria.
[67] Standard deviation must be less than 50% of the adopted criteria.
[68] 'EC (ind.)' – interim soil – ecological indirect exposure (HEPA 2020 NEMP 2.0). It should be noted that the ecological indirect exposure criteria of 0.14 mg/kg was adopted for the Construction Area on the basis that the Site has been intensively developed in the past and further intensive development is proposed which will limit the presence of secondary consumers and the potential for indirect ecological exposure. Where site characteristics do not support the use of the higher criteria, the default trigger value of 0.01 mg/kg should be utilised.
[69] Hotspot exceedances of ecological indirect criteria are all located in areas that are proposed to be covered with impermeable pavement or building footprints.
[70] Standard deviation exceeds 50% of the adopted criteria.
[71] 'HC' – human health screening values – Public open space (Offset Area) / commercial / industrial (Developable Portion (HEPA 2020 NEMP 2.0).

Table A4 – Summary of Historical Neutral pH Leachate PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth (m BGL)	Analyte	No. of samples	Minimum conc. (µg/L)	Maximum Conc. (µg/L)	Mean Conc. (µg/L)	Standard Deviation (µg/L)	No. Samples >LOR	95% UCL_{mean} (µg/L)
Construction Area	< 2	PFOS	123	<0.01	80	2.2	8.6	88	-
		PFOS + PFHxS	123	<0.01	80.66	2.4	8.9	99	-
		PFOA	123	<0.01	0.55	0.026	0.069	40	-
	> 2	PFOS	47	<0.01	71	2.1	10	23	-
		PFOS + PFHxS	47	<0.01	84	2.6	12	28	-
		PFOA	47	<0.01	0.92	0.037	0.14	9	-

Table A5 – Summary of Historical Sediment PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth (m)	Analyte	No. of samples	Minimum conc. (mg/kg)	Maximum Conc. (mg/kg)	Mean Conc. (mg/kg)	Standard Deviation (mg/kg)	No. Samples >LOR
Construction Area	< 0.1	PFOS	39	<0.0005	0.0568	0.004	0.011	31
		PFOS + PFHxS	39	<0.005	0.0647	0.0045	0.013	31
		PFOA	39	<0.0005	<0.0005	0.0003	0	0
Offset Area	< 0.1	PFOS	31	0.0005	0.922	0.04	0.16	31
		PFOS + PFHxS	31	0.0005	0.9276	0.043	0.17	31
		PFOA	31	<0.0005	0.0023	0.0004	0.0004	2

Table A6 – Summary of Historical Surface Water PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Analyte	No. of samples	Minimum conc. (µg/L)	Maximum Conc. (µg/L)	Mean Conc. (µg/L)	Standard Deviation (µg/L)	No. Samples >LOR
Developable Portion	PFOS	18	0.004	0.749	0.11	0.2	18
	PFOS + PFHxS	18	0.004	1.099	0.2	0.32	18
	PFOA	18	<0.002	0.02	0.0042	0.0068	4
Offset Area	PFOS	11	0.018	87.9	8.1	26	11
	PFOS + PFHxS	11	0.023	97.56	9.1	29	11
	PFOA	11	<0.002	0.453	0.046	0.14	8

Table A7 – Summary of Historical Groundwater PFOS, PFOS + PFHxS and PFOA Concentrations On-site

Area	Depth of well (m)	Analyte	No. of samples	Minimum conc. (µg/L)	Maximum Conc. (µg/L)	Mean Conc. (µg/L)	Standard Deviation (µg/L)	No. Samples >LOR	No. Samples > Criteria[72]	95% UCL_{mean} (µg/L)	95% UCL_{mean} Exceedance of Criteria
Construction Area	Shallow (<6 m BGL)	PFOS	9	0.012	152	33	49	9	9	63.54	Yes
		PFOS + PFHxS	8	0.15	422	101	143	8	8	196.7	Yes
		PFOA	9	<0.002	21.6	3.8	7	7	4	29.36	Yes
	Intermediate	PFOS	25	0.0021	68.4	10	19	25	25	47.47	Yes
		PFOS + PFHxS	20	0.0021	93.1	20	30	20	18	48.08	Yes
		PFOA	25	<0.001	2.13	0.28	0.59	17	4	1.454	Yes
	Deep (>12 m BGL)	PFOS	79	<0.0001	66	2.1	7.8	75	75	5.939	Yes
		PFOS + PFHxS	69	<0.001	111	6.3	16	67	52	18.51	Yes
		PFOA	79	<0.001	1.9	0.11	0.26	57	4	0.236	No
Offset Area	Shallow (<6 m BGL)	PFOS	34	<0.002	348	30	90	33	33	126.6	Yes
		PFOS + PFHxS	34	<0.002	550	87	151	33	33	159.8	Yes
		PFOA	34	<0.002	8.12	1.3	2	32	15	2.229	Yes
	Intermediate	PFOS	100	<0.002	624	32	75	99	99	64.22	Yes
		PFOS + PFHxS	99	0.0022	656	46	88	99	95	84.74	Yes
		PFOA	100	<0.001	12.4	0.79	1.6	95	31	1.051	Yes
	Deep (>12 m BGL)	PFOS	13	0.0065	3.2	0.69	1	13	13	1.886	Yes
		PFOS + PFHxS	13	0.0135	4.34	1.3	1.4	13	10	1.938	Yes
		PFOA	13	<0.001	0.054	0.017	0.018	8	0	0.0262	No

[72] Criteria adopted for human health (drinking water and recreational water quality) and ecological (Freshwater 99% species protection) (HEPA 2020 NEMP 2.0).

Assessment of Precursors

EP Risk (2018) reported that total oxidising precursor assay ('TOPA') results indicated that total oxidising concentrations of PFOS and PFHxS + PFOS were generally decreasing in concentration post oxidation under laboratory conditions using a strong oxidant. Based on the laboratory results, it is considered unlikely that significant transformation of PFAS precursors would occur under the less oxidising conditions present on-site.

AEC 4 - Underground services associated with High Risk utilities and Anthropogenic Fill

With the removal of EEC access constraints and approval to remove vegetation, the following known and/or potential contamination impact(s) remaining within the vegetated areas requiring management under the RAP (Golder 2016) when accessible, comprise:

- Underground services, in particular those associated with high risk utilities that will be removed;
- Anthropogenic fill; and
- Stockpiles of asbestos impacted materials.

The areas of known impacts remaining within vegetated areas are illustrated on **Figure 2** (**Attached Figures**) and tabulated within **Appendix C.**

Sensitive Receptors

Sensitive receptors identified at and near the Site are:

- On-site receptors:
    - Construction, remediation and subsurface maintenance workers and future commercial / industrial site users.
    - Terrestrial flora and fauna including threatened species in the Offset Area.
    - Future terrestrial flora and fauna in proposed landscaped areas located within the Developable Portion.
- Off-site receptors:
    - Recreational users of the Georges River.
    - Terrestrial and aquatic flora and fauna dependent upon the Georges River and Anzac Creek.

Source-Pathway-Receptor Linkages

Based upon the findings of the most recent human health and ecological risk assessments prepared for the Site and the Georges River by EnRiskS (2019 and 2019a) and Golder (2015a), an analysis of the potential source-pathway-receptor linkages are provided in **Table A8** and illustrated in **Figure 3** in the '**Figures**' section of the report.

Table A8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	**Secondary**	**Transport Mechanisms**	**Exposure Pathways**		
AEC1 – Chlorinated Hydrocarbon Impacted Area					
Chlorinated hydrocarbon impacted groundwater from the adjoining property to the north	Soil	Direct contact	Human Health - incidental ingestion. - Dermal contact. - Dust inhalation	- Sub-surface maintenance workers. - Future commercial / industrial site users. - General public	Not complete as soil impact is located at depths below the likely maximum depth of excavation in this area.
			Ecological (direct) - Direct uptake	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Not complete as soil impact is located at depths below 2m.
	Soil vapour	Vapour migration	Human Health - inhalation of vapour.	- Sub-surface maintenance workers. - Future commercial / industrial site users. - General public	Potentially complete if appropriate health and safety controls and PPE are not implemented during construction or sub-surface maintenance works and if the future land use includes buildings or permanent structures in this area. Management of this linkage to be included in the LTEMP and unlikely to be complete during vegetation removal and remediation of AEC 4.
	Impacted groundwater	Groundwater migration	Human Health - incidental ingestion. - Dermal contact.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Not complete as it is unlikely that groundwater would be encountered during construction works or extracted for a beneficial use.
			Ecological - Direct uptake. - Bioaccumulation and biomagnification.	Ecosystems dependent upon the Georges River and Anzac Creek.	Not complete as it is unlikely that chlorinated impacted groundwater would migrate to the Georges River.

Table A8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	**Secondary**	**Transport Mechanisms**	**Exposure Pathways**		
AEC 2 – Petroleum Hydrocarbon Impacted Area					
Petroleum hydrocarbon impacted groundwater from the adjoining property to the east	Soil	Direct contact	Human Health - incidental ingestion. - Dermal contact. - Dust inhalation	- Sub-surface maintenance workers. - Future commercial / industrial site users. - General public	Not complete as soil impact is located at depths below the likely maximum depth of excavation in this area.
			Explosive atmospheres	Damage to buried infrastructure or aesthetic impacts to human receptors	Unlikely to be complete given the marginal exceedance, the location of the exceedance at the source area of the IMEX Site and the fact that all other samples were below management limits.
			Ecological (direct) - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Not complete as soil impact is located at depths below 2m.
	Soil vapour	Vapour migration	Human Health - inhalation of vapour.	Future commercial / industrial site users in a building with a basement	Potentially complete if appropriate health and safety controls and PPE are not implemented during construction or sub-surface maintenance works and if the future land use includes buildings or permanent structures with basements in this area. Management of this linkage to be included in the LTEMP and unlikely to be complete during vegetation removal and remediation of AEC 4.

Table A8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	**Secondary**	**Transport Mechanisms**	**Exposure Pathways**		
	Impacted groundwater	Groundwater migration	Human Health - incidental ingestion. - Dermal contact.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Not complete as it is unlikely that groundwater would be encountered during construction works or extracted for a beneficial use.
			Ecological - Direct uptake. - Bioaccumulation	Ecosystems dependent upon the Georges River and Anzac Creek.	Not complete as it is unlikely that petroleum impacted groundwater would migrate to the Georges River.
AEC3 – PFAS Impacted Area					
Construction Area					
Application of AFFF to ground at fire-fighting training areas: • Dust Bowl • FFTA	PFAS impacted soil and sediment within primary source areas and surrounding land.	- Leaching of PFAS through the soil profile to groundwater. - Leaching of PFAS from exposed soil to surface water.	Human Health - incidental ingestion. - Dermal contact. - inhalation of dust.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Potentially complete if appropriate health and safety controls and PPE are not implemented during construction or sub-surface maintenance. Management of this linkage to be included in the LTEMP and unlikely to be complete during vegetation removal and remediation of AEC 4.
			Ecological (direct) - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Potentially complete if appropriate soil management controls are not implemented due to the high leachable levels reported in Table A4. Management of this linkage to primarily be provided by the implementation of the LTEMP. Additional controls provided in the CMP for vegetation removal and remediation of AEC 4 where relevant.

Table A8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	**Secondary**	**Transport Mechanisms**	**Exposure Pathways**		
			Ecological (indirect) - Bioaccumulation and biomagnification.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Potentially complete if appropriate soil management controls are not implemented due to the high leachable levels reported in Table A4. Management of this linkage to primarily be provided by the implementation of the LTEMP. Additional controls provided in the CMP for vegetation removal and remediation of AEC 4 where relevant.
	PFAS impacted surface water and sediment within primary source areas and surrounding land.	Groundwater migration and surface water flow to the Georges River and Anzac Creek.	Human Health - incidental ingestion. - Dermal contact.	- Construction, remediation, subsurface maintenance workers. - Future commercial / industrial site users.	Not complete as it is unlikely that groundwater would be encountered during construction works or extracted for a beneficial use.
			Ecological - Direct uptake. - Bioaccumulation and biomagnification.	Ecosystems dependent upon the Georges River and Anzac Creek.	Potentially complete if appropriate soil management controls are not implemented due to the high leachable levels reported in Table A4. Management of this linkage to primarily be provided by the implementation of the LTEMP. Additional controls provided in the CMP for vegetation removal and remediation of AEC 4 where relevant.

Table A8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	**Secondary**	**Transport Mechanisms**	**Exposure Pathways**		
Offset Area					
Application of AFFF to ground at fire-fighting training areas: • Dust Bowl • FFTA	PFAS impacted soil and sediment within primary source areas and surrounding land.	- Leaching of PFAS through the soil profile to groundwater. - Leaching of PFAS from exposed soil to surface water.	Human Health - incidental ingestion. - Dermal contact. - inhalation of dust.	- Revegetation workers. - Recreational users who trespass on the Offset Area. - Recreational users of the Georges River.	Not complete due to the limited access provided.
			Ecological (direct) - Direct uptake.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Not complete.
			Ecological (indirect) - Bioaccumulation and biomagnification.	Terrestrial flora and fauna exposed to soil (<2 mBGL).	Complete (exposure to secondary consumers). Management provided by the implementation of the LTEMP and not relevant to vegetation clearing which is limited to the Construction Area.
	PFAS impacted surface water and groundwater within primary source areas and surrounding land.	Groundwater migration and surface water flow to the Georges River and Anzac Creek.	Human Health - incidental ingestion. - Dermal contact.	Recreational users of the Georges River.	Not complete**.**
			Human Health - Consumption of fish	Recreational users of the Georges River.	Complete (exposure by children who consume for than two serves of fish per month sourced from the Georges River adjacent to the Site). Managed by the implementation of institutional controls restricting fishing in the portion of the Georges River adjacent and downstream of the Site as detailed in the LTEMP. Not relevant to vegetation clearing which is limited to the Construction Area.

Table A8 – Source-Pathway-Receptor Linkages

Sources		Pathways		Receptors	Linkages
Primary	**Secondary**	**Transport Mechanisms**	**Exposure Pathways**		
			Ecological - Direct uptake.	Ecosystems dependent upon the Georges River and Anzac Creek.	Not complete.
			Ecological - Bioaccumulation and higher order consumers.	Ecosystems dependent upon the Georges River and Anzac Creek.	Complete (The potential for adverse effects to the environment cannot be excluded. The assessment of potential impacts is noted to be complicated by other, as yet unknown, sources that contribute to PFAS impacts in the Georges River). Managed through the implementation of a monitoring program to be developed in the LTEMP. Not relevant to vegetation clearing which is limited to the Construction Area.
AEC 4 – Underground services associated with High Risk utilities and Anthropogenic Fill					
Underground services, in particular those associated with high risk utilities that will be removed. Anthropogenic fill. Stockpiles of asbestos impacted materials.	NA	Wind and Mechanical Disturbance	Human Health – Inhalation of Dust. Aesthetic - Visual.	Construction and Maintenance Workers	Complete during vegetation removal

Based on the information presented in **Table A8**, the following source – pathway – receptor linkages presented in **Table A9** will require management.

Table A9 – Management of Potentially Contaminating Activities associated with the Proposed Development

AEC[73]	Source-Pathway-Receptor	Management Document
AEC 1	Vapour migration of chlorinated hydrocarbons from groundwater to sub-surface maintenance workers	LTEMP
	Vapour migration of chlorinated hydrocarbons from groundwater to site workers working within buildings located in this area	LTEMP
	Extraction of groundwater for a beneficial use or for construction	LTEMP
AEC 2	Vapour migration of petroleum hydrocarbons from groundwater to sub-surface maintenance workers	LTEMP
	Vapour migration of petroleum hydrocarbons from groundwater to site workers working within buildings located in this area	LTEMP
	Extraction of groundwater for a beneficial use or for construction	LTEMP
AEC 3	Incidental Ingestion, dermal contact, and inhalation of dust from soil by construction workers and sub-surface maintenance workers	LTEMP
	Leaching and erosion of PFAS from impacted soil to surface water and groundwater associated with excavation and stockpiling activities	LTEMP
	Extraction of groundwater for a beneficial use or for construction	LTEMP
	Indirect contact of PFAS impacted soil to secondary consumers in the Offset Area	LTEMP
	Consumption of fish from the Georges River impacted with PFAS	LTEMP
	Bioaccumulation of PFAS in organism's dependent upon the Georges River.	LTEMP
AEC 4	Inhalation of dust by construction and remediation workers involved in remediation of AEC 4. Management of visual impact during removal of anthropogenic materials.	CMP

It is considered that as limited soil disturbance will occur during vegetation clearance long-term management of AEC 1, AEC 2 and AEC 3 will be primarily provided through the implementation of the LTEMP. Consideration of the contaminants of potential concern in AEC 1, AEC 2 and AEC 3 will be provided for vegetation clearing and remediation and management of AEC 4 within this CMP where relevant.

[73] Only vegetation removal is proposed within AEC 1, AEC 2 and AEC 3 and not soil disturbance. Any specific remediation required for AEC 4, which also occur in AEC 1, AEC 2 and AEC 3 will consider the management of the additional contaminants of potential concern where relevant.

Appendix B

COMPLIANCE MATRIX

Table A1 – Conditions of Consent (CoC) – SSD 7709

CoC	Requirement	Document Reference	How Addressed
C1	The applicant must ensure that the environmental management plans required under this consent are prepared in accordance with any relevant guidelines, and include: a) Baseline data; b) A description of: (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: (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: (i) Incidents and non-compliances; (ii) Complaints; (iii) Non-compliances with statutory requirements; and h) Roles and responsibilities for implementing the plan; and i) A protocol for periodic review of the plan.	a) **Section 3 and 4 and Appendix E**; b) (i) **Section 2**; (ii) **Section 4.9**; (iii) **Section 4.9 and Appendix E**; c) **Section 5 and Appendix E**; d) (i) **Section 6 and Appendix E**; and (ii) **Section 6 and Appendix E.** e) **Section 5.11**; f) **Section 6**; g) (i) **Section 6**; (ii) **Section 6**; (iii) **Section 6**; and h) **Section 2.2 and Table 2**. i) **Section 6.1.**	(i) Includes known site conditions and summarised remaining contamination issues; (ii) (i) Covers any relevant approval and/or licence 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; (iii) Specifies the details of each management plan as required by Golder (2016a); (iv) (i) 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; (v) Details the Unexpected Finds Procedure in relation to contamination; (vi) Continual improvement for the CMP is discussed; (vii) (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 (viii) Lists the responsibilities for the CMP Implementation. (ix) Specified how the CMP will be reviewed/updated.

Table A1 – Conditions of Consent (CoC) – SSD 7709

CoC	Requirement	Document Reference	How Addressed
B164	Prior to vegetation clearing: a) The Application must identify contamination within vegetated areas and prepare options for remediation in those areas, with the objectives to: (i) Retain vegetation to the greatest extent possible beyond the completion of remediation; (ii) Minimise land disturbance in accordance with condition B41; and (iii) Not reduce the ability to provide connectivity and habitat corridors in accordance with Conditions B2 and B152. b) where remediation requires prior vegetation clearing, an appropriate assessment of the impact of clearing on contaminated land must be prepared by a suitably qualified and experienced consultant; and (c) where contamination is identified as occurring within those areas where vegetation is proposed to be cleared, a **Contamination Management Plan** must be prepared in consultation with the Site Auditor detailing the location and nature of the contamination and the proposed remediation and/ or management measures that will be undertaken to address the on-site and potential off-site impacts.	a) This Plan, Golder (2016a) RAP and JBS&G (2020) b)This Plan, Golder (2016a) RAP and JBS&G (2020) c) This Plan	a) i) This plan and JBS&G (2020) provide the location and nature of contamination remaining within vegetated areas and the required management as per Golder (2016a). The contamination is associated with isolated hotspots of anthropogenic materials, fill material and high-risk utilities within vegetated areas and are shown as AEC 4 in **Appendix D**. The Golder (2016a) RAP reviewed options for remediation of anthropogenic materials, fill material and high-risk utilities which included onsite treatment, offsite treatment, excavation and disposal and consolidation and isolation. The preferred remediation method was excavation and off-site disposal. The remediation of contamination in vegetated areas proposed in this Plan is consistent with the Golder (2016a) RAP and are outlined in **Appendix E**, with the validation program provided in **Section 5.** This plan provides management of vegetation clearing during remediation in **Appendix E**. a) ii) Land disturbance is to be managed in accordance with Section 5.8 of the approved CSWMP rev10 prepared by Costin Roe Consulting. a) iii) All habitat corridors are within the biodiversity corridor and as no remediation is proposed for the biodiversity corridor, conductivity is retained as is consistent with the Koala Management Plan (Condition B152) and the development layout plan (B2). b) Consideration on the impact of clearing has been provided in this Plan.

Table A1 – Conditions of Consent (CoC) – SSD 7709

CoC	Requirement	Document Reference	How Addressed
			c) The CMP[74] was provided to the Site Auditor for review and consideration in the preparation of the site audit statement and site audit report.

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
8a)	MPW Concept EIS, Soil and Contamination PEMF Section 6.2 – Management controls – Early Works and Construction phase	Contaminated soil/fill material present will be 'chased out' during the excavation works based on visual, olfactory, and preliminary field test results.	**Section 4.7** provides an overview on the remaining contamination issues remaining in vegetated areas with full details provided in: **Appendix E**– **CMP03** describes the chase out of impacted soils and fill. Should unexpected finds be identified they will be managed in accordance with **Section 5.13.**
		Excavated soil would be temporarily stockpiled, sampled, and analysed for waste classification processes. Following receipt of waste classification results, the material would be transported to a licensed off-site waste disposal facility as soon as practicable to minimise dust and odour issue through storage of materials on-site	**Section 5.15.**
		Stockpiled soils would be stored on a sealed surface and the stockpiled areas would be securely bunded using silt fencing to prevent silt laden surface water from entering or leaving the stockpiles or the Project site.	**Section 5.15** and **CMP05** (**Appendix E**) and the Construction Environmental Management Plan (CEMP) sub-plans.
		All excavation works would be undertaken by licensed contractor experienced in remediation projects and the handling of contaminated soils.	Management measures – *approvals licences and notifications* – **Section 2 and 5.5** Unexpected Finds – **Section 5.13** and **CMP06** (**Appendix E**).
		All asbestos removal, transport and disposal must be performed in accordance with the Work Health and Safety Regulation 2011 (WH&S Regulation).	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).

[74] EP Risk (2020) *Contamination Management Plan Moorebank Precinct West Site, 400 Moorebank Avenue, Moorebank NSW*, dated 10 June 2020 (ref: EP1489.002_MPW_CMP v7.0).

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		The removal works would be conducted in accordance with the National Occupational Health and Safety Commission Code of Practice for the Safe Removal of Asbestos, 2nd Edition [NOHSC 2002 (2005)] (NOHSC 2005a).	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
		An appropriate asbestos removal licence issued by WorkCover would be required for the removal of asbestos impacted soil.	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
		Environmental management and WH&S procedures would be put in place for the asbestos removal during excavation to protect workers, surrounding residents and the environment.	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
		Temporary stockpiles of asbestos containing material (ACM) soils would be covered to minimise dust and potential asbestos release	**CMP03** (**Appendix E**)
		An asbestos removal clearance certification would be prepared by an occupational hygienist at the completion of the removal work. This would follow the systematic removal of asbestos containing materials and any affected soils from the Project site and validation of these areas (through visual inspection and laboratory analysis of selected soil samples).	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
		Asbestos fibre air monitoring would be undertaken during the removal of the asbestos materials and in conjunction with the visual clearance inspection. The monitoring would be conducted in accordance with the National Occupational Health and Safety Commission Guidance Note on the Membrane Filter Method for the Estimating Airborne Asbestos Fibre, 2nd Edition [NOHSC 3003 (2005)] (NOHSC 2005b).	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
		All stockpiles would be maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials.	**Section 5.15** and **CMP05** (**Appendix E**)
		Stockpiles would be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in unremediated areas of the Project site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas).	**Section 5.15** and **CMP05** (**Appendix E**) and associated sub-plans to the CEMP.

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		Stockpiles would only be constructed in areas of the Project site that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix G of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 4. All such preparatory works would be undertaken prior to the placement of material in the stockpile. Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil.	**Section 5.15** and **CMP05** (**Appendix E**) and associated sub-plans to the CEMP.
		The stockpiles of contaminated material would be covered with a waterproof membrane (such as polyethylene sheeting) to prevent increased moisture from rainwater infiltration and to reduce windblown dust or odour emission	**Section 5.15** and **CMP05** (**Appendix E**) and associated sub-plans to the CEMP.
		Before the reuse of any material on-site, it would be validated so that the lateral and vertical extent of the contamination is defined	**CMP05** (**Appendix E**)
		Where required, contaminated materials and wastes generated from the Project remediation and construction works would be taken to suitable licensed offsite disposal facilities	**CMP04** (**Appendix E**)
8a)	MPW Concept EIS, Soil and Contamination PEMF Section 6.4– monitoring	Within each of the Project specific management plans, the private sector developer would need to detail what monitoring would be undertaken to ensure compliance with the following:	
		The Project's EIS, with respect to the commitments made as well as the management and mitigation measures proposed;	Monitoring requirements summarised in **Section 6.5**
		Project approvals issued under the EPBC Act and EP&A Act;	Conditions of consent and approval compliance specified in **Section 2.1** and **Appendix B.**
		Contractual requirements established between MIC and the developer and operator for the Project;	N/A
		Other permits and/or licences required during the Project; and	**Section 2** **Section 6.5**
		Objectives, targets, and indicators as presented in this PEMF.	Discussed above - reference MPW Concept EIS, Soil and Contamination PEMF Section 5 – Table 5.1

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
			Also see **Section 4.9**
8a)	MPW Concept EIS, Soil and Contamination PEMF Section 6.5 – Management response to incidents and non-compliances	Contaminated soil/spoil and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal).	**CMP05**
8b) and c)	REMM 7A	To minimise the risk of leakages involving natural gas, liquid natural gas (LNG) and flammable and combustible liquids to the atmosphere: appropriate standards for a gas reticulation network, including AS 2944-1 (2007) and AS 2944-2 (2007), would be referred to in the detailed design process; correct schedule pipes would be used; a fire protection system would be installed if necessary for gas users; cathodic protection would be installed for external corrosion if appropriate; and access to the Project site would be secure.	See Management commitments **Appendix G**
	REMM 7B	To minimise the risks of leakage of LNG and liquid petroleum gas (LPG) and flammable liquids during transport: materials would be transported according to the Australian Dangerous Goods (ADG) Code, relevant standards and regulations; and contractors delivering the gas would be trained, competent and certified by the relevant authorities	See Management commitments **Appendix G**
	REMM 7C	To minimise hazards associated with venting of natural gas, LNG and LPG: LNG storage would be designed to AS/NZS 1596-2008 standards; access to the Project site would be secure; and significant separation distances to residences and other assets would be put in place	See Management commitments **Appendix G**

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
8b) and c)	REMM 7D	Storage of flammable/combustible liquids would be carried out in accordance with AS 1940, with secondary containment in place and location away from drainage paths	See Management commitments **Appendix G**
	REMM 7E	Standby or emergency generators and transformers would all have secondary containment	See Management commitments **Appendix G**
	REMM 7F	Oil coolers would generally be located in areas where leaks and runoff are appropriately controlled at source or in a retention basin.	See Management commitments **Appendix G**
	REMM 7I	No hazardous or regulated wastes would be disposed of onsite.	**CMP04**
	REMM 7J	All offsite disposals would be carried out by approved transport operators and to approved facilities	**CMP04**
	REMM 7K	Other dangerous goods, including any waste materials present on the Project site, would be suitably contained, with secondary containment and runoff controls implemented where appropriate to prevent leaks or spills migrating to environmentally sensitive areas, in particular via stormwater systems that drain to the Georges River.	See Management commitments **Appendix G**
	REMM 8B	Before construction, a remediation program would be implemented in accordance with the Moorebank Intermodal Terminal Preliminary Remediation Action Plan (RAP) (or equivalent). The program will have been formally reviewed and approved by the Site Auditor under Part 4 of the NSW Contaminated Land Management Act 1997 (CLM Act).	Currently Stage 1 works are completed and have been completed in accordance with the RAP (Golder 2016a). The outcomes of the remediation are documented in the Validation Report (JBS&G 2020) under review by the Site NSW EPA Accredited Auditor. The remaining contamination within vegetated areas is documented the CMP along with the management measures. **Section 5 and Appendix E**
	REMM 8D	An unexploded ordnance (UXO) management plan (or equivalent) would be developed for the Project site. This plan would detail a framework for addressing the discovery of UXO or explosive ordnance waste (EOW) to ensure a safe environment for all Project staff, visitors, and contractors.	**Section 5.12 and Appendix F**
	REMM 8E	An ASS management plan (or equivalent) would be developed in accordance with the ASSMAC Assessment Guidelines (1998), with active	A separate plan has been developed. Not included in the CMP.

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		ongoing management through the construction phases. Offsite disposal would need to be in accordance with the NSW Waste Classification Guidelines Part 4: Acid Sulfate Soils (2009).	
	REMM 8F	Further testing of residual sediments would be undertaken to gather data to inform the management of sediments likely to be disturbed/dewatered during construction.	It is understood no dams are positioned within vegetated areas.
	REMM 8G	Ground penetrating radar (GPR) or similar techniques would be used to locate and document all existing and underground tank infrastructure across the Project site.	This process was conducted as part of the Stage 1 MPW works and is documented in the validation report (JBS&G 2020).
	REMM 8H	A management tracking system for excavated materials would be developed to ensure the proper management of the material movements at the Project site, particularly during excavation works.	**Section 5.16** – Materials Tracking
	REMM 8I	Contaminated soil/fill material present will be 'chased out' during the excavation works based on visual, olfactory, and preliminary field test results.	**Section 4.7** provides an overview on the remaining contamination issues with full details provided in **Appendix A**. **Appendix E CMP03** describes the chase out of impacted soils and fill. Should unexpected finds be identified they will be managed in accordance with **Section 5.13.**
	REMM 8J	Excavated soil would be temporarily stockpiled, sampled and analysed for waste classification processes. Subject to receipt of waste classification results, the material would be transported to a licensed offsite waste disposal facility as soon as practicable to minimise dust and odour issue through storage of materials on site.	**Section 5.15**
8b) and c)	REMM 8K	Stockpiled soils would be stored on a sealed surface and the stockpiled areas would be securely bunded using silt fencing to prevent silt laden surface water from entering or leaving the stockpiles or the Project site	**Section 5.15** and the CEMP sub-plans.

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
	REMM 8L	All excavation works associated with potential contaminated lands would be undertaken by licensed contractors, experienced in remediation projects and the handling of contaminated soils.	Management measures – *approvals licences and notifications* – **Section 5.4** Unexpected Finds – **Section 5.13.**
	REMM 8M	All asbestos removal, transport and disposal would be performed in accordance with the Work Health and Safety Regulation 2011 (WHS Regulation)	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
	REMM 8N	The removal works would be conducted in accordance with the National Occupational Health and Safety Commission Code of Practice for the Safe Removal of Asbestos, 2nd Edition [NOHSC 2002 (2005)] (NOHSC 2005a).	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
	REMM 8RO	An appropriate asbestos removal licence issued by WorkCover NSW would be required for the removal of asbestos contaminated soil.	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
	REMM 8P	Environmental management and WHS procedures would be put in place for the asbestos removal during excavation to protect workers, surrounding residents and the environment.	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
	REMM 8Q	Temporary stockpiles of asbestos containing material (ACM) soils would be covered to minimise dust and potential asbestos release	**Section 5.15** and **CMP03** (**Appendix E**) and associated sub-plans to the CEMP.
	REMM 8R	An asbestos removal clearance certification would be prepared by an occupational hygienist at the completion of the removal work. This would follow the systematic removal of asbestos containing materials and any affected soils from the Project site, and validation of these areas (through visual inspection and laboratory analysis of selected soil samples)	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).
8b) and c)	REMM 8S	Asbestos fibre air monitoring would be undertaken during the removal of ACMs and in conjunction with the visual clearance inspection. The monitoring would be conducted in accordance with the National Occupational Health and Safety Commission	Included within the Asbestos in Soils Management Plan **(Golder 2016b)** and **CMP03** (**Appendix E**).

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		Guidance Note on the Membrane Filter Method for the Estimating Airborne Asbestos Fibre, 2nd Edition [NOHSC 3003 (2005)] (NOHSC 2005b).	
	REMM 8T	All stockpiles would be maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials	**Section 5.15**
	REMM 8U	Stockpiles would be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in unremediated areas of the Project site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas)	**Section 5.15** and associated sub-plans to the CEMP.
	REMM 8V	Stockpiles would only be constructed in areas of the Project site that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix G of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 5A and 5B. All such preparatory works would be undertaken before material is placed in the stockpile. Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil	**Section 5.15** and associated sub-plans to the CEMP.
8b) and c)	REMM 8W	Any stockpiles of contaminated material would be covered with a waterproof membrane (such as polyethylene sheeting) to prevent increased moisture from rainwater infiltration and to reduce windblown dust or odour emission	**Section 5.15** and associated sub-plans to the CEMP.
	REMM 8X	Before the reuse of any material on site, it would be validated so that the lateral and vertical extent of the contamination is defined.	**Section 5.15**

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
	REMM 8Y	Where required, contaminated materials and wastes generated from the Project remediation and construction works would be taken to suitable licensed offsite disposal facilities	**Section 5.15**
	REMM 8Z	Where necessary, consider undertaking further investigations to determine whether other buildings have organochlorine pesticides (OCP) impacts subgrade materials, and to quantify the volume of OCP impacted materials across the site	Not relevant all buildings have been removed as part of the Stage 1 Early Works.
	REMM 8AA	Additional Aqueous Film Forming Foam assessment (AFFF) be undertaken to determine if any direct remedial and/or management actions are required. A stage approach is considered appropriate and is detailed in the Preliminary AFFF Assessment (Golder Associates 2015b).	Additional PFAS Investigations have been undertaken on the Site and are summarised in EP Risk (2018).
8 d)	-	In relation to management of PFAS:	PFAS will be managed in accordance with the LTEMP.
	i)	be consistent with: National Environment Protection (Assessment of Site Contamination) Measure 1999 (as amended 2013) (ASC NEPM 2013). Australian and New Zealand Guidelines for Fresh and Marine Water Quality (under the National Water Quality Management Strategy) including the draft default guideline values for perfluorooctanoic acid (PFOS) and perfluorooctane sulfonic acid (PFOA) in freshwater as applied by the State government relevant Commonwealth environmental management guidance on PFOS and PFOA	-
	ii)	detail implementation and operational procedures, appropriate to the risk posed by any contamination, including: roles and responsibilities management of potential PFAS contaminated sites as yet un-investigated	-

Table A2 – Conditions of Approval (CoA) – EPBC 2011/6086

CoA	Reference	Condition Requirement	Document Reference and How Addressed
		management of areas of known PFAS contamination, including strategies to reduce runoff, dewatering and migration of contamination across and off the proposed site a contingency action plan for unexpected PFAS contaminant discoveries	
	iii)	detail soil, groundwater, and surface water PFAS contamination monitoring requirements and testing and disposal procedures appropriate to the risk posed by any contamination	-
	iv)	include requirements for site validation reports appropriate to the risk posed by any contamination	-
	v)	include requirements for remedial action plans appropriate to the risk posed by any contamination	-
	vi)	detail review procedures appropriate to the risk posed by any contamination	-
	vii)	impose the following performance measures for managing earthworks and the potential for effects to occur due to disturbance of PFAS contaminated soils during construction: contaminated sediment to be discharged outside the site of the action to be minimised contaminated waste material, including excavated soil, to be released through dewatering to be handled appropriately to the risk posed by the contamination and disposed of in an environmentally sound manner such that potential for the PFAS content to enter the environment is minimised contaminated waste material, including excavated soil, with a PFOS or PFOA content above 50 milligrams per kilogram (mg / kg) to be stored or disposed of in an environmentally sound manner, such that PFAS content does not enter the environment all soil remaining at the site of the action to be suitable for purpose	-

Table A3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
OB	The CEMP, or equivalent, for the Proposal would be based on the PCEMP (Appendix I of this EIS), and include the following preliminary management plans: • Preliminary Construction Traffic Management Plan (PCTMP) (Appendix M of the EIS) • Air Quality Management Plan (Appendix O of the EIS) • Erosion and Sediment Control Plans (ESCPs) and Bulk Earthworks Plans, within the Stormwater Drainage Design Drawings (Appendix R of the EIS) As a minimum, the CEMP would include the following sub-plans: • Construction Traffic Management Plan (CTMP) • Construction Noise and Vibration Management Plan (CNVMP), prepared in accordance with the Interim Construction Noise Guideline • Cultural Heritage Assessment Report/Management Plan • Construction Air Quality Management Plan • Construction Soil and Water Management Plan (SWMP), prepared in accordance with Managing Urban Stormwater, 4th Edition, Volume 1, (2004) • ESCP • Flood Emergency Response and Evacuation Plan • UXO, EO, and EOW Management Plan • Acid Sulfate Soils Management Plan • Bushfire Management Strategy • Community Information and Awareness Strategy. • Flora and Fauna Management Plan (FFMP) • Groundwater Monitoring Program (GMP)	**Section 5.12** **Appendix F**	This plan includes the UXO, EO, and EOW Management Plan.
5A	A SWMP and ESCP, or equivalent, would be prepared for the Proposal. The SWMP and ESCPs would be prepared in accordance with the principles and requirements of the Blue Book and based on the Preliminary ESCPs provided in the Stormwater and Flooding Assessment Report (refer to Appendix R of the EIS). The following aspects would be addressed within the SWMP and ESCPs: Stockpiles would be located away from flow paths on appropriate impermeable surfaces, to minimise potential sediment transportation. Where practicable,	**Section 5.15**	While this plan is separate to the SWMP and ESCP it does include this requirement for the management of stockpiles.

Table A3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	stockpiles would be stabilised if the exposed face of the stockpile is inactive more than ten days, and would be formed with sediment filters in place immediately downslope		
5I	Stockpile sites established during construction are to be managed in accordance with stockpile management principles set out in Appendix L of this RtS. Mitigation measures within the Stockpile Management Protocol include: In order to accept fill material onto site, material characterisation reports/certification showing that the material being supplied is virgin excavated natural material (VENM) / excavated natural material (ENM) must be provided. Each truck entering the Site will be visually checked and documented to confirm that only approved materials that are 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 that the materials comply with the NSW EPA Waste Classification Guidelines and the Earthworks Specification for the MPW site. The frequency of assurance testing will be as nominated by the Environmental assuror/auditor. All trucks accessing the site for the purpose of clean general fill importation would enter and exit via the existing main Site access located from Moorebank Avenue. Ingress and egress to the stockpiling areas would be arranged so that the reversing of trucks within the site is minimised. Stockpiles would not exceed ten metres in height from the final site levels, with battered walls at gradients of 1V:3H For any stockpile heights greater than 4 m, benching would be implemented. Where reasonable and feasible, and to minimise the potential for erosion and sedimentation of stockpile(s), stockpile profiles would typically be at angle of repose (the steepest angle at which a sloping surface formed of loose material is stable) with a slight concave slope to limit the loss of sediments off the slope, or through the profile and the formation of a toe drain.	**Section 5.15**	These measures have been included in the CMP.

Table A3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	The top surface of the stockpile(s) would be slightly sloped to avoid ponding and increase run off. Topsoil stockpiles would be vegetated to minimise erosion. Stockpiles would be protected from upslope stormwater surface flow through the use of catch drains, berms, or similar feature(s) to divert water around the stockpile(s). A sediment control device, such as a sediment fence, berm, or similar, would be positioned downslope of the stockpile to minimise sediment migration. Any water seepage from stockpiles would be directed by toe drains at the base of the stockpiles toward the sediment basins or check dams and away from the emplacement or extraction working face. Newly formed stockpiles would be compacted (sealed off) using a smooth drum roller at the end of each working day to minimise water infiltration. Haul roads would be located alongside the stockpile to the work/tipping area. As per best practice, the catchment area of haul roads for surface water runoff would be approximately 2530 m lengths, facilitated by the provision of spine drains which would convey water from the haul road to toe drains at the base of the stockpile, and then to sediment basins. Temporary sediment basins would be established in accordance with the ESCP prepared for the site. Stockpiling of clean fill material is to be carried out during Works Period A (pre-construction) and Works Period D (bulk earthworks). Any imported clean general fill material that would be subject to stockpiling within the Proposal site for more than a 10-day period without being worked on, would be subject to stabilisation works, to minimise the potential for erosion. Where the material being stockpiled is less coarse or has a significant component of fines then surface and slope stabilisation would be undertaken. Methods for slope stabilisation may include one or a combination of the following: – Application of a polymer to bind material together – Application of hydro-seed or hydromulch – Covering batters with mulch to provide ground cover		

Table A3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	– Covering batters with geofabric – Use of a simple sprinkler system for temporary stockpiles, including use of radiating sprinkler nozzles to maintain fine spray over exposed surfaces – Other options identified by the Contractor Topsoil stockpiles would be seeded with a grass/legume or nitrogen fixing species (such as acacia) to assist in erosion control and reduce loss of beneficial soil nutrients and micro-organisms		
6A	The CEMP would identify the actions to be taken should additional contamination be identified during the development of the site (i.e. an unexpected finds protocol), and will address REMM items 8H, 8T, 8U, 8V and 8W (of the MPW Concept Plan Approval (SSD 5066)).	**Section 5.13**	The CMP details the unexpected finds protocol in relation to land contamination. Reference to how REMM items have been addressed is provided in **Appendix G**.
6B	A site-specific Remediation Action Plan (RAP) is not considered to be required for the Proposal. The following documentation would be utilised for the purposes of remediating the site: • The Preliminary Remediation Action Plan (PB, 2014a) • The Validation Plan – Principles (Golder, 2015b) • The Demolition and Remediation Specification (Golder 2015c) • Any other contamination documentation prepared for the remediation activities undertaken for MPW Early Works (Stage 1).	**Appendix E**	Currently Stage 1 works are completed and have been completed in accordance with the RAP (Golder 2016a). The outcomes of the remediation are documented in the Validation Report (JBS&G 2020) under review by the Site NSW EPA Accredited Auditor. Contamination remaining in vegetated areas is dealt with in this plan. All other remaining contamination will be discussed in the LTEMP.
6C	The CEMP would include the preparation of a site-wide UXO, EO, and EOW management plan (or equivalent) based on the UXO Risk Review and Management Plan (G-Tek, 2016). This plan would be implemented to address the discovery of UXO or EOW during construction, to ensure a safe environment for all staff, visitors, and contractors.	**Section 5.12** **Appendix F**	The plan outlines the review and actions required to manage any unexpected finds in relation to the UXO Risk.
6D	An Asbestos in Soils Management Plan (AMP) is to be implemented as part of the CEMP in accordance with the Safe Work NSW requirements, including but not limited to: • the Guidelines for Managing asbestos in or on soil (2014), and • Codes of Practice - How to Safely Remove Asbestos (2011) and	**Golder 2016b**	The asbestos in soils management plan has been developed in accordance with current Guidelines and codes of practice.

Table A3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	• How to Manage and Control Asbestos in the Workplace (2011).		
6E	An Acid Sulfate Soils Management Plan (ASSMP) (or equivalent) would be prepared as part of the CEMP in accordance with the ASSMAC Assessment Guidelines (1998), for areas identified as being of low or high risk i.e. works within close vicinity of the Georges River (Figure 13-2 of this EIS). In addition, a risk assessment quantifying the risks associated with the volumes of soil to be disturbed, the laboratory results from ASS testing undertaken, the end use of the materials and the proximity to sensitive environments is to be undertaken. All offsite disposal would be in accordance with the *NSW Waste Classification Guidelines Part 4: Acid Sulfate Soils* (2009).	N/A	A separate ASSMP has been prepared for the Site.
6F	The existing groundwater monitoring undertaken for the Proposal would continue. A GMP would be developed at the conclusion of remediation activities for the Proposal and included as part a Long-Term Environmental Management Plan (LTEMP) (to be prepared for approval by the Accredited Site Auditor and in association with the OEMP). The main purpose of the GMP would be to assist in the management of groundwater contamination (particularly PFAS impacts) at the site, and to minimise potential harm to human health and the environment. The GMP would achieve the following objectives: 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 Provide appropriate groundwater investigation levels (GILs) for groundwater contaminants, in accordance with the National Environment Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM). Should exceedances be identified, contingency plans for further investigations or remediation would be prepared. Provide appropriate trigger levels for key contaminants (where available), based on the receptor of interest and identified contaminants	N/A	A groundwater sampling strategy is included in the LTEMP.

Table A3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
	Serve as a compliance program, so that potential impacts to down-gradient receptors are identified before adverse effect occurs (relative to above objectives) 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. Establish groundwater conditions (i.e. concentrations and/or trends) which indicated that groundwater monitoring could be reduced or ceased and the requirements of the GMP absolved. The monitoring program is to be undertaken for two years post operation of the Proposal to ensure a range of seasonal and river flow variations is assessed. At the completion of the two-year period, subject to analysis of results, consideration would be given to whether this monitoring is required to continue. The approach to PFAS management will be confirmed following further monitoring in consultation with, and the approval of, the NSW EPA Accredited Site Auditor.		
6H	At the conclusion of remediation works, a Remediation and Validation Report (RVR) is to be prepared for the Proposal to facilitate the Auditor's review of remediation and validation activities. The RVR is to document the remediation and validation activities completed within specific areas of the Proposal, including: • Information relating to the materials used in the separation layers such as the soil types, geotextile materials, and sealant types etc. (if required) • An as-constructed plan of the site showing the locations, depths and materials of the separation layers installed at the site.	**Section 5.9 - Validation**	All management works will be documented within a validation report.
6I	The existing site-wide Long-Term Environmental Management Plan (LTEMP), such as the one established at the completion of Early Works, is to be revised at the completion of the Proposal remediation activities to include protocols for ongoing maintenance and/or monitoring or any long term remedial/mitigation measures to be implemented following completion of the Site Audit Statement.	**Section 5.9 - Validation**	Where required, the LTEMP will be updated, on the completion of the works outlined in this CMP.

Table A3 – Final Compilation of Mitigation Measures (FCMMs)

FCMM	Requirement	Document Reference	How Addressed
6J	In order to accept fill material onto site, the following will be undertaken: • Material characterisation reports/certification showing that the material being supplied is VENM/ENM must be provided. • Each truck entry will be visually checked and documented to confirm that only approved materials that are 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 that the materials comply with the NSW EPA Waste Classification Guidelines and the Earthworks Specification for the MPW site. The frequency of assurance testing will be as nominated by the Environmental assuror/auditor.	**Section 5.16 – Materials Tracking**	Both requirements for the acceptance of fill are stated within this section.
7A	The following measures would be included in the CEMP (or equivalent) to minimise hazards and risks: • Procedures for safe removal of asbestos • Provision for safe operational access and egress for emergency service personnel and workers would be provided at all times • An Incident Response Plan that would include a Spill Management Procedure.	**Golder 2016b**	This plan includes procedures for the safe removal of asbestos. The remaining two requirements are not the scope of this plan.
12A	The following mitigation measures would be implemented as part of the CEMP (or equivalent) for waste management: • Characterisation of construction waste streams in accordance with the NSW Waste Classification Guidelines • Management of any identified hazardous waste streams • Procedures to manage construction waste streams, including handling, storage, classification, quantification, identification, and tracking • Mitigation measures for avoidance and minimisation of waste materials • Procedures and targets for re-use and recycling of waste materials.	**Section 5.16**	These sections of the plan detail waste management and soil classification and treatment covering these requirements. The following requirements would form part of the Waste Management Plan on the Site and are not included in this plan: • Mitigation measures for avoidance and minimisation of waste materials • Procedures and targets for re-use and recycling of waste materials

Appendix C

LOCATION AND NATURE OF REMAINING IMPACTS

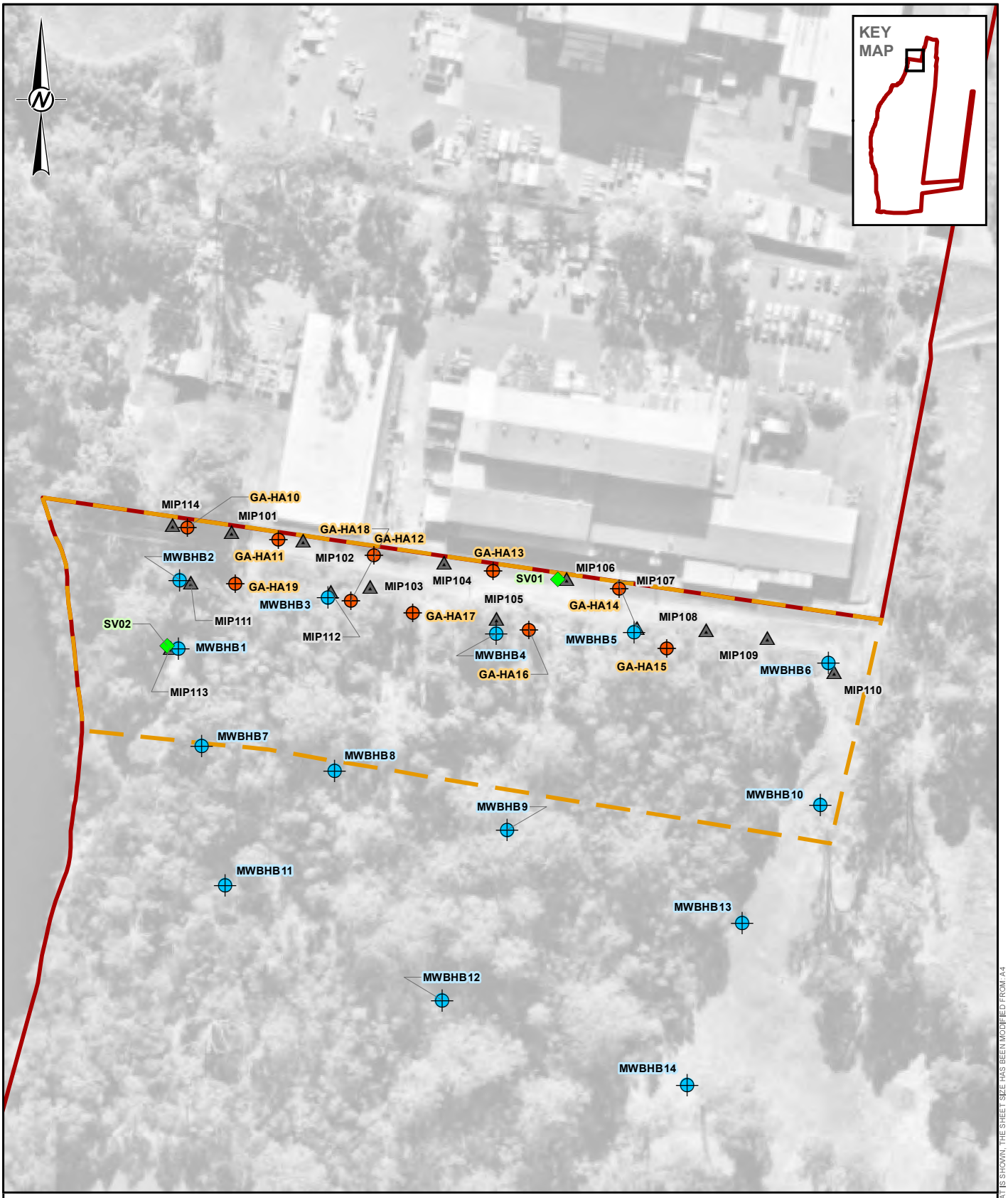
Source	CoPC	Media	Pathways	Receptors	Figures - Appendix C	Co-ordinates	CMP - Appendix E	Comments
AEC 4 - Underground services, those associated with high risk utilities								
UF07	surficial ACM fragments, PFAS	Soil	Inhalation	Construction Workers	None	307878.9316, 6240932.474	CMP03, CMP04, CMP05	Surficial ACM fragments
UF55-5	Asbestos pipe, PFAS	Soil	Inhalation	Construction Workers	JBS&G Figure 4.21	307822.2127, 6240947.202		
UF67-4	Asbestos pipe	Soil	Inhalation	Construction Workers	JBS&G Figure 4.6	308007.6279 6242034.499		It is unclear whether the pipe was removed during remediation works or remains in-situ, therefore additional investigation works are required and where appropriate, management of the remaining pipework.
UF77-4	Asbestos pipe	Soil	Inhalation	Construction Workers	JBS&G Figure 4.6	307959.6693 6242091.76		
UF79-3	Asbestos pipe	Soil	Inhalation	Construction Workers	JBS&G Figure 4.5	307905.8256 , 6241891.631		
UF95	Asbestos pipe	Soil	Inhalation	Construction Workers	JBS&G Figure 4.32	307609.4479, 6240244.889		
UF123-5	Asbestos and bituminous tar around pipe TRH/BaP	Soil	Inhalation and dermal	Construction Workers	Figure 2	307924.6269 6241975.512		
UF150-4	Asbestos pipe	Soil	Inhalation	Construction Workers	Figure 2	307931.7101 6241545.264		
UF179-1	Two asbestos pipes	Soil	Inhalation	Construction Workers	JBS&G Figure 4.6	307959.0827 6242089.872		
UF222-2	Asbestos pipe	Soil	Inhalation	Construction Workers	JBS&G Figure 4.6	307952.2756 6242072.162		
UF227-2	Asbestos pipe, PFAS	Soil	Inhalation	Construction Workers	JBS&G Figure 4.27	307209.8307 6240665.612		
UF230	Asbestos pipe	Soil	Inhalation	Construction Workers	JBS&G Figure 4.3	308007.6279 6242034.499		a live service constructed of ACM was identified running east to west along Bapaume Road. If the service is to be replaced or realigned, the pipe will require appropriate management.
UF251	ACM fragments were identified within tree roots	Soil			JBS&G Figure 4.13	307914.1615, 6241534.881		underlying soils of a fallen tree to the west of Zone B, directly south of UF150.
CPT-134A	Asbestos (AF/FA)	Soil	Inhalation	Construction Workers	Golder Figure 004A	307887.0786, 624096.461		Direct action are nominated as a circle of 10m radius centred on the point source to a depth of 0.2 metres below ground level
Former STP Stockpile SP1 - 3258m2 (Asbestos detected - TP065_A, TP010_B)	Asbestos and anthropogenic materials	Soil	Inhalation (asbestos), visual (anthropogenic)	Construction Workers	Golder Fig 004-L	-		The AMP (Golder 2016b) provided a detailed assessment of the stockpiled materials and the preferred approaches to the remediation and/or management of asbestos in soils at each of the areas. The approach to managing the stockpiles will be the same approach adopted for the anthropogenic fill areas.
Former STP Stockpile SP2 - 87m2	Asbestos and anthropogenic materials	Soil		Construction Workers		-		
TP071_C (proximal to SP2)	Asbestos - proximal SP2	Soil		Construction Workers		-		
TP060_C (proximal to SP2)	Asbestos - proximal SP2	Soil		Construction Workers		-		
TP061_C and TP064_C (proximal to SP2)	Asbestos - proximal SP2	Soil		Construction Workers		-		
Former STP Stockpile SP3 - 333m2	Asbestos and anthropogenic materials	Soil		Construction Workers		-		
Former STP Stockpile SP4 - 123m2	Asbestos and anthropogenic materials	Soil		Construction Workers		-		
Former STP Stockpile SP5 - 186m2	Asbestos and anthropogenic materials	Soil		Construction Workers		-		
Former NBC Bunker	High risk utility - Utilities constructed of ACM - associated with UF227. PFAS.	Soil	Inhalation	Construction Workers	JBS&G Fig 3C	-		The area of anthropogenic fill identified north of the former NBC compound. It is noted that an unexpected find of surface contamination (ash like materials) has been identified in the former compound and requires further assessment.

Source	CoPC	Media	Pathways	Receptors	Figures - Appendix C	Co-ordinates	CMP - Appendix E	Comments
AEC 4 - Anthropogenic Fill								
Stockpile Golf Course SP1 282 m2	Anthropogenic materials	Soil	Visual	NA	Golder Fig 004-M	-	CMP03, CMP04, CMP05	Comprises demolition materials and therefore high risk for asbestos to be present
Former lake Sisinyak North	Anthropogenic materials and UXO and asbestos	Soil	Inhalation (asbestos), visual (anthropogenic), UXO (explosive)	construction works	JBS&G Figure 4A-4F	307810.6743 6241489.756		Anthropogenic fill and ACM were also identified above site assessment criteria in Lake Sisinyak North (LSN). Asbestos was visually identified above the site assessment criteria at two locations, including LSN-V04_1.0-2.0 (0.1655% w/w), and LSN-V23_2.0-3.0 (0.0945% w/w). Both locations were unable to be excavated further due to the EEC to the north.
Former lake sestina south	Visually identified anthropogenic inclusions	Soil	visual (anthropogenic)	NA	JBS&G Figure 3	307802.554, 6241353.899		Anthropogenic materials were removed to the extent that did not adversely impact the EECs. However, anthropogenic fill remains within the south-eastern wall of Lake Sisinyak South (LSS). The south eastern wall contained a high proportion of anthropogenic fill materials consisting of plastic, brick, tiles, metal wire, concrete and wood. Validation samples for asbestos impacts did not identify ACM, however with consideration to the extent of ACM found within anthropogenic fill areas on the site, further assessment of the area.
Former lake Sisinyak East	Anthropogenic materials and UXO and asbestos	Soil	Inhalation (asbestos), visual (anthropogenic), UXO (explosive)	Construction workers	JBS&G Figure 3, 4A-4D			
LSE-V11						307825.663, 6241379.798		
LSE-V12						307821.126, 6241374.856		
LSE-V13						307815.415, 6241369.793		
ANTHRO-2 (Zone B Excavation)	Anthropogenic materials and asbestos	Soil	Inhalation (asbestos), visual (anthropogenic)	Construction workers	JBS&G Fig 3-4C			The fill area was identified following grass stripping of the adjacent area in preparation for geotechnical testing. A significant number of ACM fragments were observed within surface soils. Investigation works including test pitting and asbestos quantification were conducted, and the contamination was found to impact soils to depths between approximately 1.2 to 2.5 m below ground surface (BGL). During remedial works, the northern wall of the excavation approached an EEC boundary, and therefore, the anthropogenic fill was removed to the extent that did not adversely impact the vegetation community present. As well as asbestos, in the northern excavation face exceedances of the adopted health investigation levels for TRH (>C16-C34 Fraction) and lead in soil remain, see Figure 2. Exceedances of the adopted ecological investigation levels for copper, nickel, zinc and benzo(a)pyrene were also recorded.
Anthro2-V02						307924.763, 6241572.339		
Anthro2-V03						307928.664, 6241582.966		
Anthro2-V04						307937.47, 6241587.755		
Anthro2-V05						307945.238, 6241584.577		
Anthro2-V06						307952.984, 6241579.164		
Anthro2-V07						307961.056, 6241576.211		
Anthro2-V08						307970.477, 6241575.917		
Anthro2-V09						307979.092, 6241576.429		
Anthro2-V10						307987.498, 6241578.067		
Anthro2-V11						307997.091, 6241579.798		
Anthro2-V12						308005.264, 6241583.279		
Anthro2-V13						308011.048, 6241588.463		

Appendix D

CONSULTANT FIGURES – AREAS OF ENVIRONMENTAL CONCERN

AEC 1



LEGEND

- Approximate Site Boundary
- Tier 2 QRA Assessment
- MIP
- Grounwater Well
- Soil Vapour Well
- Hand Auger Well

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder Geotechnical and Geochemical project.

REFERENCE

1. Aerial Photography Copyright NearMap Pty Ltd.

0 5 10 20 30 40 50 Metres

REFERENCE SCALE: 1:1,500 (at A4)
PROJECTION: GDA 1994 MGA Zone 56

CLIENT
MOOREBANK INTERMODAL COMPANY

PROJECT
MOOREBANK INTERMODAL TERMINAL

TITLE
INVESTIGATION LOCATIONS

CONSULTANT
Golder Associates

YYYY-MM-DD	2015-07-31
PREPARED	AOB
DESIGN	-
REVIEW	RB
APPROVED	GVS

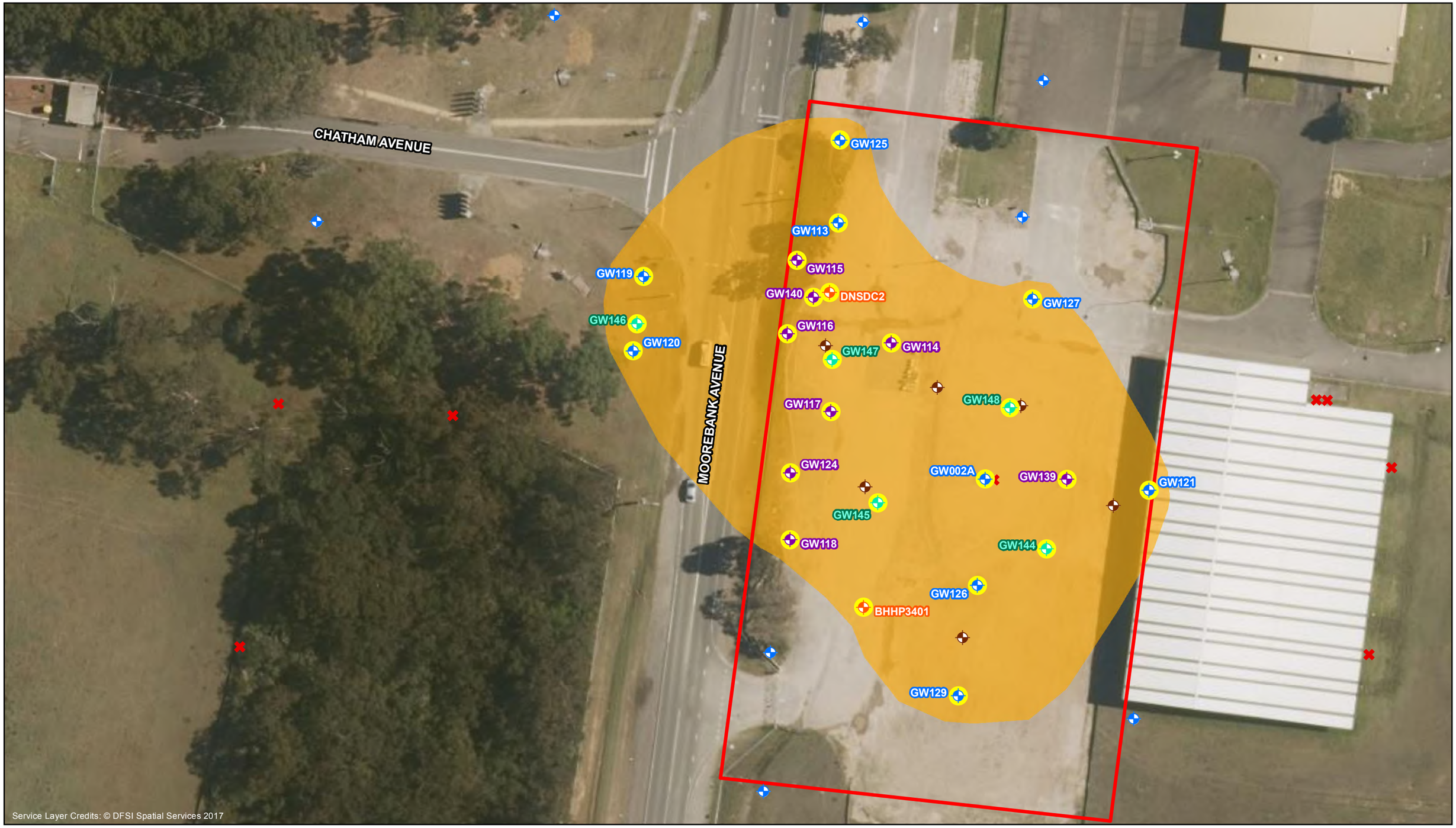
PROJECT	DOCUMENT	Rev.	FIGURE
147623070	078	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: A4

25mm

Path: \\golderg.gdesgap\Melbourne\GIS\Commonwealth\MICL\Project\Deliverable\035-Rev A\147623070-035-R-004-Rev0.mxd

AEC 2



Paper Size A4

0 5 10 20

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Site Boundary
- Inferred LNAPL extent (October 2017)
- LNAPL Present (October 2017)
- Observed Existing Groundwater Wells
- Groundwater Well Location (GHD, 2015)
- Groundwater Extraction Well Location (GHD, 2015)
- Groundwater Extraction Well (OPEC, 2016)
- Soil Vapour Wells (GHD, Sept 2016)
- Well Destroyed / Not Accessible

Department of Defence
DNSDC Refuelling Area Remediation
Moorebank Ave, Moorebank NSW

Job Number	21-25471
Revision	A
Date	18 Dec 2017

LNAPL extent
Validation results - 11-12 October 2017

Figure 7

N:\AU\Sydney\Projects\21\25471\GIS\Maps\Deliverables\DNSDC_November2017\21_25471_Z042_LNAPL_Extent.mxd

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

© 2017. Whilst every care has been taken to prepare this map, GHD (and SIXmaps 2017, NSW Department of Lands) make no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and cannot accept liability and responsibility 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 by any party as a result of the map being inaccurate, incomplete or unsuitable in any way and for any reason.

Data source: Aerial imagery - SIXmaps 2017; General topo - NSW LPI DTDB 2012. Created by:jrprice

AEC 3

Legend:

- Approximate Site Boundary
- Areas Of Potential Concern
- Services Excavation
- UST
- Stormwater
- Sewerage
- Sample Location

JBS&G

Job No: 51997

Client: Tactical Group

Version: L277 Rev A	Date: 18-Jan-2019
Drawn By: FH	Checked By: JS

Scale 1:1,800

0 20 40
metres

Coor. Sys. GDA 1994 MGA Zone 56

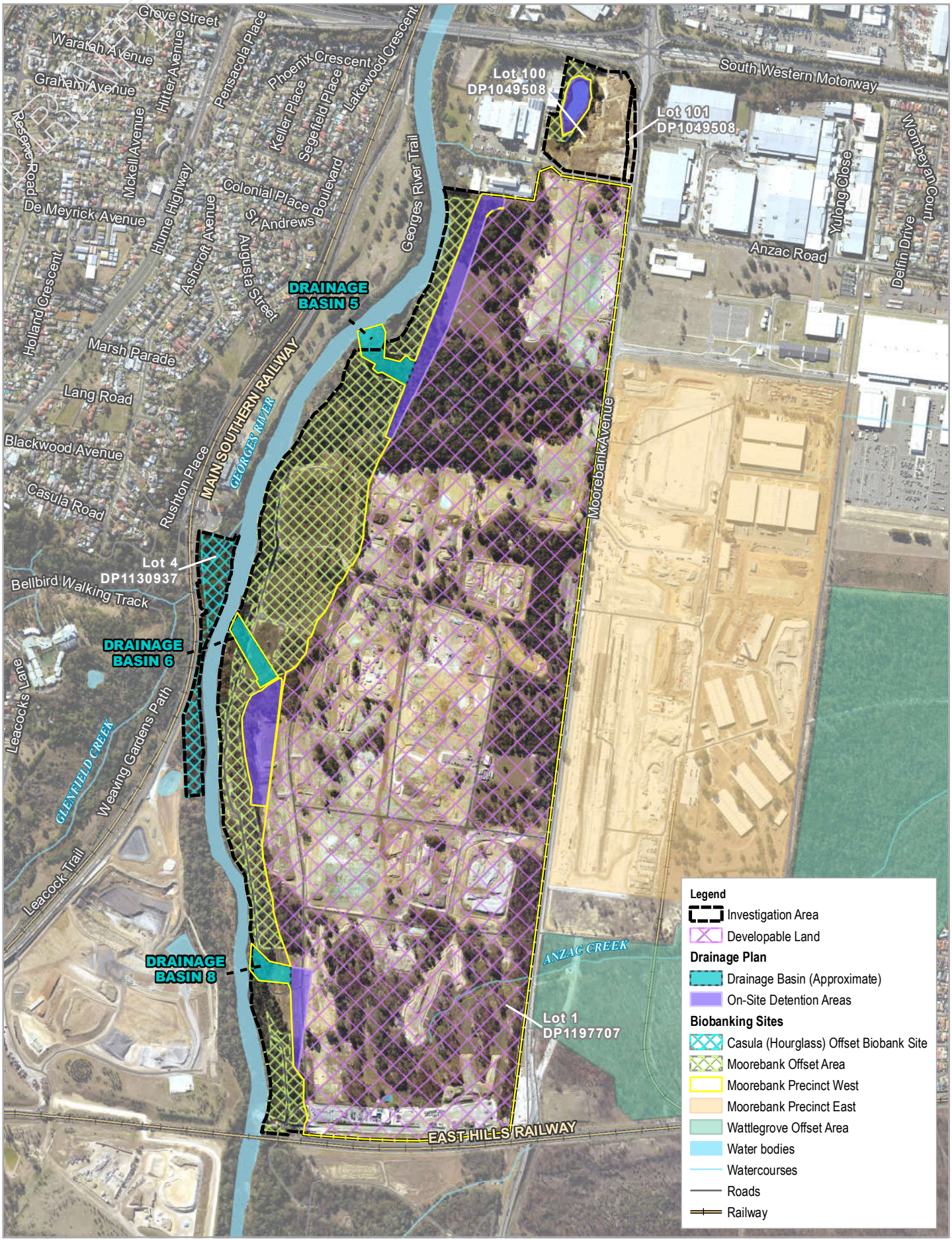
Assessment of High Risk Services

Chatham Avenue Moorebank, NSW

SITE LAYOUT AREA 20 AND 22

FIGURE: 3D

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L277 Rev A\51997_03_DDP.mxd
Reference: Nearmap http://www.nearmap.com.au - Imagery 17-07-2018



Paper Size ISO A4

0 125 250 375 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Project No. **21-28111**
Revision No. **B**
Date **17/ 04/ 2019**

Site Layout - Proposed Development

FIGURE 2

G:\21\28111\GIS\Maps\Deliverables\21_28111_Z003_Moorebank_SiteLayout_ProposedDevelopment.mxd
Print date: 17 Apr 2019 - 15:14

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: kqvelasco

Paper Size ISO A4

0 125 250 375 500

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

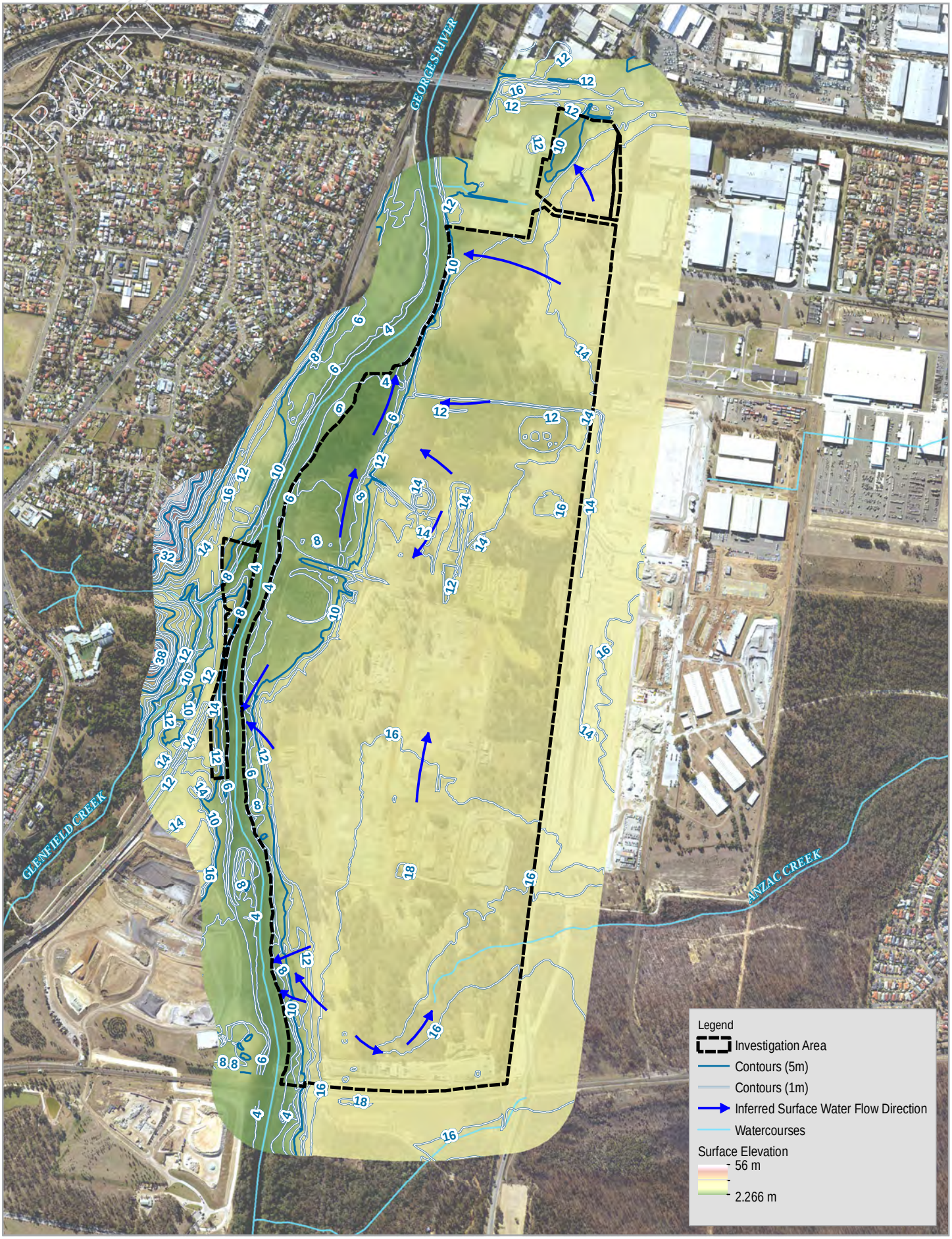
Project No. **21-28111**
Revision No. **B**
Date **17/ 04/ 2019**

PFAS Source Areas

FIGURE 3

G:\21\28111\GIS\Maps\Deliverables\21_28111_Z004_Moorebank_PFASSourceAreas.mxd
Print date: 17 Apr 2019 - 14:08

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: kqvelasco



Paper Size ISO A4

0 140 280 420 560

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

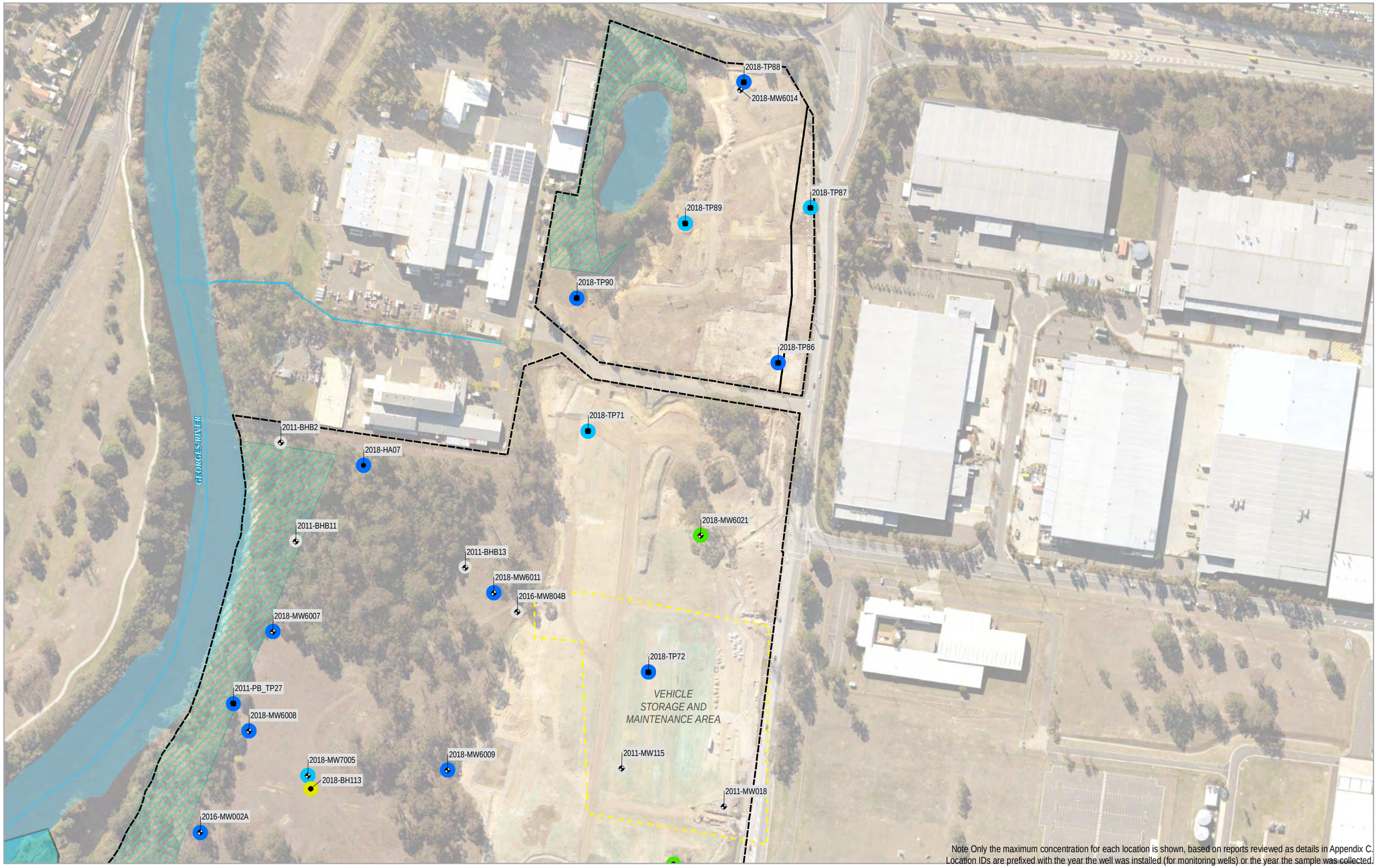
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Project No. 21-28111
Revision No. B
Date 17/ 04/ 2019

Topography and Surface Water Flows

FIGURE 4

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: kqvelasco



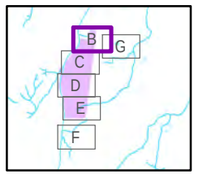
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

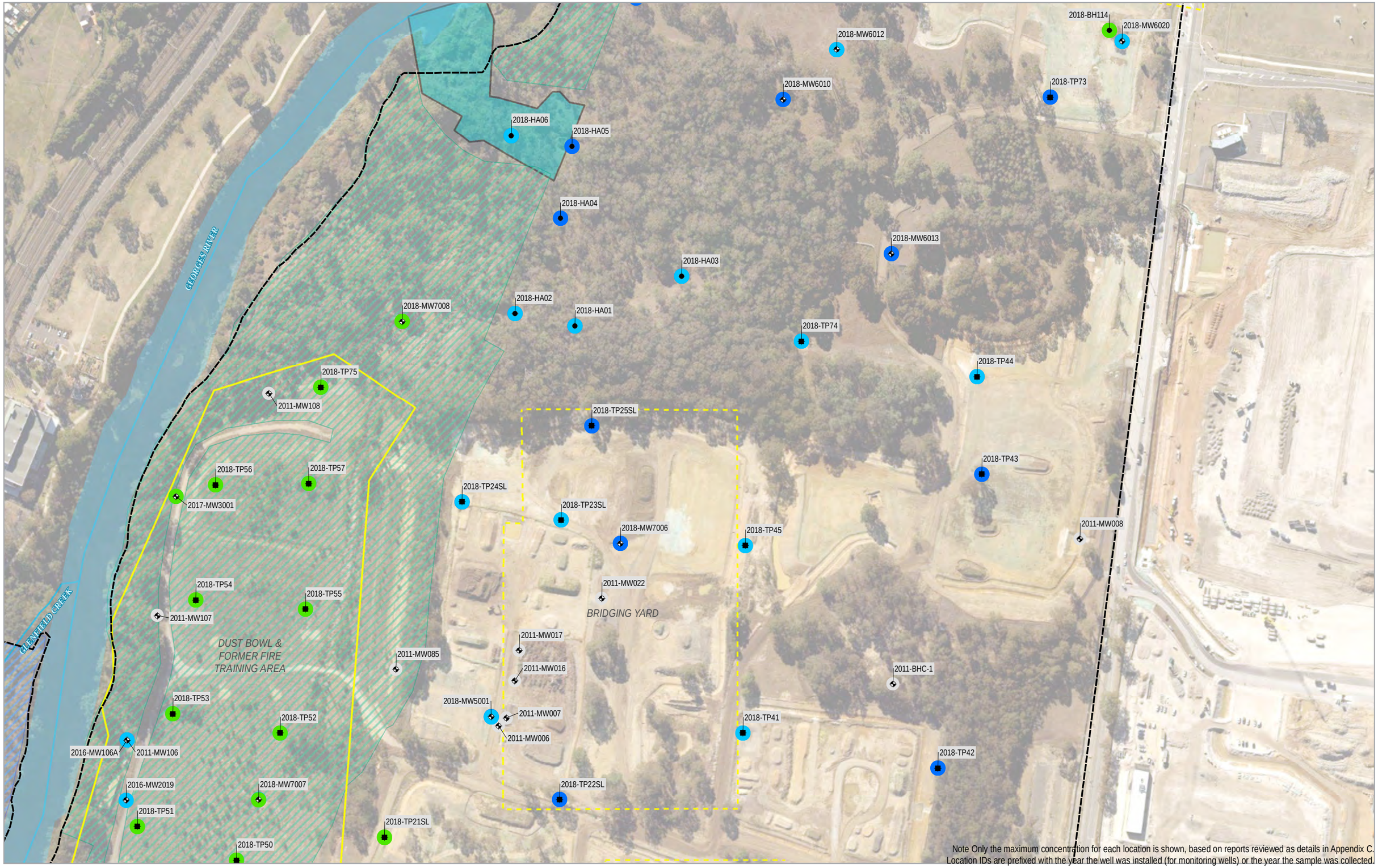
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil
PFOS + PFHxS Results
Grid 1

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 6B

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



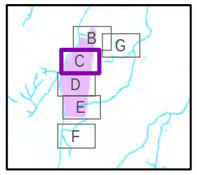
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

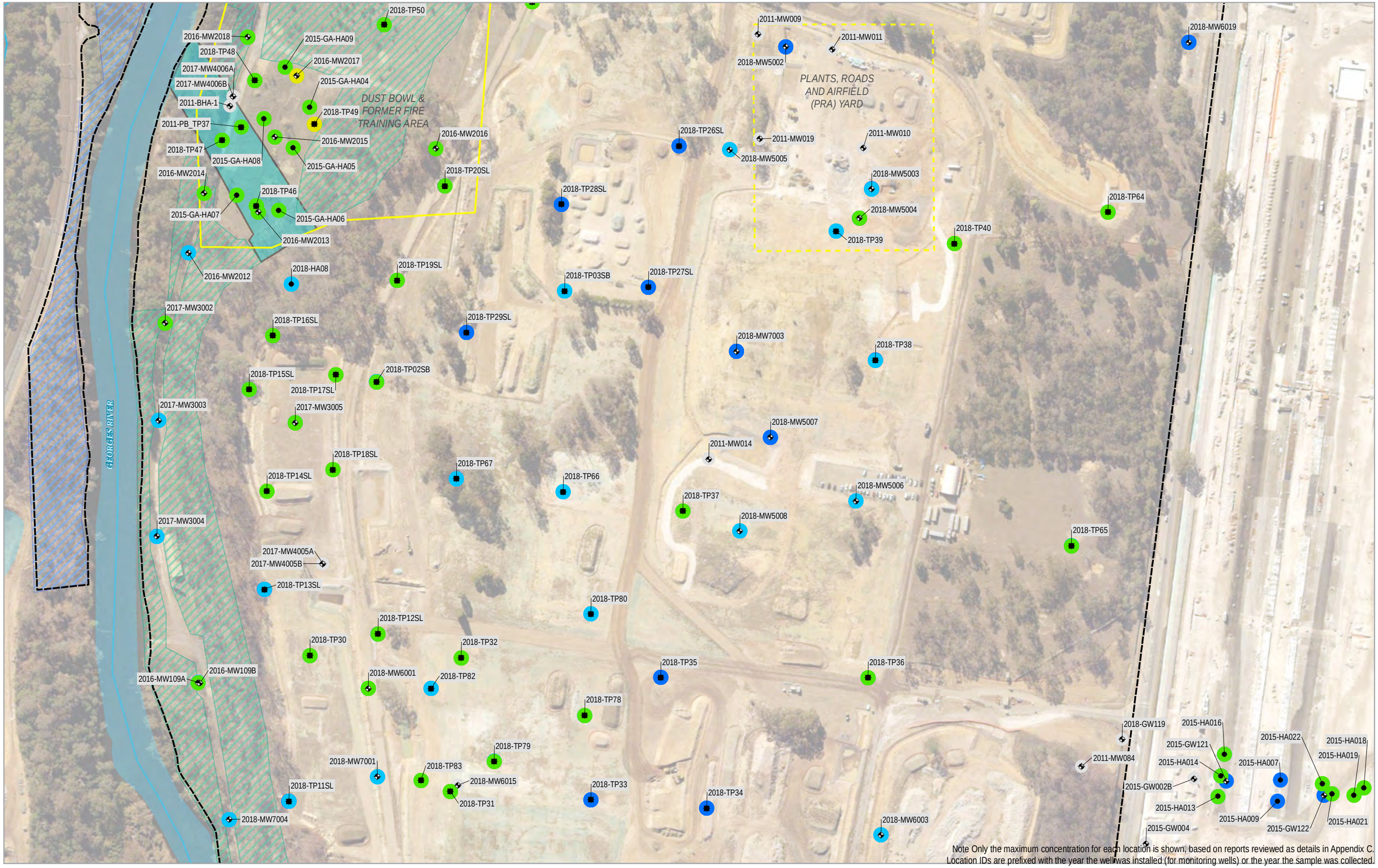
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil
PFOS + PFHxS Results
Grid 2

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 6C

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



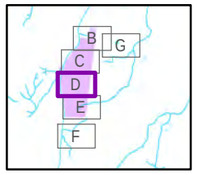
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil

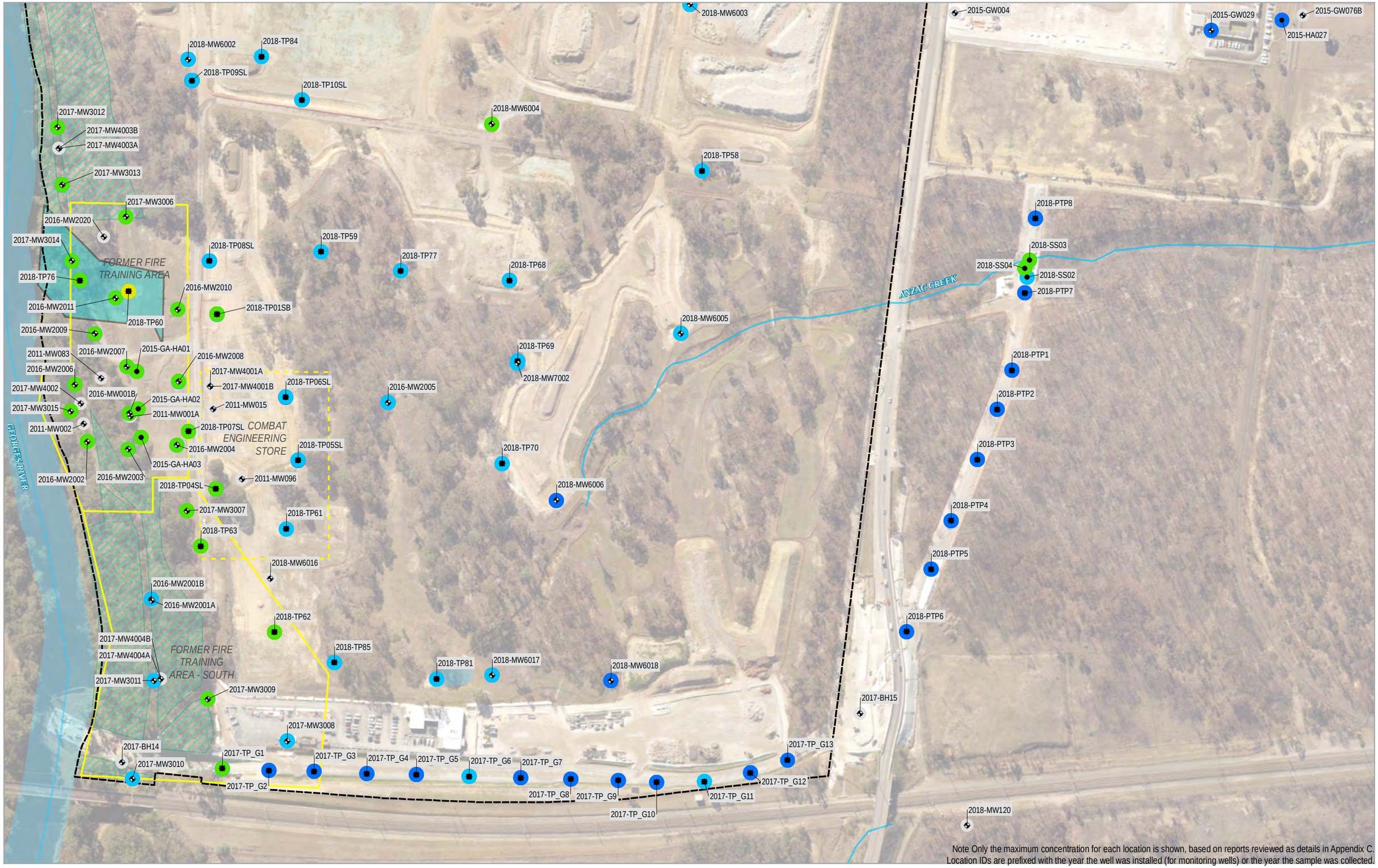
PFOS + PFHxS Results

Grid 3

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 6D

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



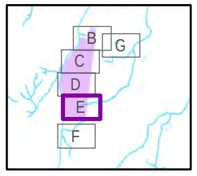
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

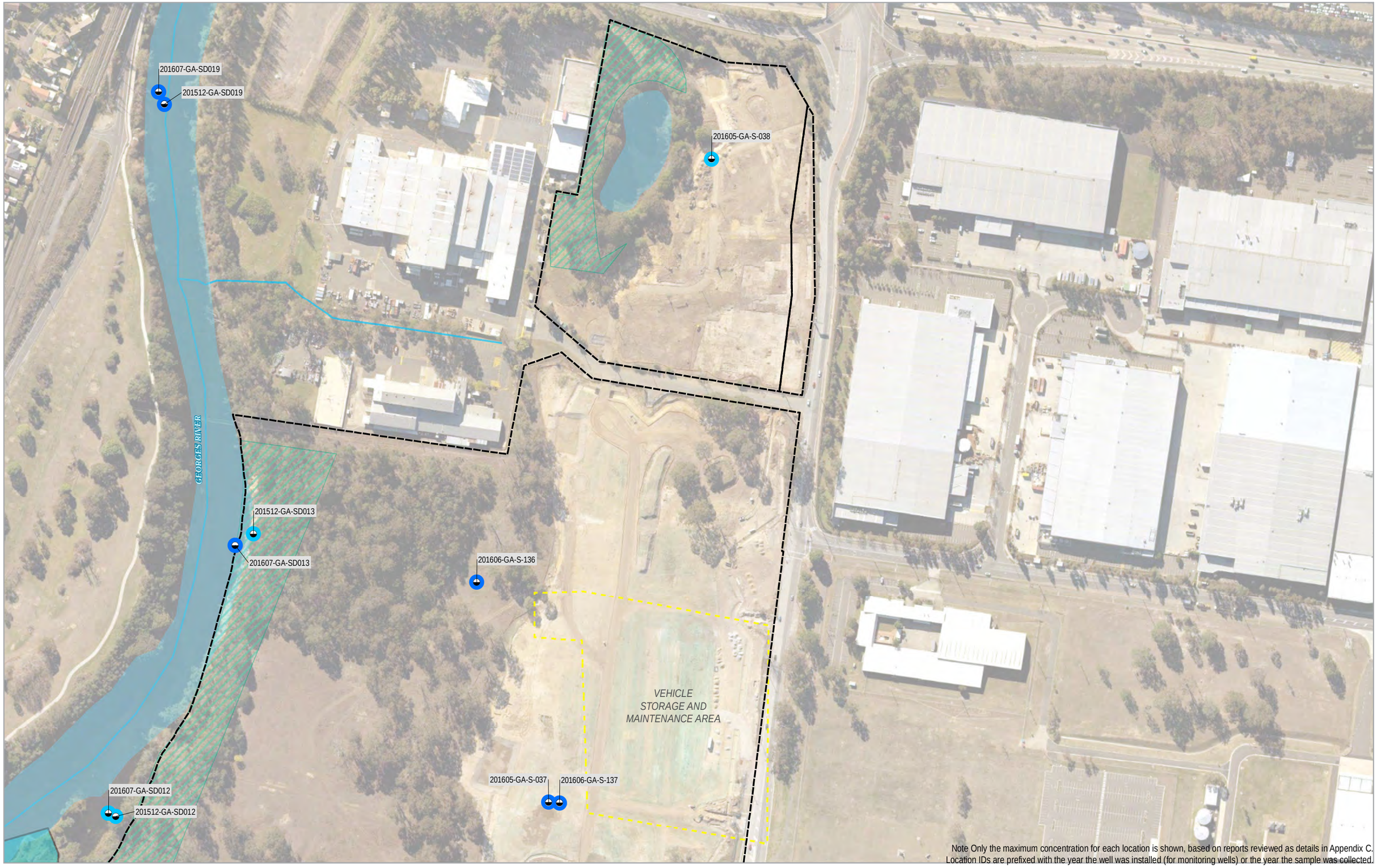
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil
PFOS + PFHxS Results
Grid 4

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 6E

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



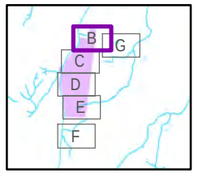
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

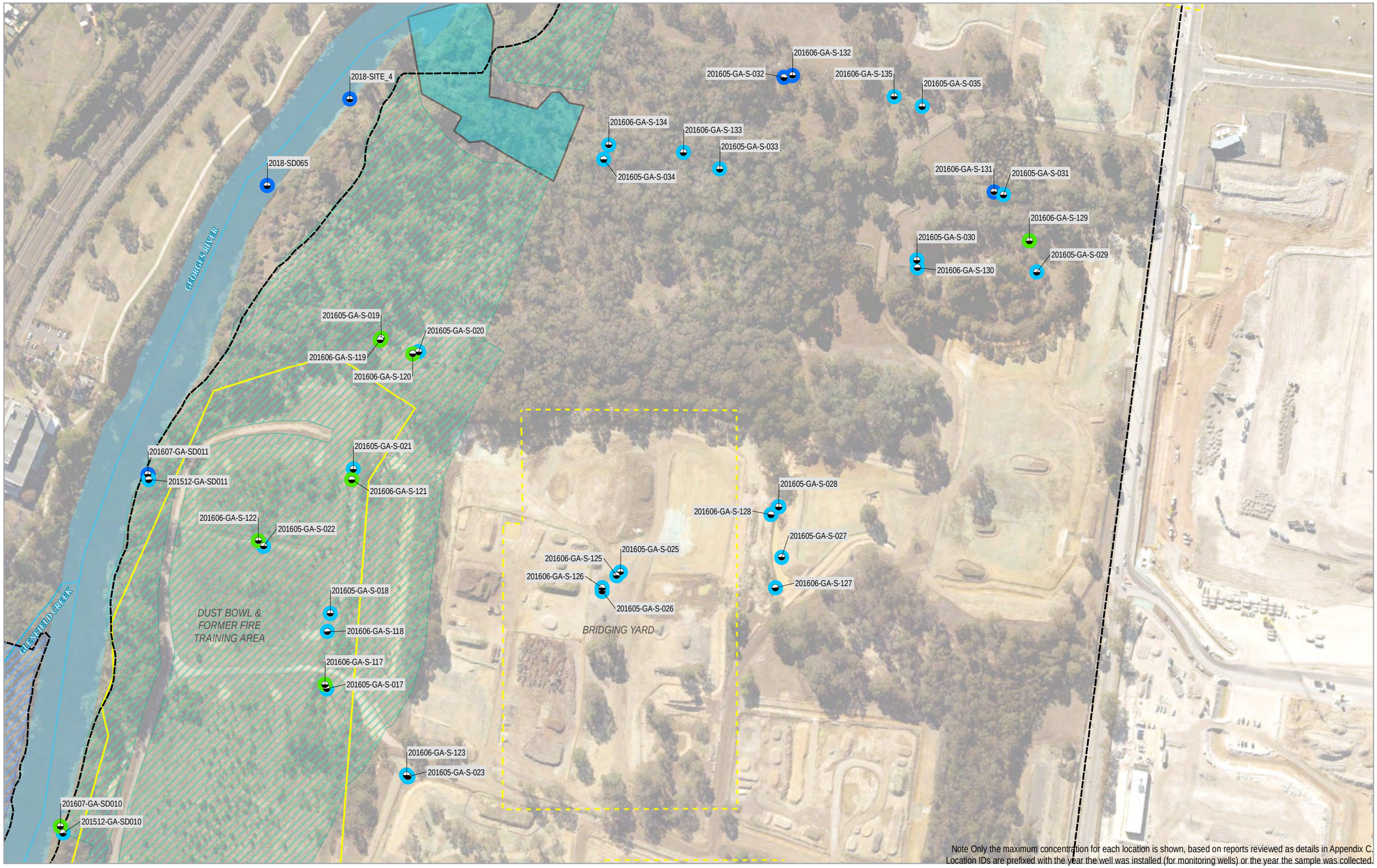
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 1

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7B

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



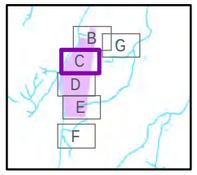
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

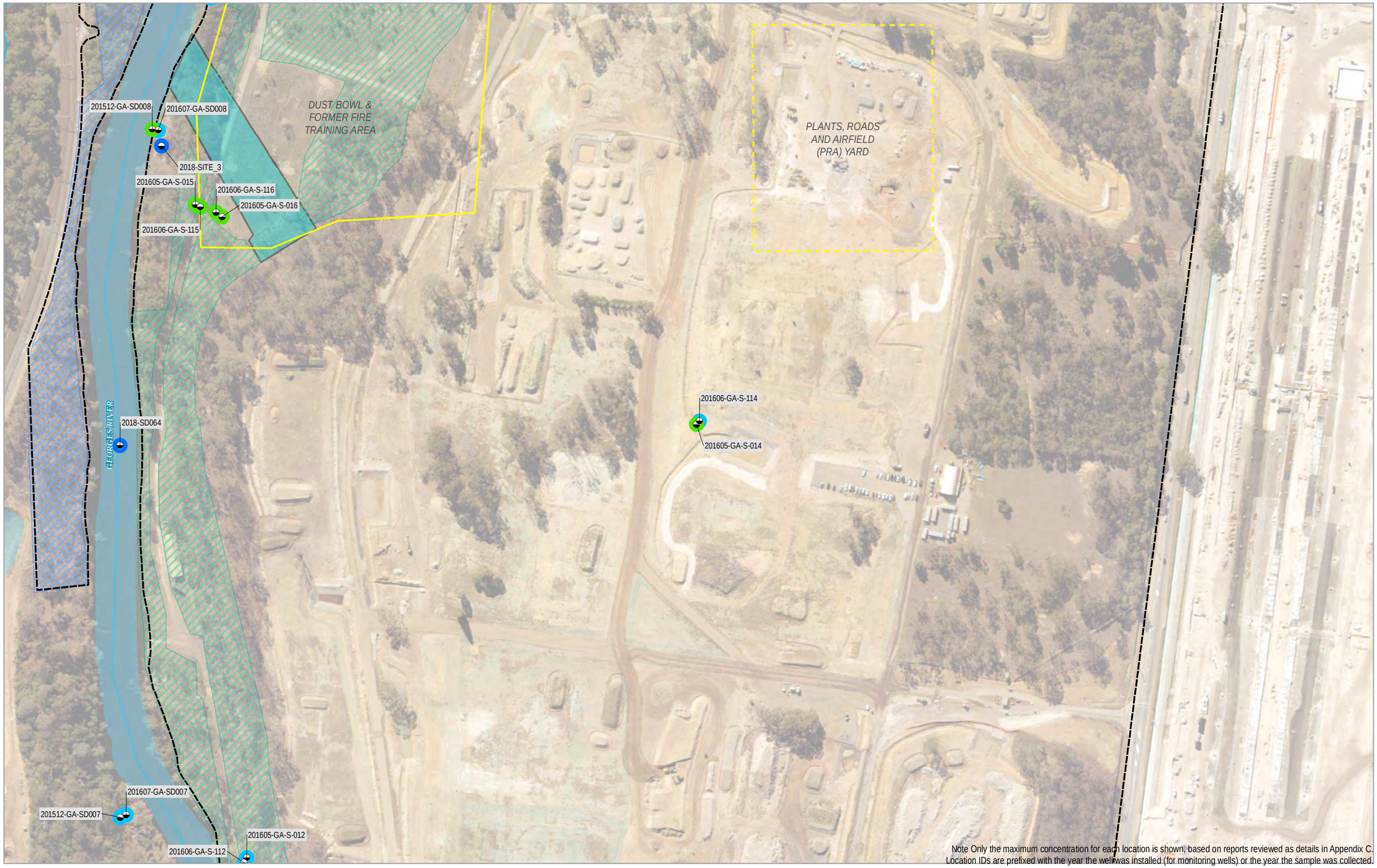
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 2

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7C

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



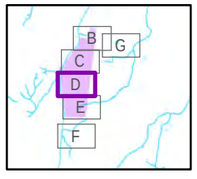
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

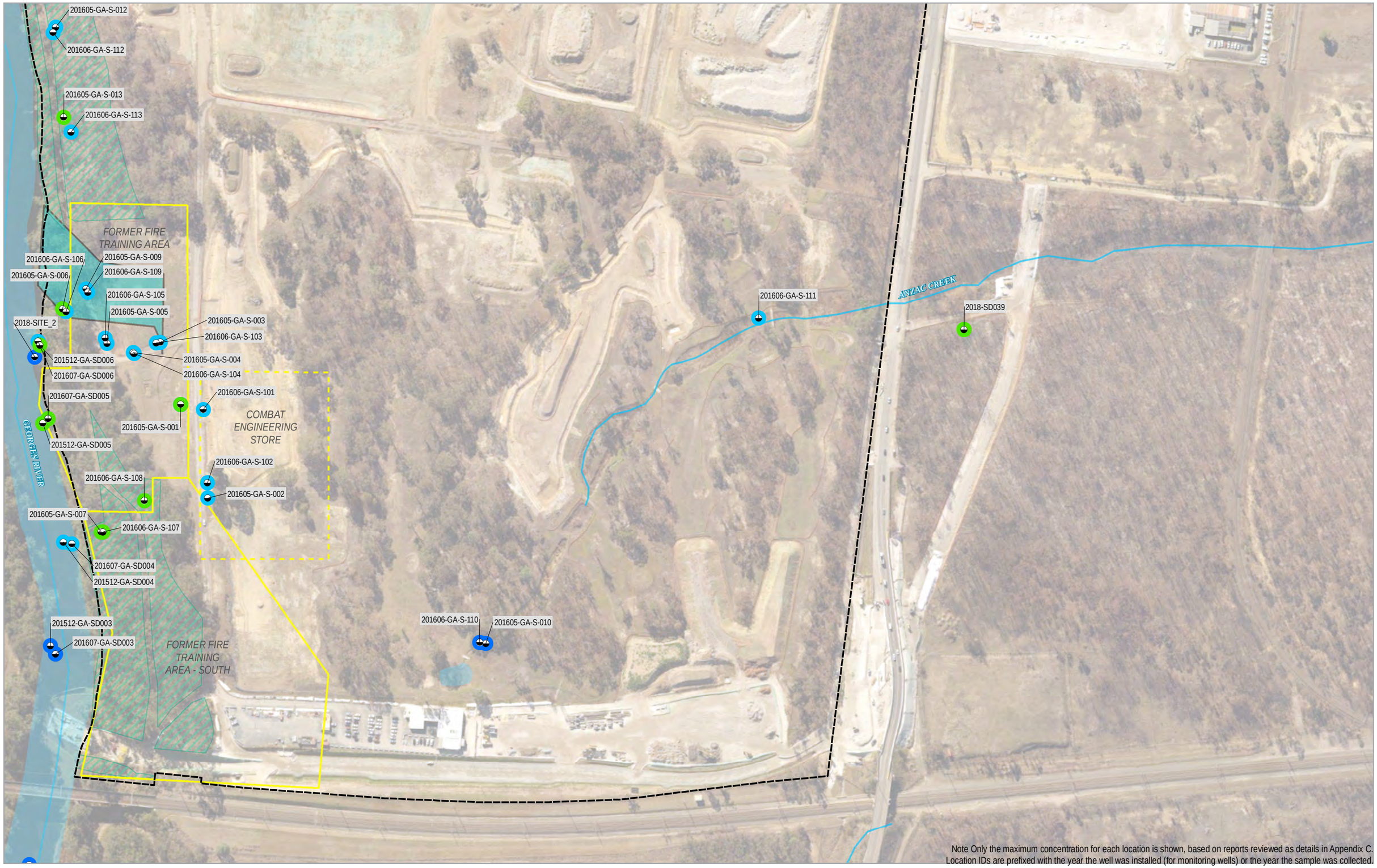
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 3

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7D

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



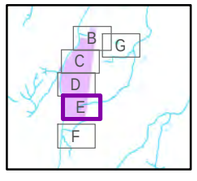
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Sediment Sample

Max PFOS + PFHxS Concentration (mg/kg)

- <LOR
- LOR - 0.01
- >0.01
- >1
- >5
- >10
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Sediment
PFOS + PFHxS Results
Grid 4

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 7E

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber

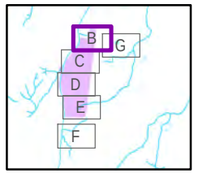
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Other Potential PFAS Source
- Moorebank Offset
- Drainage Basin (Approximate)
- Surface Water

Max PFOS + PFHxS Concentration (µg/L)

- <LOR
- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Surface Water
PFOS + PFHxS Results
Grid 1

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 8B

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber

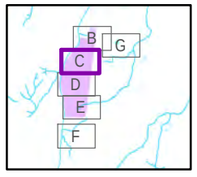
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Surface Water

Max PFOS + PFHxS Concentration (µg/L)

- <LOR
- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

GHD

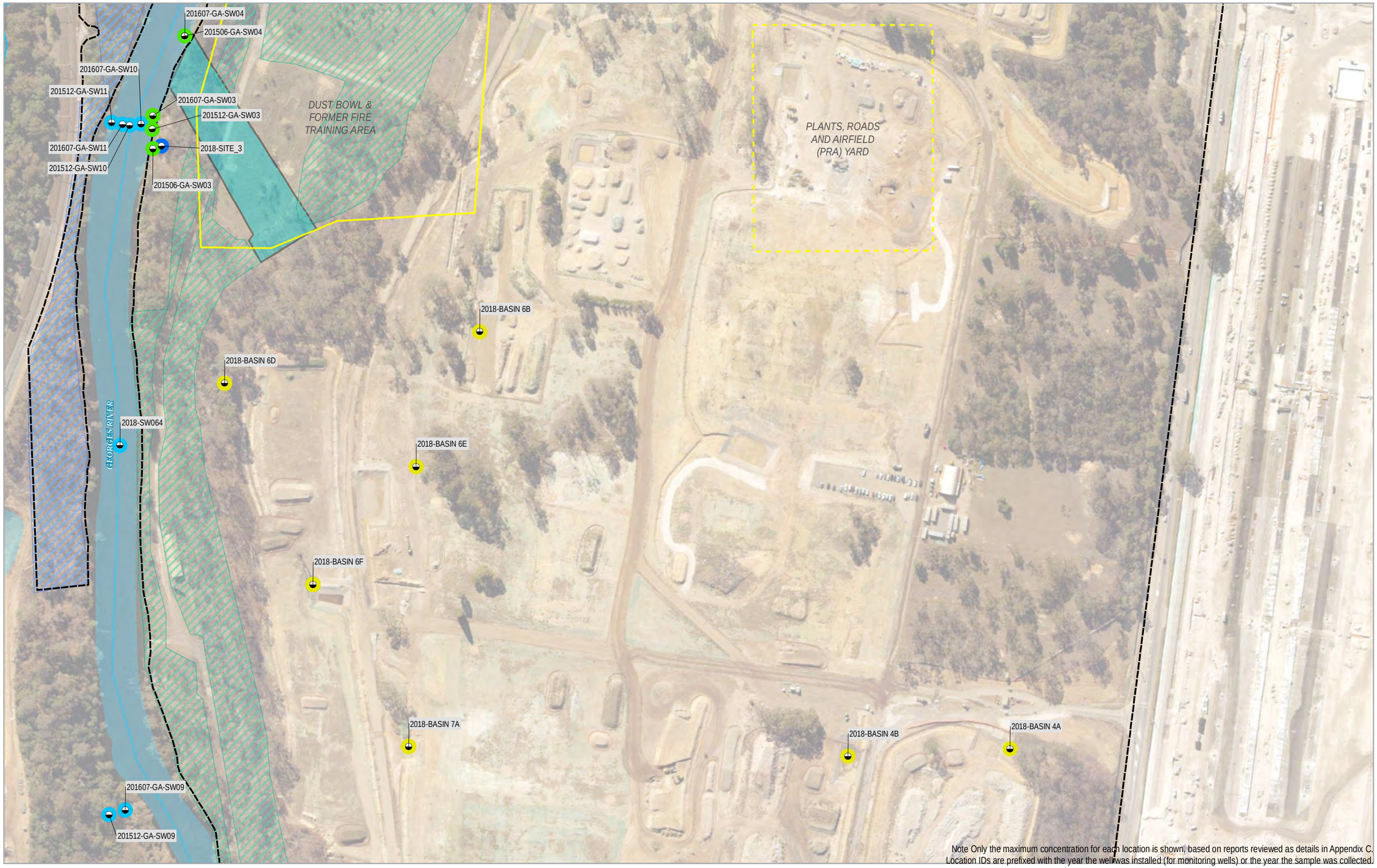
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Surface Water
PFOS + PFHxS Results
Grid 2

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 8C

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



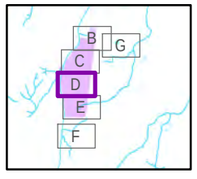
Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Surface Water

Max PFOS + PFHxS Concentration (µg/L)

- <LOR
- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data



Paper Size ISO A3

0 20 40

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

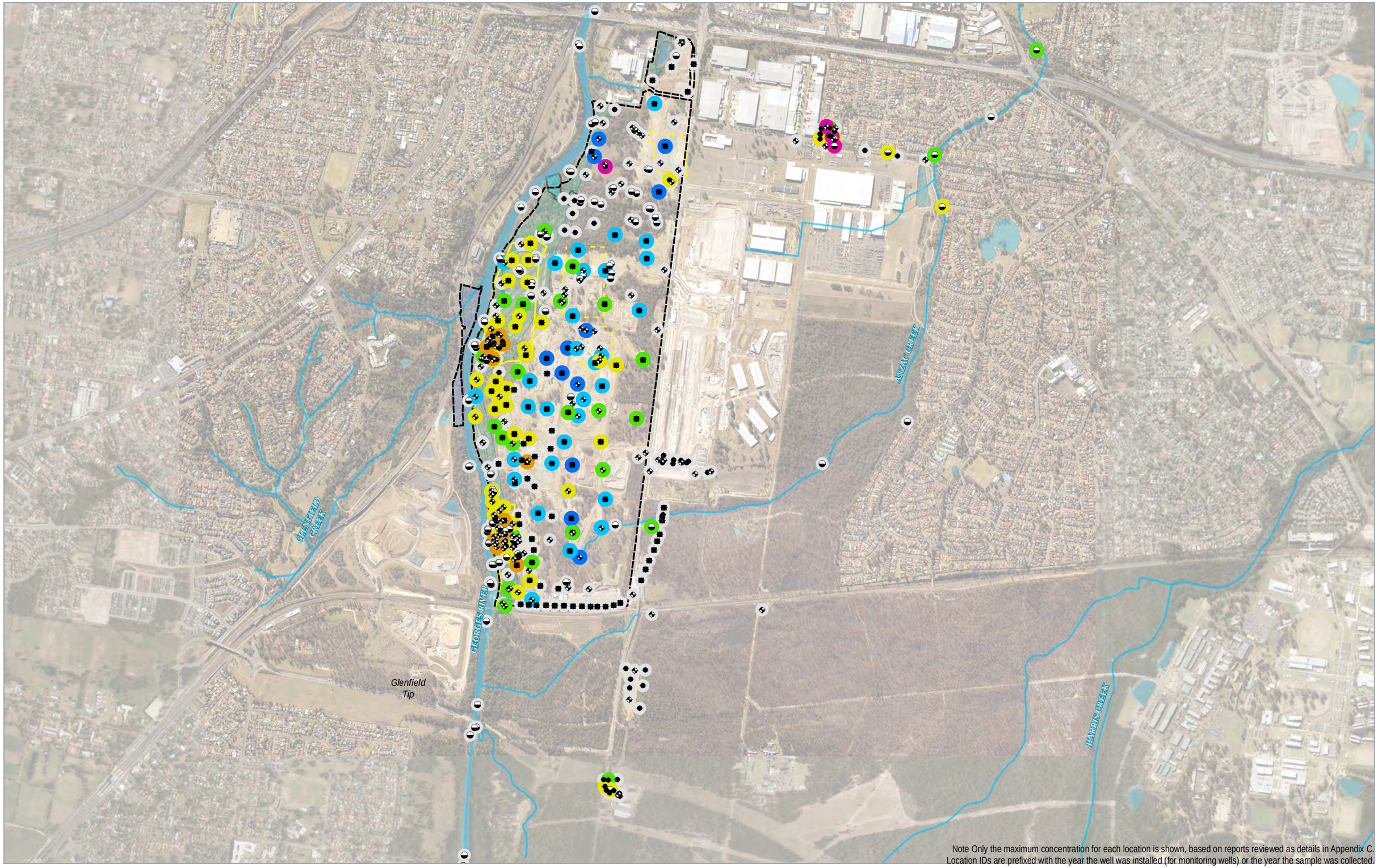
Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Surface Water
PFOS + PFHxS Results
Grid 3

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 8D

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber



Note Only the maximum concentration for each location is shown, based on reports reviewed as details in Appendix C.
Location IDs are prefixed with the year the well was installed (for monitoring wells) or the year the sample was collected.

LEGEND

- Investigation Area
- Liverpool Fire Station
- Key PFAS Source
- Other Potential PFAS Source
- Casula (Hourglass) Offset Biobank Site
- Moorebank Offset
- Drainage Basin (Approximate)
- Borehole/Hand Auger/Surface
- Monitoring Well
- Testpit
- Sediment Sample

Max PFOS + PFHxS Concentration (µg/L)

- LOR - 0.13
- >0.13
- >0.7
- >10
- >100
- No PFAS Data

Paper Size ISO A3

0 200 400

Meters

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

Moorebank Intermodal Company Limited
Summary Report PFAS Investigations
Moorebank Precinct West

Soil & Sediment ASLP

PFOS + PFHxS Results Overview

Project No. 21-28111
Revision No. A
Date 12 Apr 2019

FIGURE 11

Data source: General Topo - NSW LPI DTDB 2018 (Date Extracted: 18 Feb 2019). Cadastre - NSW LPI DCDB 2018 (Date Extracted: 18 Feb 2019). Aerial Imagery - Sixmaps 2018. . Created by: mweber

SOURCE

1 FFTA

2 Storage of AFFF

TRANSPORT PATHWAY

1 Lateral migration of groundwater

2 Groundwater entering surface water bodies

3 Surface water runoff

4 Direct contact/uptake by ecological receptors - aquatic and terrestrial

5 Vertical migration through soil profile

6 Wind erosion of impacted surface soils

7 Infiltration and leaching from soils and sediments to groundwater

8 Leaching from soil, sediments to surface water

9 Adsorption to soil or sediment from surface water

HUMAN EXPOSURE PATHWAY

1 Direct contact and incidental ingestion of soil and/or sediment

2 Direct contact and incidental ingestion of water (surface water or groundwater)

3 Consumption of flora (including homegrown produce outside of project area) and fauna already impacted contaminated soils, sediment, groundwater and/or surface water

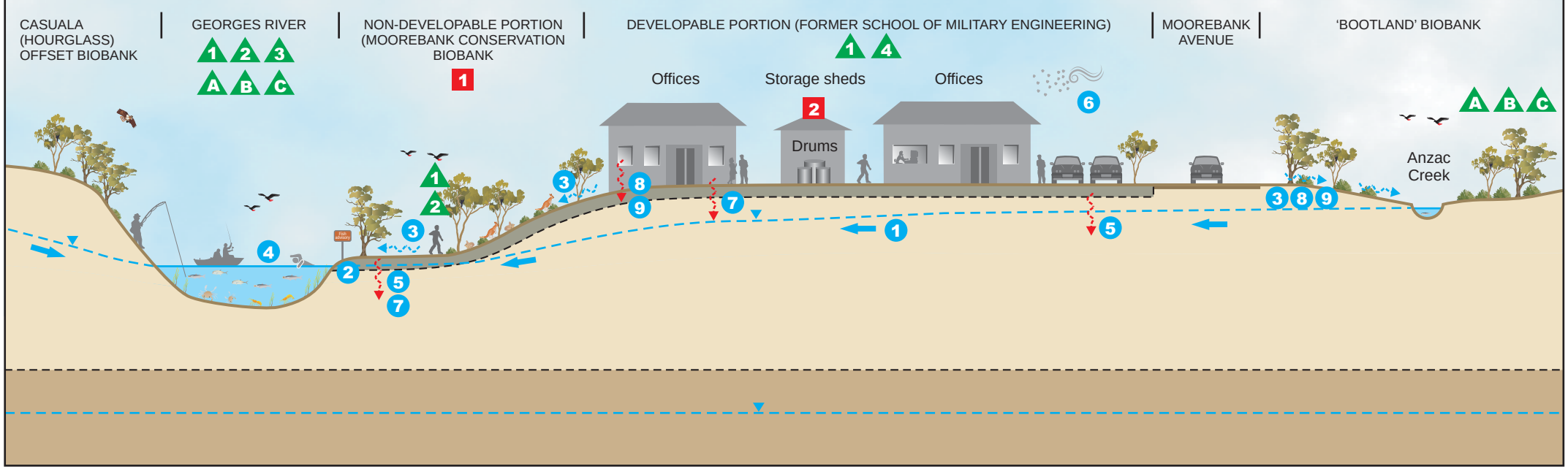
4 Inhalation of dust from impacted soils

ECOLOGICAL EXPOSURE PATHWAY

A Direct contact and incidental ingestion of soil and/or sediment

B Direct contact and incidental ingestion of surface water

C Consumption of flora and fauna already impacted via contaminated soils, sediment. groundwater and/or surface water



Conceptual diagram only - not to scale

LEGEND

Fill

Shallow unconfied aquifer

Semiconfined regional aquifer

Groundwater level

Groundwater flow

Surface water flow

Contamination migration

Moorebank Intermodal Company

Conceptual Site Model Pre-MPW Development

Job Number	21-28111
Revision	0
Date	12 Apr 2019

Figure 12

GHD\Launceston\21\2128111_LTN_01.cdr

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

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SOURCE

1 FFTA

TRANSPORT PATHWAY

1 Lateral migration of groundwater

2 Groundwater entering surface water bodies

3 Surface water runoff

4 Direct contact/uptake by ecological receptors - aquatic and terrestrial

5 Leaching from soil, sediments to surface water

HUMAN EXPOSURE PATHWAY

1 Direct contact and incidental ingestion of soil and/or sediment

2 Direct contact and incidental ingestion of water (surface water or groundwater)

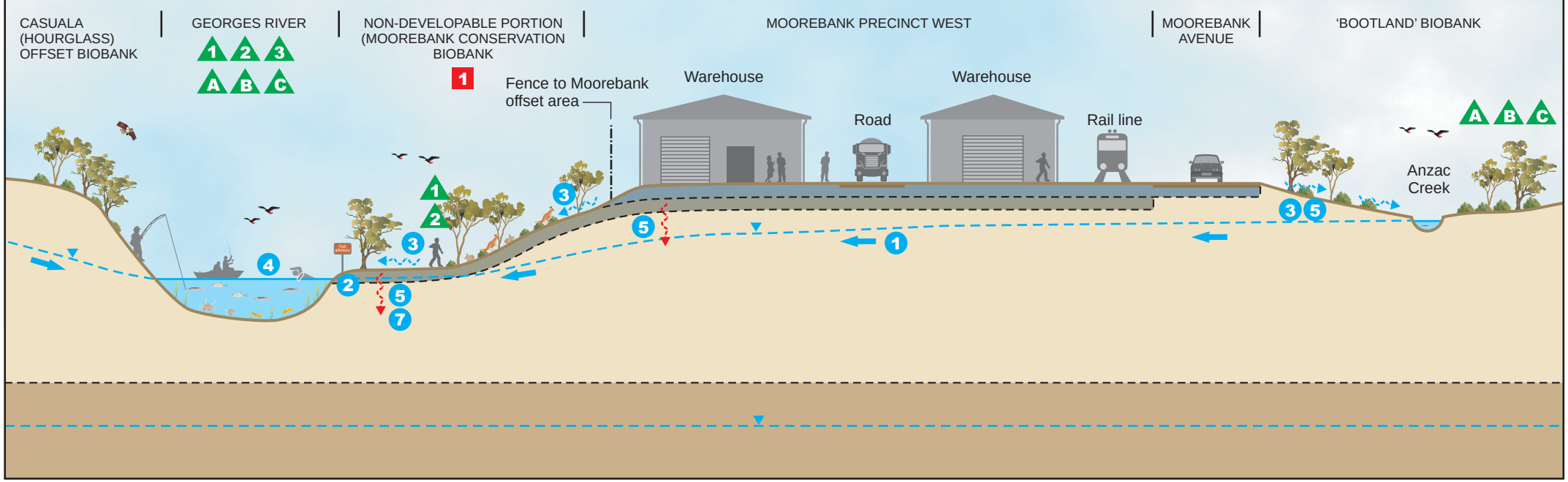
3 Consumption of flora (including homegrown produce outside of project area) and fauna already impacted contaminated soils, sediment, groundwater and/or surface water

ECOLOGICAL EXPOSURE PATHWAY

A Direct contact and incidental ingestion of soil and/or sediment

B Direct contact and incidental ingestion of surface water

C Consumption of flora and fauna already impacted via contaminated soils, sediment. groundwater and/or surface water



Conceptual diagram only - not to scale

LEGEND

- Construction fill
- Fill
- Shallow unconfied aquifer
- Semiconfined regional aquifer
- Groundwater level
- Groundwater flow
- Surface water flow
- Contamination migration

Moorebank Intermodal Company

Conceptual Site Model Post-MPW Development

Job Number	21-28111
Revision	0
Date	12 Apr 2019

Figure 13

GHD\Launceston\21\2128111_LTN_02.cdr

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

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AEC 4 – High Risk

UF55

Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Biobank Areas
- CATA Boundaries
- E3 - Environmental Management
- IN1 - General Industrial
- RAP Remediation Areas
- UST/UFT
- Unexpected Finds
- Unexpected Finds
- Unexpected Finds

JBS&G

Job No: 51997	
Client: Tactical Group	
Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL
Scale 1:1,250	

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

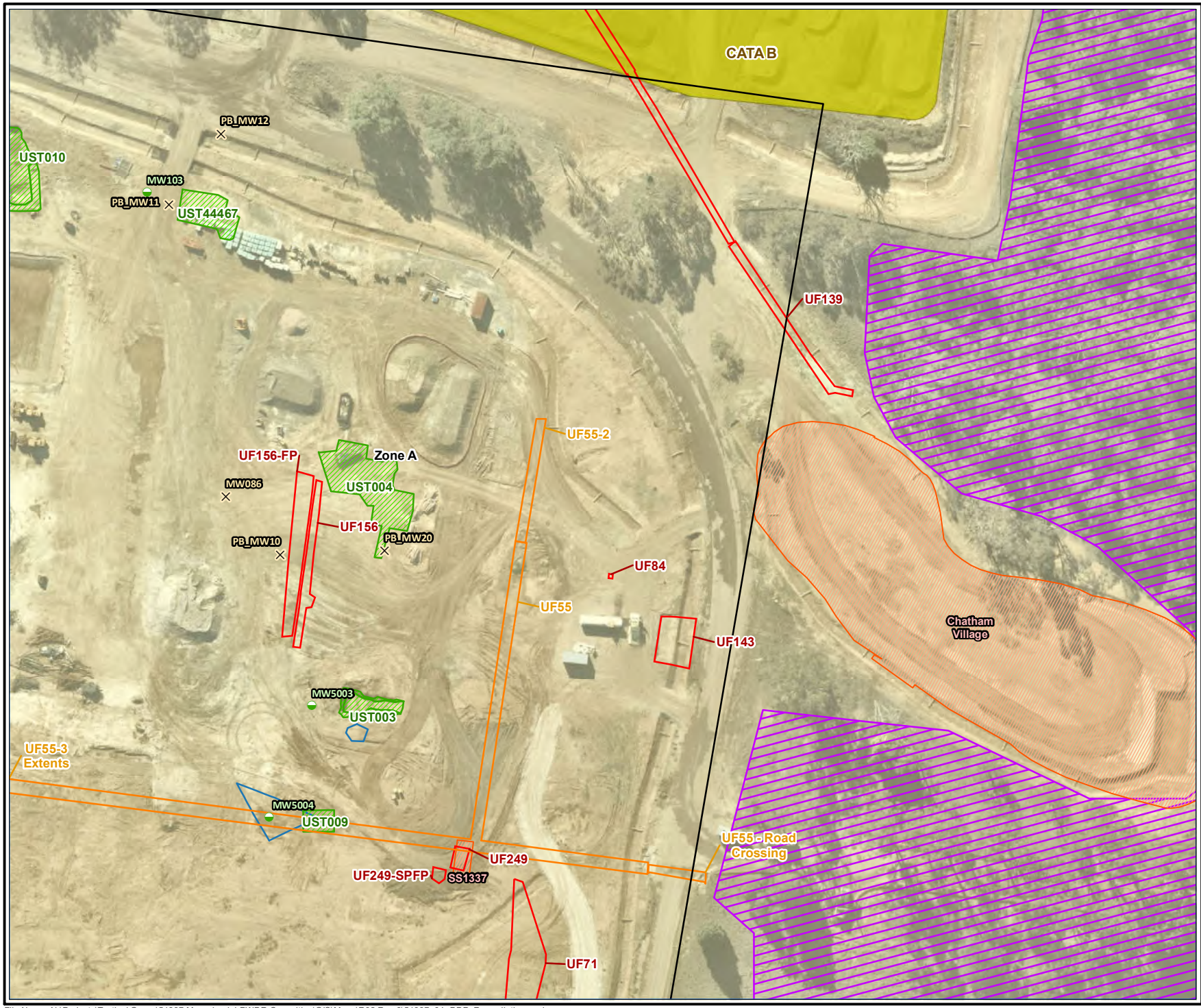
Moorebank Precinct West

Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.20

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018



Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Endangered Ecological Communities (EEC)
- CATA Boundaries
- IN1 - General Industrial
- RAP Remediation
- UST/UFT
- Unexpected Finds
- Unexpected Finds

IVR Unexpected Finds

- UF155

JBS&G

Job No: 51997

Client: Tactical Group

Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL

Scale 1:1,250

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

Moorebank Precinct West

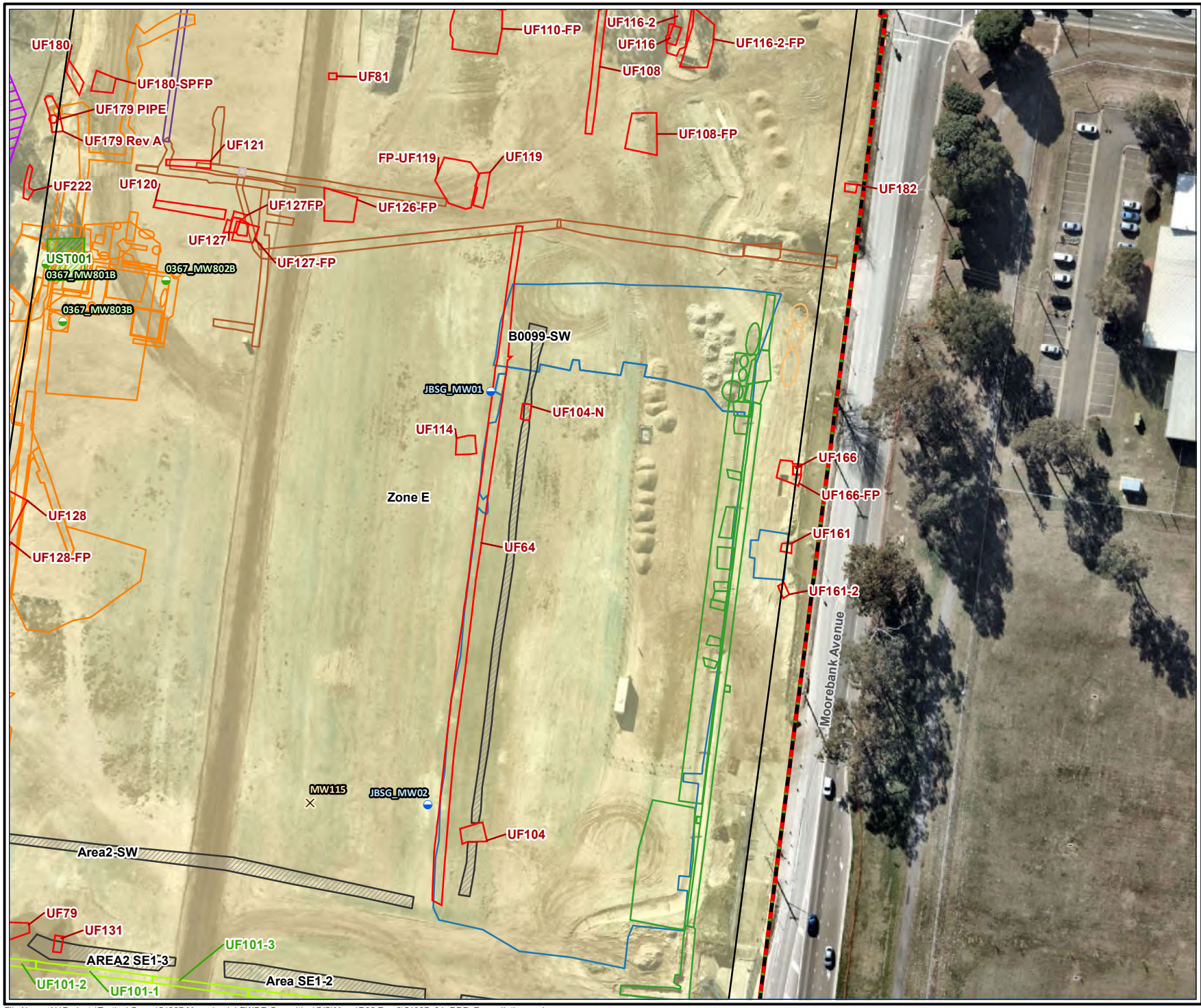
Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.21

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018

UF67, UF77, UF179 and UF222



Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Endangered Ecological Communities (EEC)
- IN1 - General Industrial
- UST/UFT
- High Risk Services
- Unexpected Finds
- Unexpected Finds

IVR Unexpected Finds

B0099, UF146, UF159, UF77, UF65, UF68, UF67

JBS&G

Job No: 51997

Client: Tactical Group

Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL

Scale 1:1,250

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

Moorebank Precinct West

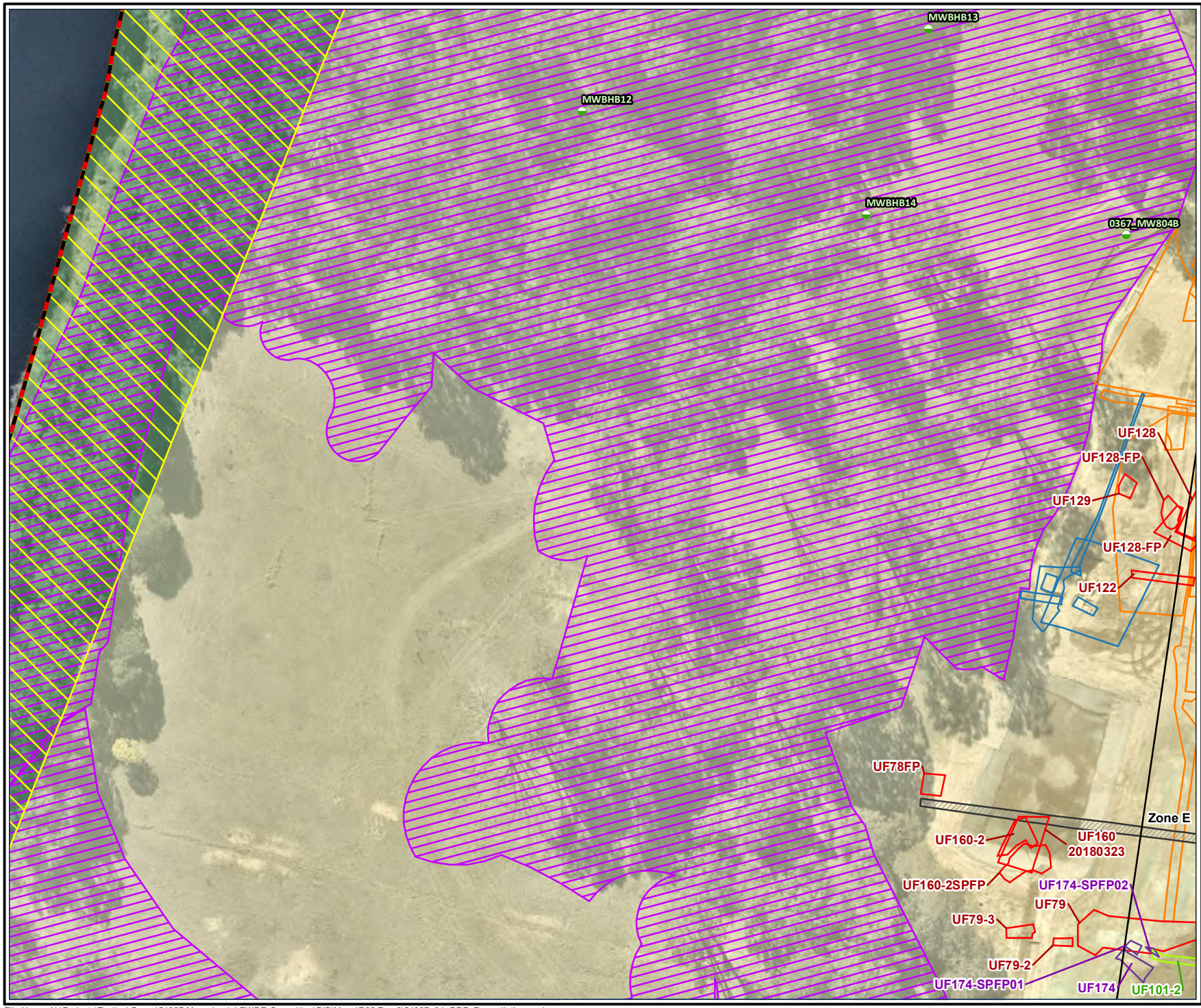
Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.6

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018

UF79



Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Biobank Areas
- Endangered Ecological Communities (EEC)
- E3 - Environmental Management
- IN1 - General Industrial
- High Risk Services
- Unexpected Finds
- Unexpected Finds
- Unexpected Finds

IVR Unexpected Finds

- UF123
- UF77

JBS&G

Job No: 51997

Client: Tactical Group

Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL

Scale 1:1,250

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

Moorebank Precinct West

Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.5

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018

UF95

Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Endangered Ecological Communities (EEC)
- IN1 - General Industrial
- RAP Remediation Areas
- Anthropogenic Fill
- Unexpected Finds

IVR Unexpected Finds

- UF39
- UF51

JBS&G

Job No: 51997

Client: Tactical Group

Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL

Scale 1:1,250

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

Moorebank Precinct West

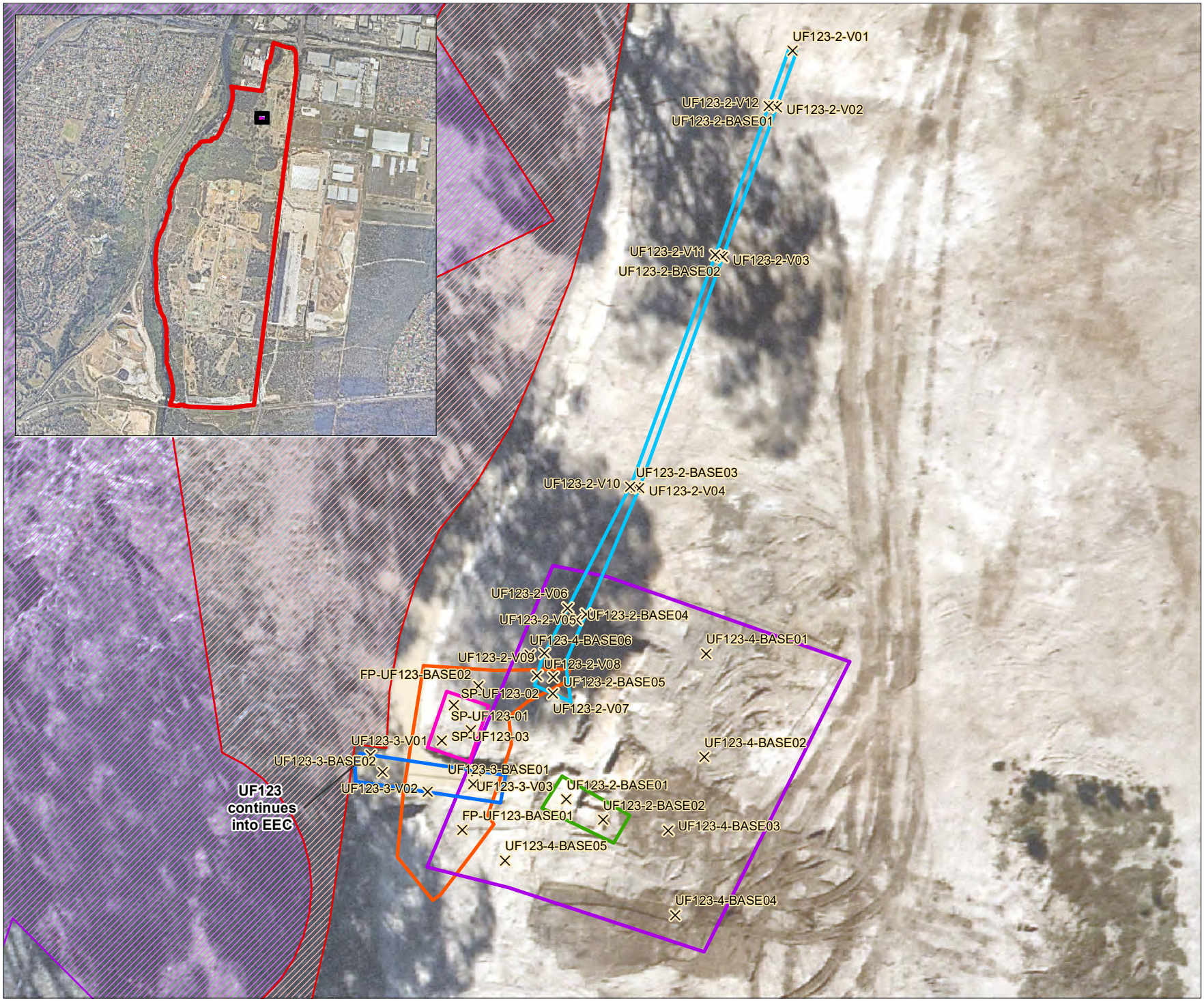
Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.32

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018

UF123



Legend:

- Approximate Site Boundary
- Flagged EEC Zone On-Site
- Endangered Ecological Communities (EECs) – Approximate Extent
- FP-UF123
- SP-UF123
- UF123-2-ACM
- UF123-2-TAR
- UF123-3
- UF123-4
- Validation Sample

JBS&G

Job No: 51997

Client: Tactical Group

Version: L229 Rev A	Date: 17-Jan-2019
Drawn By: FH	Checked By: JS

Scale 1:350

0 5 10
metres

Coor. Sys. GDA 1994 MGA Zone 56

UF123
Remediation Area

Chatham Avenue
Moorebank, NSW

SITE LAYOUT AND SAMPLE LOCATIONS

FIGURE: 2

File Name: \\JBSG-NSW-FS01\Company Data\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L229 Rev A\51997_02_Layout_and_samples.mxd
Reference: Nearmap http://www.nearmap.com.au - Imagery 17-07-2018

UF150

Legend:

- UF150 Pipe Trench
- UF150-2 Pipe Trench
- UF150-3 Telecommunications Pit
- UF150-SPFP01 SP Footprint 1
- UF150-SPFP02 SP Footprint 2
- Validation Sample Location
- UF150-4 ACM Pipe continuing into EEC

JBS&G

Job No: 51997

Client: Tactical Group

Version: L251 Rev A	Date: 10-Jan-2019
Drawn By: FH	Checked By: AF

Scale 1:250

0 5 10
metres

Coor. Sys. GDA 1994 MGA Zone 56

UF150

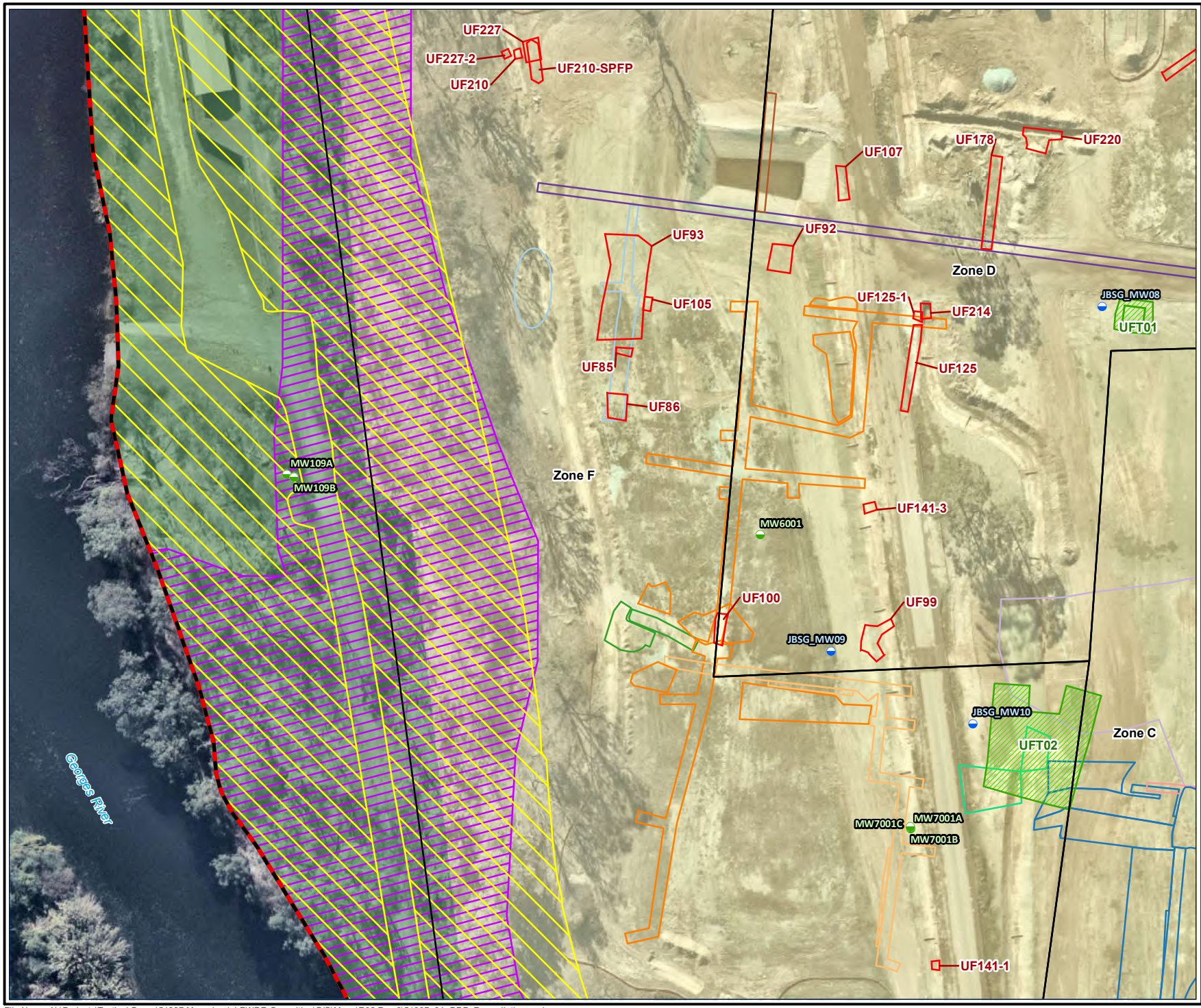
Moorebank Avenue, Moorebank, NSW

SITE LAYOUT AND SAMPLE LOCATIONS

FIGURE: 2

File Name: \\jbsg-nsw-fs01\Company Data\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L251 Rev A\51997_01_UF150.mxd
Reference: Nearmap - http://www.nearmap.com.au/. Imagery - 21-01-2018

UF227



Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Biobank Areas
- Endangered Ecological Communities (EEC)
- E3 - Environmental Management
- IN1 - General Industrial
- UST/UFT
- Unexpected Finds

IVR Unexpected Finds

UF39, UF42, UF40, UF28
UF41, UF61, UF13
UF26, UF31, UF30

JBS&G

Job No: 51997

Client: Tactical Group

Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL

Scale 1:1,250

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

Moorebank Precinct West

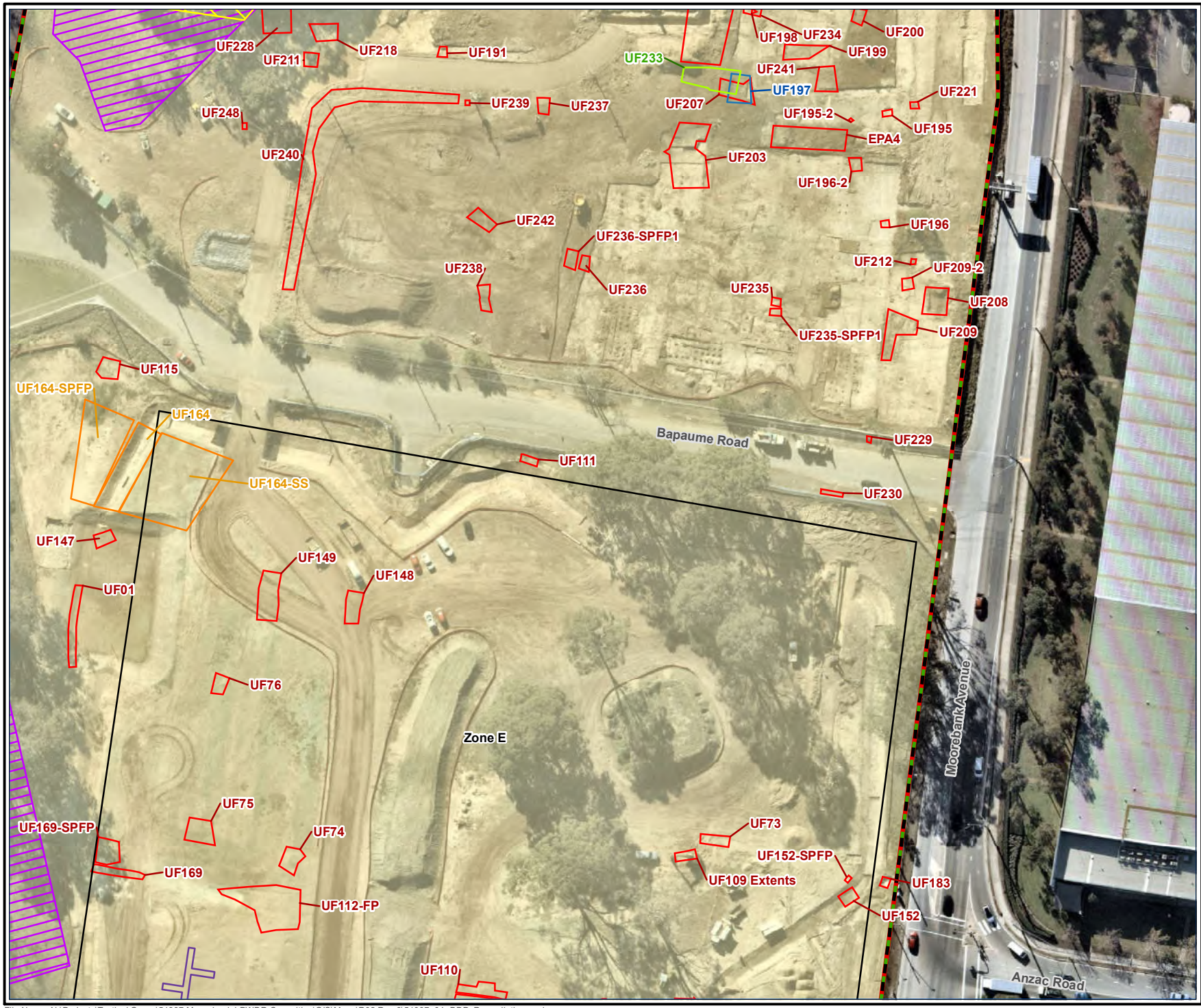
Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.27

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018

UF230



Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Biobank Areas
- Endangered Ecological Communities (EEC)
- IN1 - General Industrial
- Unexpected Finds
- Unexpected Finds
- Unexpected Finds
- Unexpected Finds

IVR Unexpected Finds

- UF68

JBS&G

Job No: 51997

Client: Tactical Group

Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL

Scale 1:1,250

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

Moorebank Precinct West

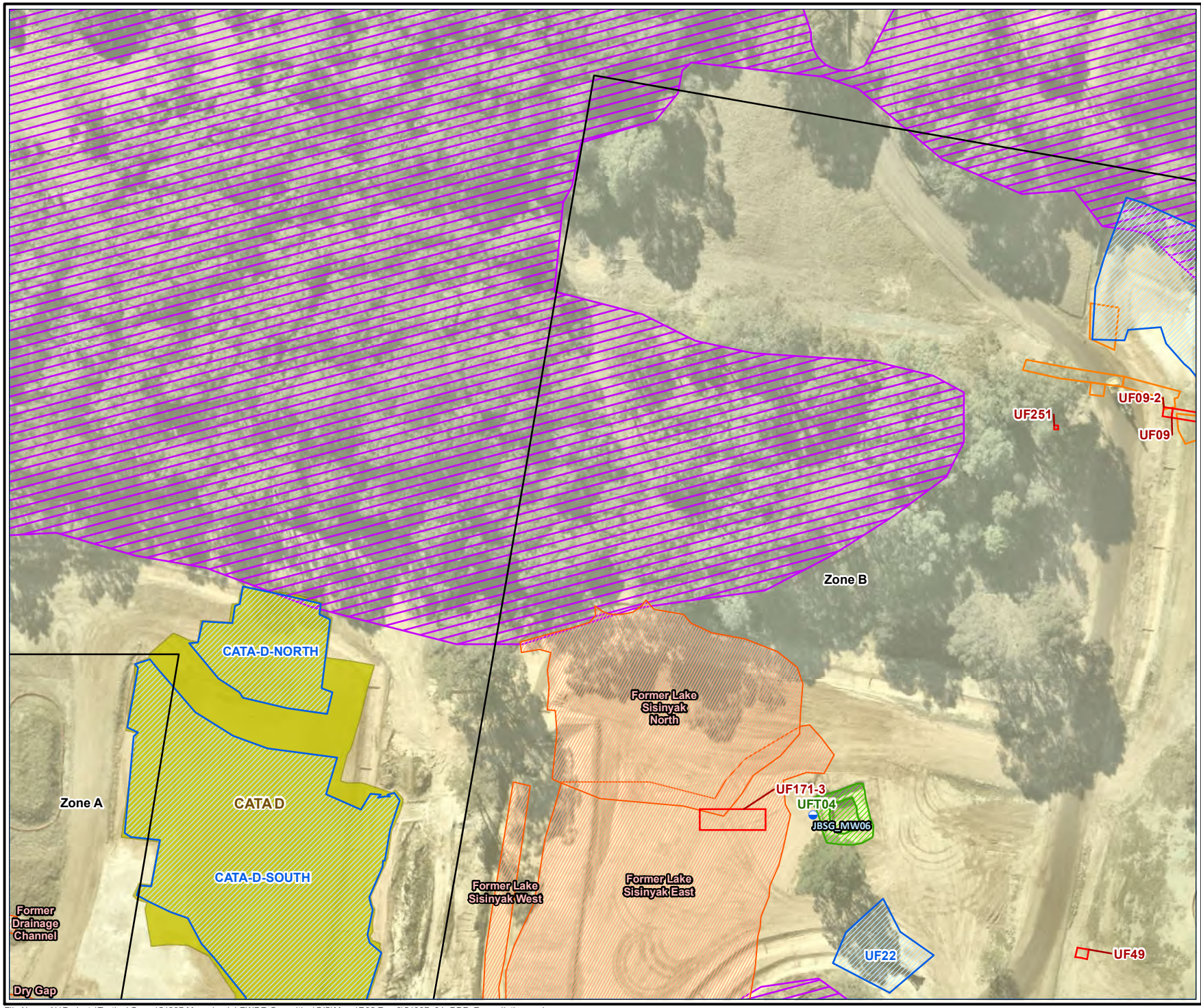
Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.3

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018

UF251



Legend:

- Approximate Site Boundary
- Approximate RAP Boundary
- Amended RAP Boundary
- Demolition Zones
- Endangered Ecological Communities (EEC)
- CATA Boundaries
- IN1 - General Industrial
- RAP Remediation
- UST/UFT
- Anthropogenic Fill
- Unexpected Finds

IVR Unexpected Finds

- UF150

JBS&G

Job No: 51997	
Client: Tactical Group	
Version: R02 Rev 0	Date 5/03/2020
Drawn By: AS	Checked By: LL
Scale 1:1,250	

0 25 50
metres

Coord. Sys. GDA 1994 MGA Zone 56

Moorebank Precinct West

Chatham Avenue
Moorebank, NSW

DETAILED REMEDIATION

FIGURE 4.13

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\R02 Rev 0\51997_04_DDP_Remediation.mxd
Reference: Nearmap Imagery - 17/07/2018

CPT-134A

Path: J:\geo\2014\1416224_SIMTA_Stage 1_Moorebank\Technical Docs\GIS\Project\035-R-RevA\05Aug16\1416224_035_R_RevA_F004A_AsbestosMP.mxd

LEGEND

- The Precinct (approximate)
- MIC Property West
- SIMTA Property
- Joint Defence Logistics Complex Moorebank
- Moorebank
- Moorebank Ave Realignment
- Conservation Area (approximate)
- Anthropogenic Fill (confirmed)
- Anthropogenic Fill (potential)
- Stockpile
- Asbestos Inspection Area
- Area of previous building demolitions - Not inspected
- Asbestos identified (2016 investigation)
- Asbestos identified (pre 2016)
- Asbestos tested but not identified
- Asbestos in soil exceeds NEPM HSL

NOTE(S)
1. Conservation Area digitised from Drawing PREC-RCG-AR-SKC-00002a (Masterplan Precinct, 09/06/2016 issue K)

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

COPYRIGHT
Aerial Photography Copyright
1.NearMap Pty Ltd.

0 210 420
METRES
1:5,000
PROJECTION: GDA 1994 MGA Zone 56

CLIENT
THE TACTICAL GROUP

PROJECT
ASBESTOS IN SOILS MANAGEMENT PLAN

TITLE
ASBESTOS IN SOILS DISTRIBUTION SUMMARY

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-08-12
PREPARED	KJS
DESIGNED	####
REVIEWED	JD
APPROVED	GVS

PROJECT NO.	CONTROL	REV.	FIGURE
1416224	030-R	0	004A

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: A3
25mm
0

Former STP

LEGEND

- RAP Site Boundary
- Proposed works compound

Investigation Locations

- Borehole
- CPT
- Handpit
- Sediment
- Surface Scrape
- Test Pit
- Locations with Asbestos detected
- Asbestos detected
- Vegetation exclusion area

Remediation Areas

- Hotspot
- Stockpile

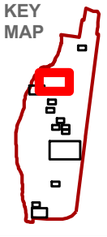
NOTES

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

0 10 20 30 40 50 METRES

REFERENCE SCALE: 1:1,000 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
REMEDIATION AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-08-08
PREPARED	KJS / KB
DESIGN	-
REVIEW	GVS
APPROVED	GVS

PROJECT No.	CONTROL	Rev.	FIGURE
1651776	005-R	0	004-L

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: A3

25mm

Path: \\golder.gds\gan\Sydney\Jobs\ewv\2016\1651776 - SMITA Stage 2 SSD Summary Report\GIS\Project\003-Rev0\1651776_003_F004_Rev0_Remediation Areas.mxd

Former NBC Bunker

Legend:

- Approximate Site Boundary
- Areas Of Potential Concern
- Unexpected Finds
- Stormwater

JBS&G

Job No: 51997

Client: Tactical Group

Version: L277 Rev A	Date: 18-Jan-2019
Drawn By: FH	Checked By: JS

Scale 1:800

0 10 20
metres

Coor. Sys. GDA 1994 MGA Zone 56

Assessment of High Risk Services

Chatham Avenue Moorebank, NSW

SITE LAYOUT AREA 16

FIGURE: 3C

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L277 Rev A\51997_03_DDP.mxd
Reference: Nearmap http://www.nearmap.com.au - Imagery 17-07-2018

Golf Course Stockpile

LEGEND

- RAP Site Boundary

Investigation Locations

- Borehole
- CPT
- Hand auger
- Test Pit
- Vegetation exclusion area

Remediation Areas

- Stockpile

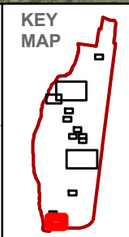
NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER POST PHASE 2 ESA PROJECT.

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP



CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 5,5 11 16,5 22 27,5 METRES

REFERENCE SCALE: 1:500 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
REMEDIATION AREAS

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-08-08
PREPARED	KJS / KB
DESIGN	-
REVIEW	GVS
APPROVED	GVS

PROJECT No.	CONTROL	Rev.	FIGURE
1651776	005-R	0	**004-M**

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: A3

25mm

0

Path: \\golder.gds\gap\Sydney\Jobs\ev\2016\1651776 - SIMTA Stage 2 SSD Summary Report\GIS\Project\005-R\ev\01651776_003_F004_Rev0_RemediationAreas.mxd

Former Lake Sisinyak North

Legend:

- Dog Training Area & Former Lake Sisinyak
- Former Lake Sisinyak North Final Remediation Extent
- Current Lake Sisinyak East Remediation Area
- Wall Present
- Wall Not Present
- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present

Validation Sample Locations

- Final Validation Sample Location - Passed
- Anthropogenic Material Present in Sample Location
- Sample Redundant Following Additional Removal of Material

Note: All validation samples end with the suffix _0-1.0

JBS&G

Job No: 51997

Client: Tactical Group

Version: L018 Rev B	Date: 06-Jun-2017
Drawn By: BC	Checked By: LL

Scale 1:500

0 6 12
metres

Coor. Sys. GDA 1994 MGA Zone 56

Former Lake Sisinyak North Remediation Area
Chatham Avenue,
Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 0-1.0M)

FIGURE: 4A

File Name: 51997_04A
Reference: Near Maps http://www.nearmap.com.au/. Imagery 17 Jan 2017.

Legend:

- Dog Training Area & Former Lake Sisinyak
- Former Lake Sisinyak North Final Remediation Extent
- Current Lake Sisinyak East Remediation Area
- Wall Present
- Wall Not Present
- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present

Validation Sample Locations

- Final Validation Sample Location - Passed
- Anthropogenic Material Present in Sample Location
- Sample Redundant Following Additional Removal of Material
- Sample is Excluded From Final Remediation Extent

Note: All validation samples end with the suffix _1.0-2.0

JBS&G

Job No: 51997

Client: Tactical Group

Version: L018 Rev B	Date: 06-Jun-2017
Drawn By: BC	Checked By: LL

Scale 1:500

0 6 12
metres

Coor. Sys. GDA 1994 MGA Zone 56

Former Lake Sisinyak North Remediation Area
Chatham Avenue,
Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 1.0-2.0M)

FIGURE: 4B

File Name: 51997_04B
Reference: Near Maps http://www.nearmap.com.au/. Imagery 17 Jan 2017.

Legend:

- Dog Training Area & Former Lake Sisinyak
- Former Lake Sisinyak North Final Remediation Extent
- Current Lake Sisinyak East Remediation Area
- Wall Present
- Wall Not Present
- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present

Validation Sample Locations

- Final Validation Sample Location - Passed
- Anthropogenic Material Present in Sample Location
- Sample Redundant Following Additional Removal of Material
- Sample is Excluded From the Final Remediation Extent

Note: All validation samples end with the suffix _2.0-3.0

JBS&G

Job No: 51997

Client: Tactical Group

Version: L018 Rev B	Date: 06-Jun-2017
Drawn By: BC	Checked By: LL

Scale 1:500

0 6 12
metres

Coor. Sys. GDA 1994 MGA Zone 56

Former Lake Sisinyak North Remediation Area
Chatham Avenue,
Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 2.0-3.0M)

FIGURE: 4C

File Name: 51997_04C
Reference: Near Maps http://www.nearmap.com.au/. Imagery 17 Jan 2017.

Legend:

- Dog Training Area & Former Lake Sisinyak
- Former Lake Sisinyak North Final Remediation Extent
- Current Lake Sisinyak East Remediation Area
- Wall Present
- Wall Not Present
- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present

Validation Sample Locations

- Final Validation Sample Location - Passed
- Anthropogenic Material Present in Sample Location
- Sample Redundant Following Additional Removal of Material

Note: All validation samples end with the suffix _3.0-4.0

JBS&G

Job No: 51997

Client: Tactical Group

Version: L018 Rev B	Date: 06-Jun-2017
Drawn By: BC	Checked By: LL

Scale 1:500

0 6 12
metres

Coor. Sys. GDA 1994 MGA Zone 56

Former Lake Sisinyak North Remediation Area
Chatham Avenue,
Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 3.0-4.0M)

FIGURE: 4D

File Name: 51997_04D
Reference: Near Maps http://www.nearmap.com.au/. Imagery 17 Jan 2017.

Legend:

- Dog Training Area & Former Lake Sisinyak
- Former Lake Sisinyak North Final Remediation Extent
- Current Lake Sisinyak East Remediation Area
- Wall Present
- Wall Not Present
- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present

Validation Sample Locations

- Final Validation Sample Location - Passed

Note: All validation samples end with the suffix _4.0-5.0

JBS&G

Job No: 51997

Client: Tactical Group

Version: L018 Rev B	Date: 06-Jun-2017
Drawn By: BC	Checked By: LL

Scale 1:500

0 6 12
metres

Coor. Sys. GDA 1994 MGA Zone 56

Former Lake Sisinyak North Remediation Area
Chatham Avenue,
Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 4.0-5.0M)

FIGURE: 4E

File Name: 51997_04E
Reference: Near Maps http://www.nearmap.com.au/. Imagery 17 Jan 2017.

Legend:

- Dog Training Area & Former Lake Sisinyak
- Former Lake Sisinyak North Final Remediation Extent
- Current Lake Sisinyak East Remediation Area
- Wall Present
- Final Validation Sample Location - Passed

JBS&G

Job No: 51997	
Client: Tactical Group	
Version: L018 Rev B	Date: 06-Jun-2017
Drawn By: BC	Checked By: LL
Scale 1:500	

0 6 12
metres

Coor. Sys. GDA 1994 MGA Zone 56

Former Lake Sisinyak North Remediation Area
Chatham Avenue,
Moorebank, NSW

SAMPLE LOCATIONS - EXCAVATION BASE

FIGURE: 4F

File Name: 51997_04F
Reference: Near Maps http://www.nearmap.com.au/. Imagery 17 Jan 2017.

Former Lake Sisinyak South

Legend:

- Further Anthropogenic
- Former Lake Sisinyak South Final Remediation Extent
- Former Lake Sisinyak East Final Remediation Extent
- Former Lake Sisinyak West Final Remediation Extent
- Wall Not Present
- Original Endangered Ecological Communities (EEC)
- Revised EEC Zone
- Sample Location

JBS&G

Job No: 51997

Client: Tactical Group

Version: L138 Rev A	Date: 06-Dec-2018
Drawn By: FH	Checked by: EH

Scale 1:200

0 4 8
metres

Coor. Sys. GDA 1994 MGA Zone 56

Lake Sisinyak South Remediation Area

Chatham Avenue Moorebank, NSW

SAMPLE LOCATIONS

FIGURE: 3

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L138 Rev A\51997_03_Sample_Locations.mxd
Reference: Nearmap Imagery 17/07/2018

Former Lake Sisinyak East

Legend:

- Test Pit Location

Historical Sample Locations

- Hand Pit
- Sediment
- Test Pit
- Former Lake Sisinyak East Final
- Former Lake Sisinyak North Final Remediation Exstent
- Former Lake Sisinyak West Final Remediation Extent
- Former Lake Sisinyak East Proposed Remediation Extent (RAP, Golder 2016a)

JBS&G

Job No: 51997

Client: Tactical Group

Version: L039 Rev B	Date: 09-Nov-2018
Drawn By: FH	Checked By: LL

Scale 1:800

0 10 20
metres

Coor. Sys. GDA 1994 MGA Zone 56

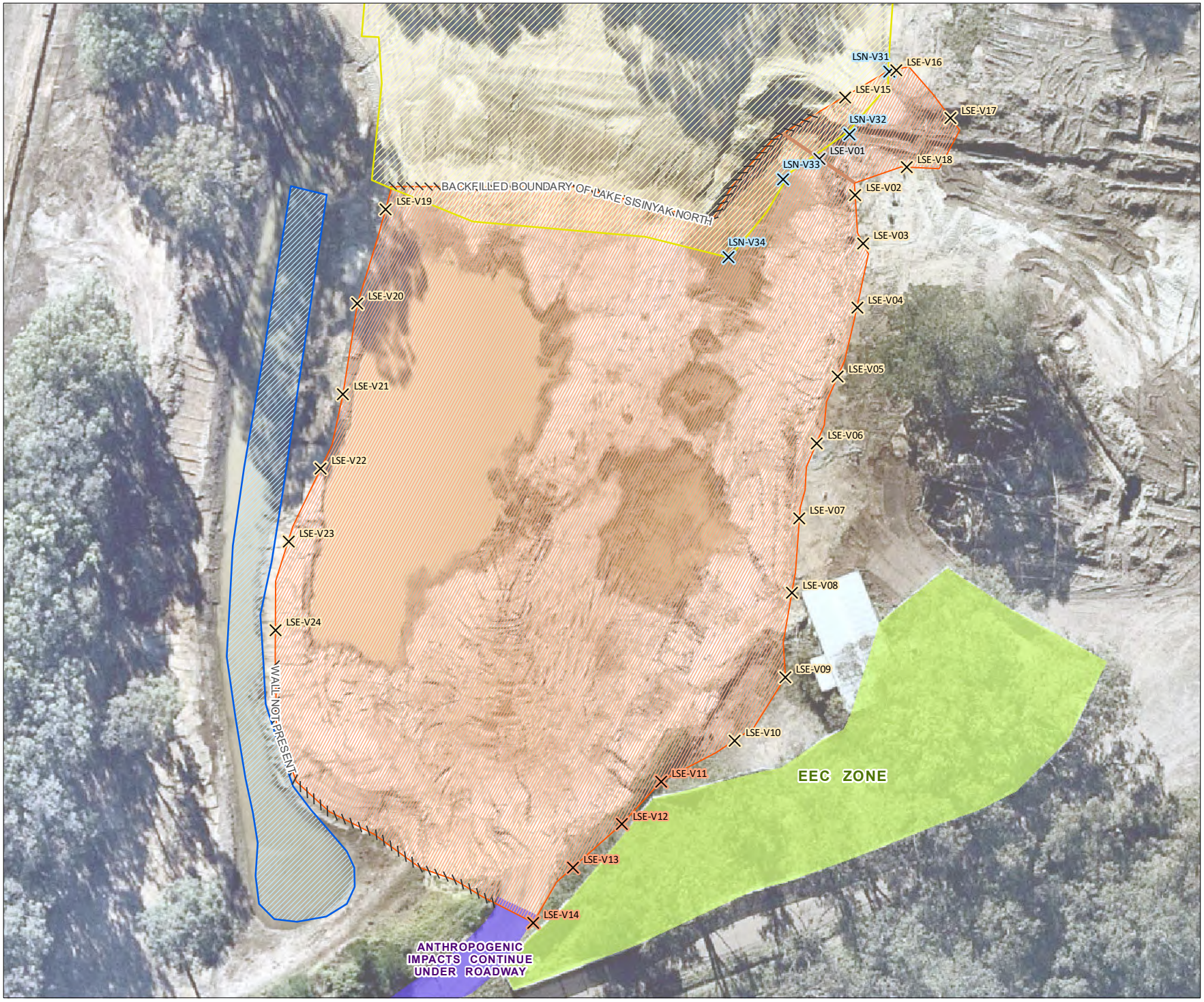
Former Lake Sisinyak East Remediation Area

Chatham Avenue, Moorebank, NSW

HISTORICAL SAMPLING LOCATIONS & REMEDIATION EXTENT

FIGURE: 3

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L039 Rev B\51997_03.mxd
Reference: Near Maps http://www.nearmap.com.au/. Iimagery 02-07-2017.



Legend:

- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present
- Former Lake Sisinyak East Final
- Former Lake Sisinyak North Final Remediation Exstent
- Former Lake Sisinyak West Final Remediation Extent
- Anthropogenic Material Identified on EEC Boundary
- Final Validation Sample Location - Passed
- Sample Redundant Following Additional Removal of Material
- Former Lake Sisinyak North Sample Locations - Passed

JBS&G

Job No: 51997

Client: Tactical Group

Version: L039 Rev B	Date: 09-Nov-2018
Drawn By: FH	Checked By: LL

Scale 1:600

0 10 20
metres

Coor. Sys. GDA 1994 MGA Zone 56

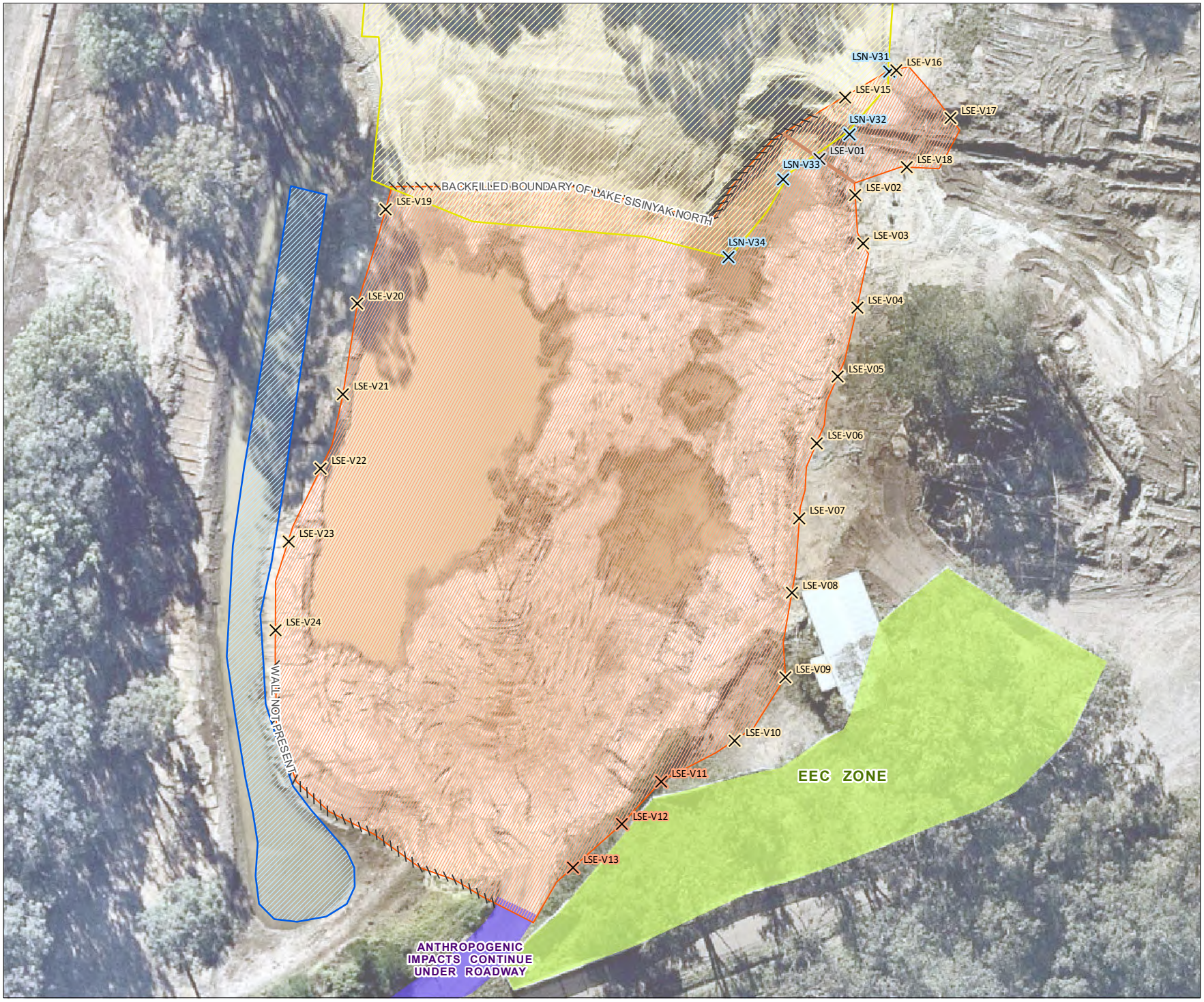
Former Lake Sisinyak East Remediation Area

Chatham Avenue, Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 0-1.0M)

FIGURE: 4A

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L039 Rev B\51997_04A.mxd
Reference: Near Maps http://www.nearmap.com.au/. Iimagery 02-07-2017.



Legend:

- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present
- Former Lake Sisinyak East Final
- Former Lake Sisinyak North Final Remediation Exstent
- Former Lake Sisinyak West Final Remediation Extent
- Anthropogenic Material Identified on EEC Boundary
- Final Validation Sample Location - Passed
- Sample Redundant Following Additional Removal of Material
- Former Lake Sisinyak North Sample Locations - Passed

JBS&G

Job No: 51997

Client: Tactical Group

Version: L039 Rev B	Date: 08-Nov-2018
Drawn By: FH	Checked By: LL

Scale 1:600

0 10 20
metres

Coor. Sys. GDA 1994 MGA Zone 56

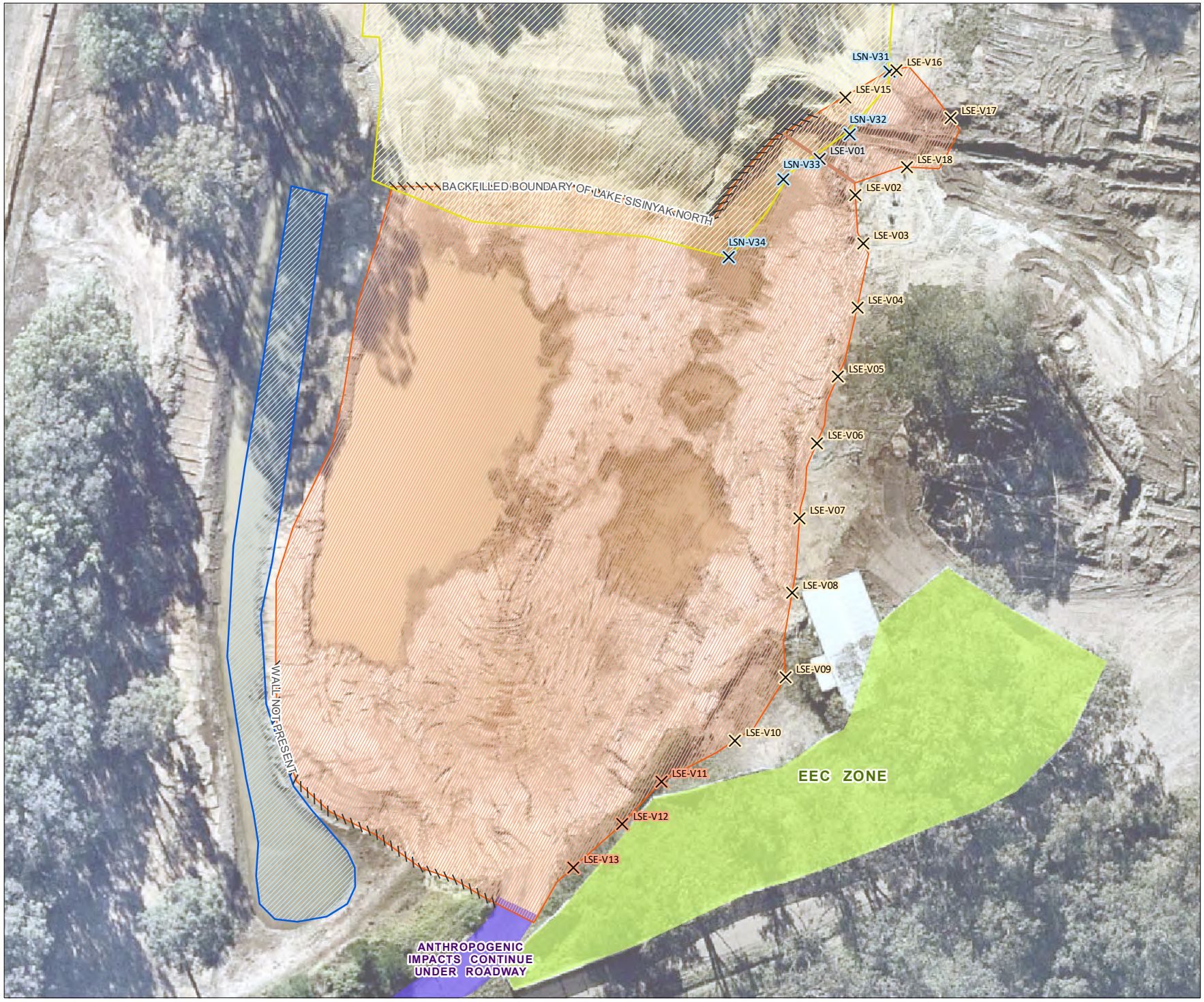
Former Lake Sisinyak East Remediation Area

Chatham Avenue, Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 1.0-2.0M)

FIGURE: 4B

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L039 Rev B\51997_04B.mxd
Reference: Near Maps http://www.nearmap.com.au/. Iimagery 02-07-2017.



Legend:

- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present
- Former Lake Sisinyak East Final
- Former Lake Sisinyak North Final Remediation Exstent
- Former Lake Sisinyak West Final Remediation Extent
- Anthropogenic Material Identified on EEC Boundary
- Final Validation Sample Location - Passed
- Sample Redundant Following Additional Removal of Material
- Former Lake Sisinyak North Sample Locations - Passed

JBS&G

Job No: 51997

Client: Tactical Group

Version: L039 Rev B	Date: 08-Nov-2018
Drawn By: FH	Checked By: LL

Scale 1:600

0 10 20
metres

Coor. Sys. GDA 1994 MGA Zone 56

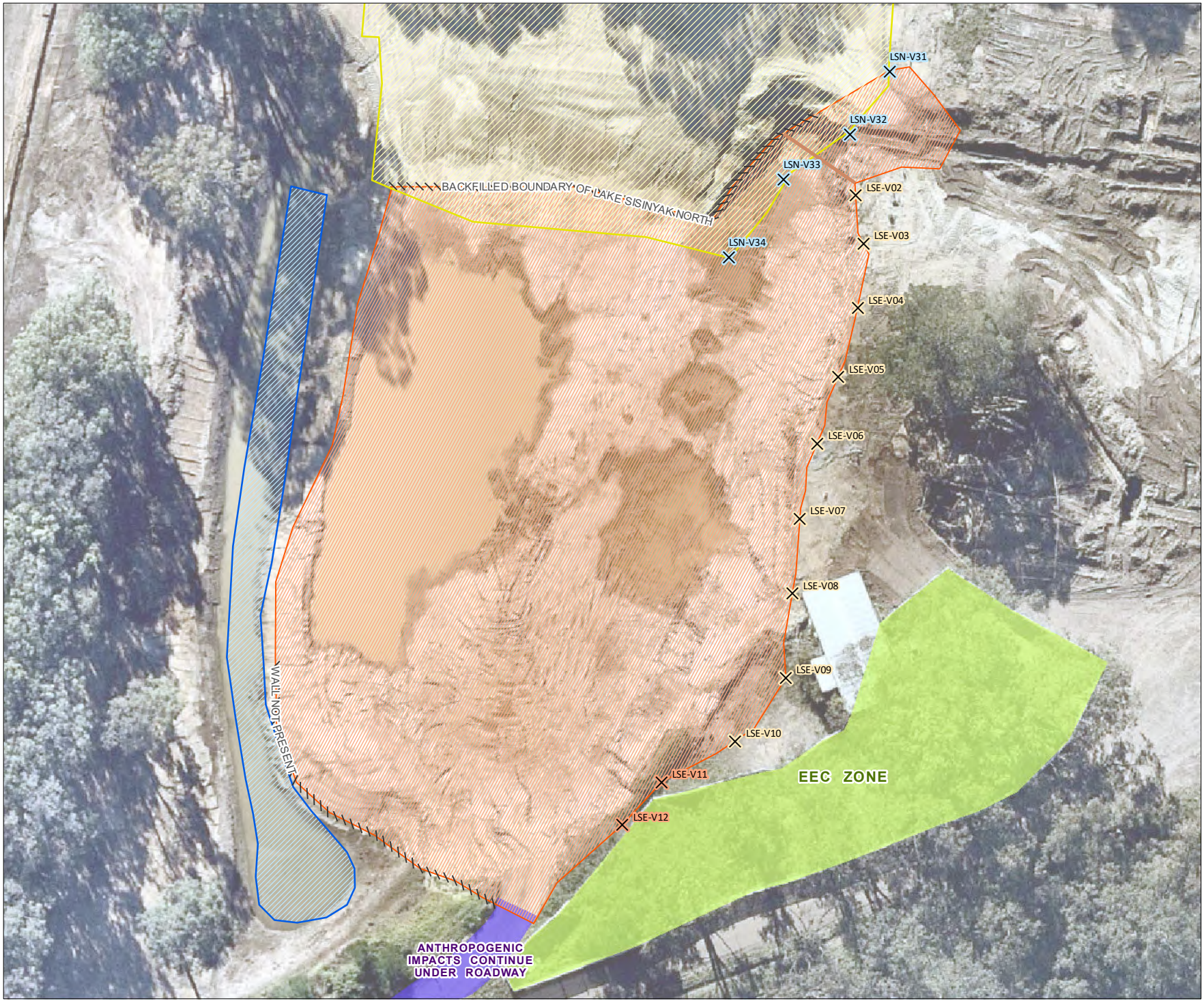
Former Lake Sisinyak East Remediation Area

Chatham Avenue, Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 2.0-3.0M)

FIGURE: 4C

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L039 Rev B\51997_04C.mxd
Reference: Near Maps http://www.nearmap.com.au/. Iimagery 02-07-2017.



Legend:

- Former Approximate Exent of Boundary Wall Removed Due to Anthropogenic Material Present
- Former Lake Sisinyak East Final
- Former Lake Sisinyak North Final Remediation Exstent
- Former Lake Sisinyak West Final Remediation Extent
- Anthropogenic Material Identified on EEC Boundary
- Final Validation Sample Location - Passed
- Former Lake Sisinyak North Sample Locations - Passed

JBS&G

Job No: 51997

Client: Tactical Group

Version: L039 Rev B	Date: 08-Nov-2018
Drawn By: FH	Checked By: LL

Scale 1:600

0 10 20
metres

Coor. Sys. GDA 1994 MGA Zone 56

Former Lake Sisinyak East Remediation Area

Chatham Avenue, Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 3.0-4.0M)

FIGURE: 4D

File Name: N:\Projects\Tactical Group\51997 Moorebank LPWDR Consulting\GIS\Maps\L039 Rev B\51997_04D.mxd
Reference: Near Maps http://www.nearmap.com.au/. Iimagery 02-07-2017.

Anthro-2

Legend:

- Anthro-2 (Zone B) Final Remediation Extent
- Test Pit Location

JBS&G

Job No: 51997

Client: Tactical Group

Version: L117 Rev A	Date: 10-Jan-2018
Drawn By: BC	Checked By: SG

Scale 1:600

0 7 14
metres

Coor. Sys. GDA 1994 MGA Zone 56

Anthro-2 (Zone B) Remediation Area

Chatham Avenue, Moorebank, NSW

REMEDIATION EXTENT

FIGURE: 3

File Name: 51997_03
Reference: Near Maps http://www.nearmap.com.au/. Imagery date: 12-12-2017.

Legend:

- Anthro-2 (Zone B) Final Remediation Extent
- Surface Scrape Area
- Wall Present
- Wall Not Present
- Final Validation Sample Location
- Anthro Material Identified on EEC Boundary
- Surface Sample Location

JBS&G

Job No: 51997	
Client: Tactical Group	
Version: L117 Rev A	Date: 10-Jan-2018
Drawn By: BC	Checked By: SG
Scale 1:474	

0 5.5 11
metres

Coor. Sys. GDA 1994 MGA Zone 56

Anthro-2 (Zone B) Remediation Area

Chatham Avenue, Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 0-1.0M)

FIGURE: 4A

File Name: 51997_04A
Reference: Near Maps http://www.nearmap.com.au/. Imagery date: 12-12-2017.

Legend:

- Anthro-2 (Zone B) Final Remediation Extent
- Wall Present
- Wall Not Present
- Final Validation Sample Location - Passed
- Anthro Material Identified on EEC Boundary

JBS&G

Job No: 51997	
Client: Tactical Group	
Version: L117 Rev A	Date: 10-Jan-2018
Drawn By: BC	Checked By: SG
Scale 1:600	

0 7 14
metres

Coor. Sys. GDA 1994 MGA Zone 56

Anthro-2 (Zone B) Remediation Area

Chatham Avenue, Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 1.0-2.0M)

FIGURE: 4B

File Name: 51997_04B
Reference: Near Maps http://www.nearmap.com.au/. Imagery date: 12-12-2017.

Legend:

- Anthro-2 (Zone B) Final Remediation Extent
- Wall Not Present
- Wall Present
- Anthro Material Identified on EEC Boundary

JBS&G

Job No: 51997

Client: Tactical Group

Version: L117 Rev A	Date: 10-Jan-2018
Drawn By: BC	Checked By: SG

Scale 1:600

0 7 14
metres

Coor. Sys. GDA 1994 MGA Zone 56

Anthro-2 (Zone B) Remediation Area

Chatham Avenue, Moorebank, NSW

SAMPLE LOCATIONS (DEPTH 2.0 - 2.5M)

FIGURE: 4C

File Name: 51997_04C
Reference: Near Maps http://www.nearmap.com.au/. Imagery date: 12-12-2017.

Appendix E

CONTAMINATION MANAGEMENT PROCEDURES

Land use restrictions	**CMP01**
Responsibility:	Site Owner (or nominated representative)
Frequency:	As required
Objective:	To manage risk to human health and the environment through land use restrictions
Areas of the Site	AEC 4
Backfilling of AEC 4 can only be undertaken after completion of remediation and validation works to ensure that appropriate access is maintained to these areas. All work conducted is limited to that defined in the CMP and as detailed in **Appendix C and D**.	

Vegetation Removal	**CMP02**
Responsibility:	Site Owner (or nominated representative)
Frequency:	As required
Objective:	To protect human health and the environment
Areas of the Site	AEC 4

General

All vegetation clearing should be undertaken in accordance with the Construction Soil and Water Management Plan[75].

AEC 1 – Chlorinated Hydrocarbon Impacted Area

Golder (2015a) reported residual chlorinated hydrocarbon groundwater contamination at depths of 7 – 9 metres below ground level (mBGL) and soil contamination predominantly between 3 - 7 mBGL. Given the depth of impact in AEC 1, it is considered unlikely that vegetation clearing will result in a risk to human health or the environment.

AEC 2 – Petroleum Hydrocarbon Impacted Area

GHD (2018) reported light non-aqueous phase liquid (LNAPL) in several monitoring wells at AEC 2 at a depth of approximately 6 mBGL. Given the depth of impact in AEC 2, it is considered unlikely that vegetation clearing will result in a risk to human health or the environment.

AEC 3 – PFAS Impacted Area

Based on the EnRiskS (2019) Land HHERA, the potential risk to human health associated with workers having direct contact with PFAS in soil, sediment and water was low and acceptable on the assumption that typical workplace safety protocols and PPE are implemented. In order to manage exposure of PFAS to workers at the Site, the following management controls should be implemented:

- Project inductions to identify areas with high risk of PFAS contamination.
- Prepare SWMS to identify risks associated with PFAS and appropriate control measures.
- Where appropriate, the area of the excavation/disturbance shall be appropriately separated from the balance of the Site to minimise inadvertent traffic and/or worker exposure.
- PPE used in the PFAS impacted area to include:
  - Disposable coverall suits including boots.
  - Disposable waterproof nitrite gloves in addition to standard glove requirements.
  - All other standard PPE required for works on Site.
- Signage placed in ablution blocks to ensure all workers wash hands and face prior to eating, regardless if gloves are worn.
- If worker's skin encounters PFAS impacted water, ensure skin is immediately washed with clean water and wet clothing is removed immediately after work is complete.

[75] Costin Roe Consulting (2020) Construction Soil and Water Management Plan, Moorebank Logistic Park Precinct West Stage 2, Moorebank Avenue, Moorebank NSW, dated 16 March 2020 (ref: 13455.07-03_10.rpt).

Vegetation Removal	CMP02

EnRiskS (2019) reported PFAS impacted soil is leachable and the following control measures should be implemented to minimise the risk to ecological receptors during vegetation removal:

- Water runoff should be diverted around vegetation clearance areas.
- Stabilisation of disturbed soil to reduce the risk of erosion, leaching and dust generation (e.g. application of a cover layer, polymer, geofabric, hydro-seed or hydromulch).
- Stormwater collected from catchments where vegetation clearing has occurred should be tested in accordance with the requirements of the Environmental Protection Licence prior to discharge off-site.

It is noted some vegetation removal is required in the vicinity of OSD Basin 6 and OSD Basin 8 (**Figure 2**). Both these locations are within known PFAS impacted areas. The additional control measures should be implemented to minimise the risk to ecological receptors during vegetation removal within these areas:

- The area/s should be delineated clearly prior to clearing.
- Where possible vegetation clearing should only be conducted as part of the OSD construction.
- Where vegetation clearing is not conducted as part of the OSD Construction and where bare ground is exposed after clearing, to reduce the risk of PFAS impacted soil leaching or eroding to surface water and groundwater, the area should be covered with a cover layer, such as a VENM / ENM.
- Covered and cleared area/s should be inspected weekly, in dry weather, and daily during wet weather, to ensure cover materials are not eroding.

Please refer to **CMP01** for further information on land use restrictions. Please refer to **CMP06** for the management of any unexpected finds during sub-surface works.

Note: Land disturbance is to be managed in accordance with Section 5.8 of the approved CSWMP prepared by Costin Roe Consulting.

Excavation/Handling of Potentially Impacted Services and Soils	CMP03
Responsibility:	Site Owner (or nominated representative)
Frequency:	As required in the event of disturbance of fill material
Objective:	To minimise exposure of contractors and site personnel to impacted soils during future excavation works within vegetated areas.
Areas of the Site	AEC 4

Residual areas of in-situ fill material remained at the time of the validation assessment in vegetated areas, as well as ACM in stockpiles and inground services. Where works are required in these areas of the site, there is the potential that workers may be exposed to fill material impacted with ACM and/or other contaminants.

Other remaining contamination issues on the Site, outside of the vegetated area within the Construction area, are detailed in the LTEMP.

Generally, measures are required to be put in place to eliminate the potential for unacceptable exposure of site workers. It is anticipated such contact may occur via dermal contact, ingestion, or inhalation.

For the known management areas within this CMP (AEC 4), as well as unexpected finds identified under the unexpected finds procedure (**CMP07**), the following process will be undertaken.

Procedure

Prior to the commencement of ground disturbance activities, a safety review of the proposed activities is required to be completed and an appropriate Safe Work Method Statement (SWMS) including Job Safety Analysis document be prepared in addition to any other appropriate documents which may be appropriate for the proposed works. The SWMS to be submitted to the Site Owner, or nominated representative, shall include as a minimum:

- Communication of the potential presence of impacted surface fill materials at the Site to site workers prior to the commencement of works where the workers may disturb the impacted material.
- Acknowledgement of the Unexpected Finds Protocol and requirements for ceasing work if such conditions are identified during activities.
- Where appropriate, the area of the excavation/disturbance shall be appropriately separated from the balance of the Site to minimise inadvertent traffic and/or worker exposure.
- Excavation/disturbance works shall only commence where appropriate precautions are taken, such as use of the correct PPE, as outlined below.
- Implementation of dust and sediment control procedures as outlined in the site CEMP (and sub-plans) during all site disturbance works.

All workers likely to be in contact with subsurface contaminated soil are required to meet the applicable personal protective equipment (PPE) requirements as outlined below and must have undertaken Occupational Health and Induction Training as defined in Part 6.5 of the *Work Health and Safety Regulation 2011.*

Excavation/Handling of Potentially Impacted Services and Soils	CMP03

Any person required to directly contact soils shall be required to wear the following minimum level of personal protective equipment (PPE):

- Long sleeves and pants; and
- Gloves.

Should evidence of asbestos impact be identified such as asbestos impacted soils or ACM conduits, appropriate additional PPE will be defined as an outcome of a risk assessment process.

Where ACM conduits or ACM impacted soils are required to be removed, all works must be completed in accordance with the WHS Regulations and How to Safely Remove Asbestos – Code of Practice (SafeWork NSW). Appropriate monitoring and clearance inspections, including validation must be undertaken. At the completion of removal works, an asbestos clearance certificate must be provided if documents that the asbestos removal area is suitable to re-occupied and the clearance works satisfy the asbestos criteria for commercial/industrial land in the ASC NEPM[76].

Prior to excavation of potentially contaminated material, measures must be in place to avoid cross-contamination with previously validated areas. This includes establishment of a contamination assessment and treatment area (CATA) within the area formerly containing EEC, and appropriate bunding and sediment fencing measures in place.

The excavations shall be maintained in accordance with SafeWork NSW Code of Practice. The excavated soils shall be carted to a CATA and, as necessary:

- Treated via hand picking, screening and/or bioremediation (if required); and
- Classification of treated materials for on-site reuse or off-site disposal.

Removal of High-Risk Utilities

The method of removal for high risk services shall include:

- Disconnection and / or isolation of any energy sources associated with the services;
- Excavation of the narrowest practical trench to remove the utility;
- The soil from the surface to the top of the utility excavated and side cast adjacent to the trench;
- Any fluids or liquids contained within the utility pumped off and disposed in accordance NSW EPA waste guidance;
- ACM pipe removal and disposal in accordance with relevant regulation and codes of practice by appropriate licensed contractors. Excavation must continue until all 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 m^3 of concrete; and
- The location of remaining pipes at the site boundary recorded by survey.

Validation of High-Risk Utilities Removal

The removal of high-risk utilities is to be validated as follows:

- For sewers and stormwater lines the validation is to include one sample per 50 m length of

[76] National Environmental Protection Council (NEPC), *National Environmental Protection (Assessment of Site Contamination) Measure (NEPM)*, 2013.

Excavation/Handling of Potentially Impacted Services and Soils	CMP03

trench, with samples collected from the base of the trench and analysed for contaminants of interest for the area. For smaller trench lengths, a minimum rate shall be one sample per trench less than 10 m and two samples for trenches between 10 and 50 m length;

- A sample shall also be collected from each triple interceptor traps, grease traps, pump well, etc. encountered;
- 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;
- For pipes made of ACM, validation will be via confirmation from a trained supervisor in asbestos removal that the trench is free of visible asbestos and a validation sample collected;
- The chemical contaminants of concern associated with remediation areas near the high-risk services shall be included in the analytical suite for validation; and
- Additional remediation and validation works shall occur if observations or testing indicate areas of contamination. The additional excavation should be treated as a hot spot remediation excavation.

Anthropogenic Fill and Hot Spot Management

Where identified anthropogenic fill and unexpected hot spot soil contamination is encountered, they shall be excavated, and the subsequent excavation validated. The following is to be implemented at each location:

- Impacted soils shall be excavated and the excavation works guided by an appropriately qualified and experienced consultant (Environmental Consultant). Excavated materials shall 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;
- Excavations shall extend until field observations (visual inspection and PID / XRF readings) indicate that contaminated soil above the adopted site remediation criteria is likely to have been removed;
- The depth and extent of excavations shall be continued until validated by the Environmental Consultant or until practicable limits of excavation are reached;
- Excavated soils shall be transported to a CATA, where soils shall be stockpiled to enable characterisation, and appropriate reuse/disposal;
- Soils evaluated as being impacted with hydrocarbons and /or soils reporting concentrations of hydrocarbons above the remediation validation criteria shall be treated on-site through bioremediation;
- If excavated materials cannot 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; and
- Stockpiles outside CATAs will be covered to mitigate generation of dust or impacted surface water runoff.

Anthropogenic Fill and Hot Spot Validation

- Validation soil sampling of the base of the excavations shall be undertaken at a minimum of two

Excavation/Handling of Potentially Impacted Services and Soils	CMP03

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 shall be applied to each strata 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 strata will be collected; and
- Excavations known or suspected to be impacted with asbestos will be classified or validated using the gravimetric approach, as described within the ASC NEPM (2013), where the soil is tested using a representative number of individual 10 L and 500g samples.
- Validation soil samples shall be submitted for laboratory analysis for contaminants identified as exceeding the relevant criteria during the assessment phase and those contaminants identified as being of concern through site observation and/or site history review.

Asbestos Air Monitoring

In the event that asbestos is found a monitoring program will 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;
- clearance monitoring (if friable asbestos is encountered only); and
- Site Inspections.

<u>Daily Static Airborne Asbestos Fibre Monitoring</u>

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 How to Safely Remove Asbestos (2018):

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.

Excavation/Handling of Potentially Impacted Services and Soils	CMP03
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. Note: Land disturbance is to be managed in accordance with Section 5.8 of the approved CSWMP prepared by Costin Roe Consulting.	

Off-Site Disposal of Excavated/Unsuitable Material	CMP04
Responsibility:	Site Owner (or nominated representative)
Frequency:	Continuous
Objective:	To ensure that material which exceed the adopted site criteria (including in-situ fill material) is appropriately characterised for off-site removal and lawfully disposed from the site.
Areas of Site	AEC 4

Manage and Minimise Waste

It is recommended that disturbance of soil within AEC 4 required to complete remediation in accordance with the Golder (2016a) RAP should be minimised by reusing and retaining material on the Site where practicable.

Procedure

Where the Site Owner (or nominated representative) identifies the requirement to remove material from AEC 4 in order to complete remediation in accordance with the Golder (2016a) RAP, the material is required to be characterised by an Environmental Consultant to evaluate potential off-site removal options.

The Environmental Consultant shall consider the relevant requirements of NSW legislation and regulations in the identification of appropriate options for off-site disposal / reuse including, but not limited to the following:

- NSW EPA Waste Classification Guidelines (EPA 2014).
- NSW EPA Waste Classification Addendum (EPA 2016).
- Excavated Natural Material Regulation 2014 and Excavated Natural Material Order 2014.
- Relevant resource recovery orders and resource recovery exemptions made by the NSW EPA.

The requirements for use of licensed vehicles, waste tracking, covering of vehicles, etc. as noted in the POEO (Waste) Regulation (2014) will be identified by the Environmental Consultant and documented as part of a waste classification report to facilitate off-site disposal of waste material to a facility with the appropriate NSW EPA Environmental Protection License to accept the classified material.

Disposal records for all material removed from the site shall be required to be provided to the Site Owner or appointed representative, by the appointed contractor upon completion of the disposal works. These records will be maintained in accordance with **CMP12**. The records will be made available to the Environmental Consultant engaged to prepare final site condition reports upon request to demonstrate the lawful off-site disposal of material from the site.

ACM conduits or ACM impacted soils must be disposed offsite as Special Waste (Asbestos) in combination with other classes of waste (if applicable). Asbestos waste is to be tracked in accordance with Clauses 76 and 79 of the *Protection of the Environment Operations (Waste) Regulation 2014*.

Stockpile Classification

Stockpile classification testing will be undertaken by the Environmental Consultant in accordance with the following:

- All stockpiles must be classified prior to off-site disposal. Stockpiles of general fill may be classified visually based on their waste content and observations. All other stockpiles will be

Off-Site Disposal of Excavated/Unsuitable Material	CMP04

classified based on classification testing, with samples scheduled for laboratory analysis of the contaminants of concern corresponding with the source of the stockpile;
• Stockpiles must generally not be less than 200 m^3 in volume and not greater than 2,500 m^3 in volume. It is recognised 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 stockpiled material at the following sampling frequency:
  • One test per 25 m^3 for soils assessed for volumes less than 200 m^3; 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 2,500 m^3, the sampling frequency of one test per 250 m^3 will be adopted).	

Stockpile management		**CMP05**
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required in the event of the stockpiling of soil	
Objective:	To minimise the risk to human health and the environment from the stockpiling of soil.	
Areas of the Site	AEC 4	

Stockpiling of soil may be a requirement of remediation works associated with AEC 4 in accordance with the Golder (2016a) RAP or management of unexpected finds. The following management protocols should be implemented during these works.

General Stockpiles

All stockpiles will be managed in accordance with the CEMP and sub-plans, and in accordance with the EPBC Act conditions of approval for 2011/6086 and maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials.

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 any site materials management and tracking plan as part of the CEMP.

If cover is 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. Stockpiles will be placed at approved locations and located to mitigate environmental impacts while facilitating material handling requirements.

ACM Stockpile Management and Validation

Subject to prior notification to SafeWork NSW, identified stockpiles of ACM shall be managed similar to anthropogenic fill, including: measures to minimise dust and fibre generation, excavation; cart to CATA for treatment; treatment via hand picking and screening (if required); validation of former stockpile footprint and treated materials; and classification of treated materials for on-site reuse or off-site disposal.

Contaminated Stockpiles

If assessment by the Environmental Consultant or the Ordnance Contractor identifies contamination in soil excavated from the Site, or a stockpile is observed to be contaminated, then the Environmental Consultant will assess the stockpile in accordance with the unexpected finds protocol (**CMP06**) to delineate the contamination and assess the extent of management, if required.

Contaminated or potentially contaminated materials would only be stockpiled within areas of the Site or at locations that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas). A CATA will be established to allow assessment and treatment of contaminated soil. The following protocols will be applied at each CATA:

- Stockpiles would only be constructed in areas of the Project site that had been prepared in accordance with the requirements of the Project Preliminary RAP in Appendix G of Technical Paper 5 – Environmental Site Assessment (Phase 2), Volume 4.
- Stockpiles would be placed at approved locations and would be strategically located to mitigate environmental impacts while facilitating material handling requirements. Contaminated or potentially contaminated materials would only be stockpiled in unremediated areas of the Project site or at locations

Stockpile management	CMP05

that did not pose any risk of environmental impairment of the stockpile area or surrounding areas (e.g. hardstand areas).

- The CATA will be located outside of flood zones and separated from stormwater channels or overland flow areas.
- A designated CATA will be set up for the management of each type of contaminated soil to make sure that materials contaminated with different contaminants are kept separate.
- All preparatory works associated with the construction of the CATA would be undertaken prior to the placement of material in the stockpile.
- All new stockpiles will be given a unique identifier and their location recorded. A stockpiling and materials tracking procedure is to be developed as part of the CEMP and implemented during Stage 2 Works.
- Stockpiles must be located on sealed surfaces such as sealed concrete, asphalt, high density polyethylene or a mixture of these, to appropriately mitigate potential cross contamination of underlying soil and to prevent seepage of leachate to groundwater or surface water.
- Contaminated material will be covered to prevent increased moisture from rainwater infiltration and to reduce windblown dust or odour emission.
- Surface water will be diverted away from the excavations and stockpiles using bunds or water diversion measures to ensure surface water does not become contaminated by entering a contaminated excavation. These water diversion measures will also be used around stockpiling areas to ensure surface waters do not encounter contaminated materials.
- Any leachate collected from the CATA must be tested and treated or disposed off-site.
- Temporary stockpiles of asbestos containing material ('ACM') soil would be covered to minimise dust and potential asbestos release.
- All stockpiles would be maintained in an orderly and safe condition. Batters would be formed with sloped angles that are appropriate to prevent collapse or sliding of the stockpiled materials.
- The CATA will be sign posted noting that contaminated soils are stored there and inspected weekly to ensure proper containment and management.
- Before the reuse of any material on-site, it would be validated with respect to the proposed use.
- Should the soil be surplus to requirements then it will be classified in accordance with **CMP04** prior to off-site disposal. The fate of the material from each CATA will be recorded as will its final location and classification as described in **CMP04**.
- Following the completion of the works these areas will be assessed and validated by the environmental consultant.

PFAS Impacted Stockpiles

In addition to the general and contaminated stockpile management controls provided above the following additional management controls in accordance with the HEPA (2020) NEMP 2.0 provided in **Table CMP05_1** should be applied where PFAS is identified.

Stockpile management		CMP05
Table CMP05_1 – Temporary PFAS Stockpile Management		
Stockpile Description	**Timeframe**	**Storage infrastructure for solid wastes and contaminated equipment**
Transient	Less than 48 hours with no rain predicted	Covered stockpile or storage area on impervious bottom liner (e.g. tarp, plastic sheeting, membrane, etc.)
Temporary	From 48 hours to 6 months	Managed stockpile, covered, on impervious, bunded hardstand, with effective stormwater controls (e.g. diversion drains, banks, etc.)
Short-term	From 6 months to 2 years	Constructed stockpile with robust anchored covers, impervious bottom liner, and effective stormwater controls to ensure that rainwater and sheet flow do not contact impacted solids.
Medium-term	From 2 to 5 years	Engineered containment facility, with effective stormwater controls
Long-term •	More than 5 years	Engineered containment facility, with effective stormwater controls

Unexpected Finds		CMP06
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To minimise exposure of contractors and site personnel to impacted sub-surface soils during future excavation works beneath the site.	

During Construction

An unexpected finds protocol (UFP) has been prepared by SIMTA (2018)[77] for the construction of Stage 2 of the MPW Project in accordance with SSD 7709. This UFP has been developed to manage the unexpected discovery of contamination within imported spoil, heritage items, threatened flora and fauna, and onsite contamination during the construction phase of Stage 2 Works and is incorporated into the CEMP for Stage 2 Works.

Procedure

There is a possibility some hazards within the site have not been identified to date. The nature of hazards which may be present, and which may be discovered are expected to generally be detectable through visual or olfactory means, for example:

- The presence of significant aggregates of friable or non-friable asbestos materials (visible);
- Excessive quantities of Construction/Demolition Waste (visible);
- Hydrocarbon impacted materials (visible/odorous);
- Drums or underground storage tanks (USTs) (visible); and
- Oily Ash and/or oily slag contaminated soils/fill materials (visible/odorous).

As a precautionary measure to ensure the protection of the workforce, should any of the abovementioned substances (or any other unexpected potentially hazardous substance) be uncovered during ground disturbance activities, then the following should be immediately implemented:

- Stop work within the area. Isolate the affected area via the placement of temporary barriers or other appropriate measures (i.e. plastic sheeting, geotextile fabric covers, polymer dust suppressant spray, etc.) to prevent exposure to site personnel and/or off-site airborne dust migration; and
- an Environmental Consultant should be immediately contacted to determine an appropriate course of action regarding the assessment and/or management of the "Unexpected Find".

It is envisaged the assessment strategy will be aimed at determining the nature of the substance – that is, is it hazardous and, if so, is it at concentrations which pose an unacceptable risk to human health or the environment.

The sampling frequency of the identified substance/materials shall meet the minimum requirements for hot spot management detailed in **CMP03** and be enough to characterise conditions in relation to the objectives of the CMP.

The Environmental Consultant will also be responsible for any reporting necessary to document the details of the Unexpected Find and the results of the validation sampling, and will be responsible for providing clearance certificates stating it is suitable to resume works at the remediated Unexpected Find area.

[77] SIMTA (2018) Unexpected Finds Protocol, Moorebank Precinct West Stage 2, dated 26 October 2018 (ref: MIC2-QPMS-EN-APP-00022).

Importation of Fill Material/Aggregate	**CMP07**
Responsibility:	Site Owner (or nominated representative)
Frequency:	Continuous
Objective:	To ensure that only material fit for purpose and lawfully able to be brought onto site is imported either temporarily or permanently onto the subject site.

Importation of fill material may be required to backfill excavations at the completion of remediation works associated with AEC 4 or as cover material to minimise the generation of PFAS impacted stormwaters (**CMP02**).

Procedure

Prior to the importation of soil, aggregate or other engineering fill material, it is required an appropriate characterisation assessment of the material proposed to be imported is prepared by an Environmental Consultant and this documentation is provided to the Site Owner, or their appointed representative, seeking approval for the importation of the material.

Where necessary, the Site Owner may seek a technical review of the provided documentation from the Environmental Consultant to ensure that the assessment has been consistent with NSW EPA guidelines. In summary, in accordance with the NSW EPA policy that only material that does not represent an environmental or health risk at the receiving site may be legally imported to site. This is considered to comprise:

- Virgin Excavated Natural Material (VENM) as defined in the *Protection of the Environment Operations Act* (1997) Schedule 1;
- An engineered product derived solely from VENM (e.g. quarried material from two sources blended prior to delivery to site);
- Excavated Natural Material as defined in EPA in (2014b) – *The Excavated natural material order 2014* that in addition has been demonstrated to be free of contaminant of concern concentrations suitable for the proposed land use (including detectable asbestos fibres/material).
- Recovered Aggregate as defined in (2014b) - *The Recovered Aggregate Order 2014* that in addition has been demonstrated to be free of contaminant of concern concentrations suitable for the proposed land use (including detectable asbestos fibres/material).

Upon approval of the material for importation, records should be kept by the Site Owner (or their representative) of the dates of importation, approximate quantities, and location of placement.

Each truck entry will be visually checked and documented, by the Principal Contractor, to confirm only approved materials consistent with the environmental approvals can 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 characterisation documentation and received material details should be held by the Site Owner (or nominated representative) consistent with the requirements outlined in **CMP12**.

Training		CMP08
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	Suitably trained personnel will be available to implement the requirements of the CMP	

Procedure

The Site owner or nominated responsible party, shall ensure that any personnel engaged in the implementation of nominated tasks for which the Site Occupant is responsible, have been provided with adequate training to manage the site contamination and hazardous materials conditions which may be encountered during site ground disturbance activities.

Personnel conducting sampling, measuring, monitoring, and reporting activities are to be suitably trained or experienced in the activity. Records of all training are to be filed in accordance with the project filing system.

As a minimum the induction will include the following:

- Existence and requirements of this CMP;
- Relevant legislation, penalties, fines;
- Roles and responsibilities for Contamination Management;
- Asbestos identification and management requirements;
- Stockpile management measures;
- Material movement and tracking measures; and
- Unexpected finds.
- Toolbox meetings will also be undertaken, as and when required.

The Site Occupant shall maintain records of personnel engaged in the nominated tasks and their relevant training/qualifications for the period of implementation of the CMP in accordance with **CMP12** and with the document control system outlined in the CEMP.

Works involving contractors and subcontractors will be managed in accordance with **CMP09**.

Contractor and Subcontractor Management	CMP09
Responsibility:	Site Owner (or nominated representative)
Frequency:	As required
Objective:	Ensure that all persons who may be exposed to contaminated material are suitably aware of conditions and requirements of this CMP

Procedure

The Site Owner (or nominated representative) is required to ensure that Contractors and Sub-contractors are advised of potential safety and environmental issues on site during site-specific induction training. This induction shall include the occupational health and safety responsibilities, requirements, and controls for all (sub)contractors working on site. In addition, all site workers, including contractors and subcontractors shall be made aware that they are required to implement the provisions of this CMP.

All subcontractor activities will be monitored by the Site Owner, or a nominated representative, to ensure compliance with the requirements of this CMP.

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

1. Providing their own personal protective equipment;
2. Training their employees in accordance with applicable laws;
3. Providing medical surveillance and obtaining medical approvals for their employees;
4. Ensuring their employees are advised of and meet the minimum requirements of this CMP and any other additional measures required by their site activities; and
5. Designating their own site safety officer.

All contractors/subcontractors must sign an acceptance form prior to commencing work on site.

Part 6.5 of the *Work Health and Safety Regulation 2011* required that an employer of employees undertaking construction work must ensure that the employees have completed induction training as specified by the Regulation. In addition, the Principal Contractor (if required) must not allow any person to carry out construction work unless he/she is satisfied that the person has undergone OHS induction training, including:

- 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.

The Site Owner (or nominated representative) shall require all contractors completing such works to maintain, for each person carrying out construction/maintenance works, for a period of three years:

- A copy of relevant statements of OHS induction training, or a statement indicating that 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.

Contingency Plan	**CMP10**
Responsibility:	Site Owner (or nominated representative)
Frequency:	As required
Objective:	Ensure that in the event of unplanned exposure of impacted materials all appropriate measures are implemented to minimise the risk to on-site personnel and the environment.

Procedure

In the event site operations or conditions result in the disturbance of significant impacted material without the prior preparation of specific works/management procedures and implementation of appropriate exposure minimisation measures, or alternatively an environmental incident occurs (contaminant leak/spill, identification of asbestos in imported material, etc.), the following shall be implemented:

- Isolation of the affected area via the placement of temporary barriers or other appropriate measures (i.e. plastic sheeting, geotextile fabric covers, polymer dust suppressant spray, etc.) to prevent exposure to site personnel and/or off-site airborne dust migration; and
- Implementation of applicable CMPs with respect to personnel and site management, or where appropriate the Unexpected Finds Protocol included in this CMP, and subsequent appropriate removal/management of the identified impacted material via excavation and off-site removal or otherwise containment/treatment as applicable.

Where considered appropriate by the Site Owner (or its nominated representative), an appointed Environmental Consultant shall undertake a validation assessment of the impacted area such it can be confirmed the disturbance of material has not resulted in conditions with unacceptable risks to site users or the environment. This may include inspections, and or soil/water sampling within the site and subsequent analysis of samples for identified contaminants of concern at the site.

Following implementation of these procedures to ensure there are no further unacceptable exposures to site workers and/or environmental emissions, consideration shall be given to the requirements of **CMP11** to **CMP14** inclusive, in relation to documentation and renewal of the CMP to minimise the potential for future exposure of impacted material. This should include a formal review of the incident by an appropriately qualified person appointed by the Site Owner (or nominated representative) with the objective of identifying the cause of the incident and providing recommendations on alternative procedures or systems to be implemented at the site and/or within the CMP to prevent/minimise the likelihood of the incident reoccurring.

The incident shall be documented within the activity register as outlined in **CMP11** and where appropriate, amendment(s) to the CMP will be undertaken as outlined in **CMP14**.

Non-Compliances with CMP		CMP11
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	To ensure the CMP is implemented as intended.	

Procedure

Non-compliances with the intent and procedures of the CMP may occur during the implementation of the CMP.

Where a non-compliance is identified by a responsible organisation, they shall inform the affected organisations of the non-compliance in writing. Where a non-compliance with the CMP is identified by another organisation (in the activities of an alternate organisation), then they shall have the responsibility of informing the non-complying party in writing of the non-compliance. The non-complying party will be required to rectify the non-conformity as soon as possible, as per the requirements of the relevant procedure(s) where non-compliance has occurred.

Detail of the action taken to rectify the non-compliance shall be provided to each of the affected organisations in writing. Where a non-compliance cannot be rectified, then the CMP will require to be reviewed as per the requirements of **CMP14** CMP Review.

Where contaminated soil/spoil and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal) this will constitute a non-conformance to be managed under the CEMP.

Where contaminated soil/spoil and hazardous materials have not been appropriately managed (i.e. classification, handling, storage, transport, and disposal) the following will be undertaken:

- Where required, isolation of the affected area via the placement of temporary barriers or other appropriate measures (i.e. plastic sheeting, geotextile fabric covers, polymer dust suppressant spray, etc) to prevent exposure to site personnel and/or off-site airborne dust migration;
- Implementation the Unexpected Finds Protocol Included in this CMP, and subsequent appropriate removal/management of the identified impacted material via excavation and off-site removal or otherwise containment/treatment as applicable;
- Fill out incident response form and raise a non-conformance for improvement; and
- Where required, notify regulatory authorities.

Record Keeping		**CMP12**
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	Records of the implementation of the CMP require to be retained.	

Procedure

The Site Owner (or nominated representative) shall be responsible for the maintenance of all documents relating to the implementation of the CMP. This shall include any contamination assessments and validation undertaken, registers for the maintenance of the CMP (site inspection forms, works approval checklists, revised plans, *etc.*) and any relevant correspondence between the Site Owner (or nominated representative), Contractors and/or any other party.

All records shall be retained by the Site Owner (or nominated representative) throughout the time of implementation of the CMP. In the event that the role of the Site Owner (or nominated representative) is transferred from one organisation to another, control of all relevant (historical and current) documents will be transferred for safe keeping to the current Site Owner (or nominated representative).

Audit/Review of CMP Implementation	CMP13
Responsibility:	Site Owner (or nominated representative)
Frequency:	Once every 12 months
Objective:	The implementation of the CMP requires to be audited in accordance with EPA guidance publications to identify areas of non-compliance or partial compliance with relevant legislation/regulations and/or the requirements of this plan.

Procedure

An environmental audit shall be undertaken annually from implementation of this CMP to ensure ongoing compliance with the CMP requirements. The audit shall be undertaken by an Environmental Consultant in general compliance with the DEC '*Compliance Audit Handbook*' (DEC, Feb 2006) and identify areas of non-compliance or partial compliance with the requirements of:

- Relevant legislation / regulations; and
- This plan.

The findings of the audit should be documented and form the basis of the subsequent management review process as outlined following.

Specific tasks that will be undertaken as part of the audit include:

- Review of records generated by the Site Owner, and their respective contractors to ensure they meet the intended scope of the CMP;
- Review of the works register documenting ground disturbance activities completed at the site and associated work method statements, monitoring/validation activities to ensure that the management activities undertaken have met the intended scope of the CMP; and
- Periodic review and inspection of the site condition.

Where a non-compliance is detected during the audit process, then the non-compliance shall be informed as per the requirements of **CMP11**: Non-Compliances with CMP. The Site Owner (or nominated representative) is required to maintain records of the audit review. Records will require to be maintained on site and made available to relevant authorities in the event of a site inspection. The results of the audit will be considered as part of a broader review of the CMP to be undertaken on an annual basis by an Environmental Consultant in conjunction with the Site Owner. This review shall consider:

- The results of the CMP Audit as outlined above;
- Any non-compliances with the CMP that have been unable to be resolved;
- Practicalities and efficiencies of management measures and whether there are more effective ways to improve environmental compliance;
- Any changes in state or national environmental protection legislation or guidelines that impact any part of the CMP; or
- Any proposed changes in land-use of the site or adjoining sites which may impact upon exposure pathways.

Where a review identifies items, which are required to be modified, or added to the CMP, then a revision of the CMP shall be prepared by a suitably qualified person. The revised CMP will require approval by relevant stakeholders prior to implementation of the revised plan.

CMP Review		CMP14
Responsibility:	Site Owner (or nominated representative)	
Frequency:	As required	
Objective:	The CMP requires review to ensure its continued appropriateness to be used on the site	

Procedure

A review of the CMP shall be undertaken as required by an Environmental Consultant in conjunction with the Site Owner (or nominated representative). This review shall consider:

- The results of the CMP Audit as outlined in **CMP13**;
- Any non-compliances with the CMP that have been unable to be resolved;
- Practicalities and efficiencies of management measures and whether there are more effective ways to improve environmental compliance;
- Any changes in state or national environmental protection legislation or guidelines that impact any part of the CMP; or
- Any proposed changes in land-use of the site or adjoining sites which may impact upon exposure pathways.

If the Site Owner ceases to be recognised as the Site Manager, a review of the CMP document and compliance measures will be necessary to identify suitable replacement CMP compliance mechanisms.

In addition, where a review identifies items which are required to be modified, or added to the CMP, then a revision of the CMP shall be prepared by a suitably qualified person.

Any revisions to the CMP must be approved by the appointed NSW EPA Accredited Auditor.

Cessation of Construction CMP Application	**CMP15**
Responsibility:	Site Owner (or nominated representative)
Frequency:	As required
Objective:	To ensure impacts associated with residual issues within vegetated areas requiring management at the site during this interim period have been appropriately resolved to ensure the ongoing suitability of the site for the proposed land use.

Procedure

After addressing residual contamination issues, final verification and assessment of suitability of vegetated areas for the proposed land use will be completed via sampling/analysis. Based on the outcome of the verification/validation assessment it is anticipated a statement identifying these areas as suitable for the end use proposed by the Site Owner (or nominated representative) or suitable for the proposed use subject to management in accordance with an updated LTEMP developed to reflect the amended site condition.

To address potential residual soil and groundwater issues after the scope of the remediation is completed, the RAP (Golder, 2016a) envisaged implementation of a LTEMP to provide a management, monitoring and review framework. It is proposed that a LTEMP will be developed / revised, as warranted, and include:

- Assigned 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 residual contamination present on the site;
- Provide an unexpected finds protocol suitable for future redevelopment of the site;
- 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 CMP is to be implemented until vegetation clearance, remediation and validation of AEC 4 are complete.

Appendix F

UNEXPLODED ORDNANCE (UXO) RISK REVIEW AND MANAGEMENT PLAN (G-TEK 2019) AND REMEDIATION ACTION PLAN (G-TEK 2019A)

BETTER BY DEFINITION

REMEDIATION ACTION PLAN

UNEXPLODED ORDNANCE
MOOREBANK PRECINCT WEST
MOOREBANK AVENUE UPGRADE WORKS
[MPW_MAUW]

R A P

V1.02

G-tek Australia Pty Limited

DOCUMENT VERSION CONTROL			
Version	Date	Raised By	Released By
1_01			P O'Donnell
1_02			P O'Donnell

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EXECUTIVE SUMMARY

Moorebank Precinct West and Moorebank Avenue are being redeveloped as part of the Moorebank Intermodal Terminal Project to provide a rail "port shuttle" service for containerised goods between Port Botany and the Moorebank Precinct.

Unexploded Ordnance Risk Review and Management Plan for Moorebank Precinct West Stage 2 incorporating Moorebank Avenue Upgrade Works (G-tek Australia Pty Limited 17114EPRI dated 9 October 2019) indicated a potential for inert air delivered ammunition and other explosive remnants of war (IA) to have been left in-situ as a result of previous training activities within areas of the former Army School of Military Engineering (SME).

The Risk Review and Management Plan indicates that, to ensure a final risk rating of Low where Excavations are required as part of Site works within Areas SW0182, SW0190 and SW0192, a member of the Department of Defence Environmental and Heritage Panel F2 stream is to be engaged to Safeguard works if Remediation is not completed prior to works.

Based on the historical use, the potential nature of remnant material i.e. IA rather than UXO or ERW with a potential to contain energetic material, and the differing types/potential locations of IA, it is considered that the most appropriate Strategy for each area is:

- Area SW0182 – Remediation prior to any intrusive works, including landscaping, excavation or recontouring; and,
- Areas SW0190 and SW0192 – Safeguarding during intrusive excavation works.

At the completion of required Safeguarding and/or Remediation works, the UXO consultant will issue a Works Area Release or other required document indicating that Area SW0182 and designated excavation Sites within Areas SW0190 and SW0192 are suitable for the proposed redevelopment within that Area in accordance with any required consent conditions.

The following Definitions and Acronyms may apply within this Report:

Ammunition (Ammo): 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.

Banksman: A suitably qualified and experienced UXO Technician that is on site, to instrument survey and/or watch excavations being conducted, ready to respond to any UXO chance find.

Dummy (Drill) Ammunition: A completely inert replica of ammunition used for training in handling, laying, loading, fusing and drill purposes.

Explosive: A substance or mixture of substances, which, under external influences, is capable of rapidly releasing energy in the form of gases and heat.

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).

Inert Ammunition (IA): An item of ammunition that, by process or design, contains no energetic material.

Military Produce: Any item identified as military in origin that is not ammunition-related.

Munitions of Concern (MOC): Collective term explosive ordnance waste (EOW) and inert training ordnance (TO) that has the appearance of UXO/EO and which may cause concern if located; health and safety risk from MOC is perceptual rather than actual.

Safeguarding: Having a suitably qualified and experienced UXO Technician on site, to conduct instrument and/or visual inspection of intrusive or other works being conducted; where potential UXO is encountered, the works location is generally move to an adjacent "clear" position.

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, i.e. 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 Field Validation Survey).

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

1.1 General

Unexploded Ordnance Risk Review and Management Plan for Moorebank Precinct West Stage 2 incorporating Moorebank Avenue Upgrade Works (G-tek Australia Pty Limited 17114EPRI dated 9 October 2019) indicated a potential for inert air delivered ammunition and other inert explosive remnants of war (IA) to have been left in-situ as a result of previous training activities within areas of the former Army School of Military Engineering (SME). Areas identified as SW0182 – Practice Mine and Bomb Disposal, SW0190 – Bomb Disposal Training Area and SW0192 – Potential Explosive Drowning Area (Figures 1, 2 and 3 below) are to be subjected to cutting and excavation as part of MPW_MAUW and require unexploded ordnance (UXO) remediation and/or safeguarding to allow the required works to be safely and efficiently conducted.

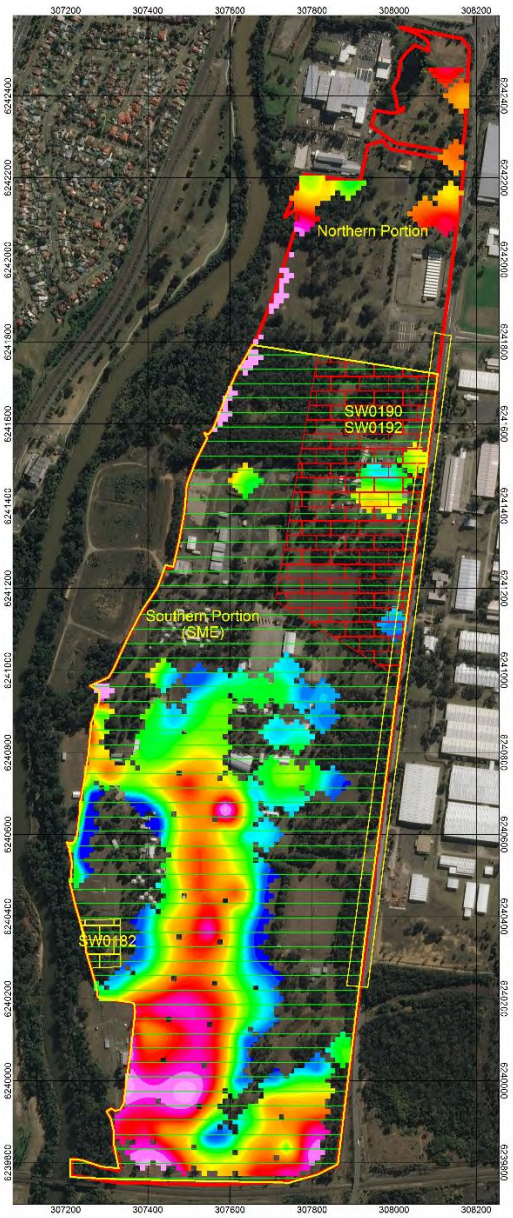

Figure 1 – MPE_MAUW Overview

Figure 2 – SW0190 SW0192 Detail

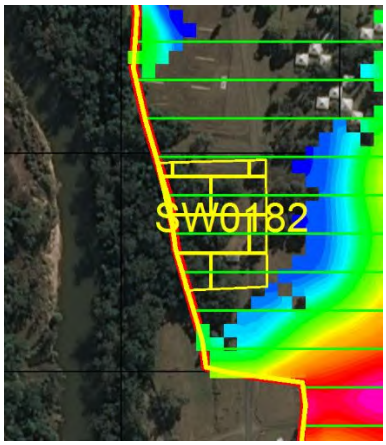

Figure 3 – SW0182 Detail

1.2 Purpose

The Purpose of this Remediation Action Plan (RAP) is to facilitate the proposed development works within Areas SW0182, SW0190 and SW0192 as part of the overall MPW_MAUW development.

1.3 Goals

The goal of this RAP is to ensure that appropriate action on potential risk from remnant explosive ordnance related material is taken to ensure that human health is protected prior to and during required intrusive development works.

2.0 SITE CONTEXT

Moorebank Precinct West and Moorebank Avenue are being redeveloped as part of the Moorebank Intermodal Terminal Project to provide a rail "port shuttle" service for containerised goods between Port Botany and the Moorebank Precinct.

2.1 Site History Summary

Records indicate potential various military use of the Moorebank and Holsworthy area from the late1800's, but direct use of the MPW_MAUP really began during World War Two (WWII) when the School of Military Engineering (SME) was first developed on the Site. Training within SME occurred for base and supervisory field engineering roles, and explosive ordnance related activities included mine laying and recovery, demolition to create and deny access to areas, destruction of infrastructure and disposal of UXO in battlefield clearance and bomb disposal roles in time of war.

Introductory training was conducted within SME using primarily training or practice items containing propellant, pyrotechnics or particular simulant materials. Training was highly regulated and monitored and specified competency levels needed to be achieved prior to moving to higher level training using explosives.

Training using explosives was conducted away from SME, generally on an authorised demolitions range within a Defence range such as Holsworthy, or where a task was available for appropriate training outside a Defence area.

3.0 CONTAMINATION SUMMARY

The Risk Review and Management Plan indicates that within the former SME:

Combat Engineers conducted battlefield clearance tasks of ERW to assist mobility of combat forces and as a humanitarian responsibility. Battlefield clearance of air delivered munitions, particularly large aircraft bombs, may include the location of the item, excavation of pits or shafts to access the item and the construction of bunds or revetments to minimise the effects of blast or fragmentation if an item detonates. The items used within SME were inert and, once recovered, were stored and re-used for subsequent exercises and training courses. There is a potential for remnant inert air delivered munitions (IA) to have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192, and

Battlefield clearance activities also require familiarisation and training with a range of allied and "enemy" land ordnance, including rocket, grenade, mortar and artillery ammunition, and it is anticipated that inert examples of a wide range of such items would also have been used for both classroom and field training activities, again for both human and canine trainees. There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192.

The items used within SME for training Combat Engineers in mine actions activities were either inert replica items for classroom/display use, or practice items for field training use; these generally emitted a coloured smoke to indicate that they had been activated. Area SW0182 has the potential to contain remnant training mines.

4.0 REMEDIATION OPTIONS AND STRATEGY

The Risk Review and Management Plan indicates that, to ensure a final risk rating of Low where Excavations are required as part of Site works within Areas SW0182, SW0190 and SW0192, a member of the Department of Defence Environmental and Heritage Panel F2 stream is to be engaged to Safeguard works if Remediation is not completed prior to works.

4.1 Options

Options for Areas SW0182, SW0190 and SW0192 are considered to be:

1. Define areas where excavation is required and conduct IA Remediation of those areas, or
2. Conduct IA Safeguarding of excavation works as they occur.

4.2 Strategy

Based on the historical use, the potential nature of remnant material i.e. IA rather than UXO or ERW with a potential to contain energetic material, and the differing types/potential locations of IA, it is considered that the most appropriate Strategy for each area is:

- Area SW0182 – Remediation prior to any intrusive works, including landscaping, excavation or recontouring; and,
- Areas SW0190 and SW0192 – Safeguarding during intrusive excavation works.

5.0 WORKS PROGRAM AND PROCEDURES

5.1 Areas SW0190 and SW0192

Prior to the commencement of any required excavation works within Areas SW0190 or SW0192, the Client is to engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to provide a UXO Safeguarding presence on site as a Banksman to observe and monitor excavations within these Areas and appropriately evaluate any potential ordnance related material located for disposal.

5.1.1 Work Plan

Prior to the conduct of excavation works, all personnel directly involved in the works are to be inducted onto the Site and briefed on the excavation procedure planned, risk assessment conducted and a Safe Work Method Statement (SWMS) developed and endorsed.

Daily safety briefs are to be conducted prior to the commencement of excavation works and the SWMS reviewed and updated on a regular basis.

5.1.2 Works Procedure

Where practical, excavations are to be conducted in layers of not more than 300mm and the outcomes of each layer confirmed by the Banksman as being free from exposed IA prior to the next layer being removed.

Direct contact (visual and/or radio) is to be maintained between the plant operator and the Banksman and where any potential item of IA is observed by either excavation will stop and the blade/bucket placed on the ground to allow the Banksman to safely enter the works area and inspect the item.

On direction from the Banksman the observed item may be moved/relocated to an appropriate stockpile area for subsequent disposal.

All IA and IA related material identified during excavation works is to be photographed and recorded in an IA log by the Banksman.

Any IA item recovered will need to be certified by the Banksman as “Free from Explosives” (FFE) and disfigured prior to entering a recycling waste stream.

5.1.3 Validation

At the completion of excavation works to required levels and prior to any reinstatement or filling, 100% of the excavated area is to be visually checked for remnant IA material by the Banksman. Where additional/potential IA material is identified during final visual check, additional excavation may be required to allow full identification and recovery/removal of the material.

At the completion of any required additional works, the Banksman will repeat the final visual check process. At the completion of excavation within an Area, a Works Area Release or appropriate required document will be raised and any IA recovered will be suitably disposed.

5.2 Area SW0182

Prior to the commencement of any required excavation works within Area SW0182, the Client is to engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to provide a UXO Remediation team to conduct remedial search within this Area and appropriately evaluate any potential ordnance related material located for disposal.

5.2.1 Work Plan

Prior to the conduct of remediation works, all personnel directly involved in the works are to be inducted onto the Site and briefed on the remediation procedure planned, risk assessment conducted and a Safe Work Method Statement (SWMS) developed and endorsed.

A safety briefs is to be conducted prior to the commencement of remediation works and the SWMS reviewed and updated as required.

5.2.2 Works Procedure

Remediation with Area SW082 is to be conducted by 100% shallow search of the Area using Minelab F3 metal detectors using a team led by a Defence trained UXO technician. The Minelab F3 provides an aural cue to the operator in the presence of metal; each cue will be intrusively investigated and, if ordnance related, will be recorded.

All IA and IA related material identified during remediation works is to be photographed and recorded in an IA log and any IA item recovered will need to be certified as “Free from Explosives” (FFE) and disfigured prior to entering a recycling waste stream.

5.2.3 Validation

At the completion of 100% search, the team leader will conduct a minimum of a 10% QC search of Area SW0182; where IA is located during QC, 100% re-search of the Area and QC will be repeated until remediation of the Area is considered to be complete.

At the completion of remediation, a Works Area Release or appropriate required document will be raised and any IA recovered will be suitably disposed.

6.0 ENVIRONMENTAL MANAGEMENT

Client/Site Environmental Management Plans and requirements during excavation/intrusive works are to be adhered to at all times during IA related remediation and safeguarding works.

Item of IA contain no materials that may cause environmental harm when disfigured or disposed and, once disfigured can be disposed in an appropriate waste stream.

7.0 HEALTH AND SAFETY

Client/Site Health and Safety requirements are to be fully adhered to during excavation works and a task specific works plan and SWMS developed.

Accidents/Incidents and near misses are to be reported in accordance Client and Workcover (NSW) requirements.

8.0 QUALITY

All processes are to be in accordance with Project Plans and this RAP.

All excavations are to be fully Safeguarded and all excavated surfaces visually searched for items of potential IA.

Final visual search is to be conducted and Works Area Release raised prior to any filling or restoration of excavated areas.

100% search is to be subjected to a minimum 10% QC check and repeated as required.

All IA finds are to be photographed and logged prior to raising of FFE certification and appropriate disposal.

9.0 OUTCOMES

At the completion of required Safeguarding and/or Remediation works, the UXO consultant will issue a Works Area Release or other required document indicating that Area SW0182 and designated excavation Sites within Areas SW0190 and SW0192 are suitable for the proposed redevelopment within that Area in accordance with any required consent conditions.

BETTER BY DEFINITION

REVIEW

UNEXPLODED ORDNANCE (UXO) RISK REVIEW AND MANAGEMENT PLAN

MOOREBANK PRECINCT WEST STAGE 2 (MPW2) INCORPORATING MOOREBANK AVENUE UPGRADE WORKS (MAUW) MOOREBANK, NSW

V1.01

G-tek Australia Pty Limited

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Purpose of This Report

This report was commissioned for the purpose of detailing the activities undertaken by G-tek regarding the Client's site and the results of those activities (The Purpose).

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1.01	9 October 2019	G Guthrie	P O'Donnell

DOCUMENTATION CONTROL	
Copy Number	Issued To
1	Tactical Group Pty Ltd c/o EP Risk Management Pty Ltd
2	G-tek Australia Pty Limited

Copy 1 of 2

The following Definitions may apply within this Risk Assessment:

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.

As Low as Reasonably Practical (ALARP): The ALARP principle is that the residual risk shall be as low as reasonably practical. For a risk to be ALARP it must be possible to demonstrate that the cost involved in reducing the risk further would be grossly disproportionate to the benefit gained.

Drill Ammunition (DA): An inert replica of ammunition specifically manufactured for display or instructional purposes

Explosive: A substance or mixture of substances which, under external influences, is capable of rapidly releasing energy in the form of gases and heat.

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 IA resultant from the initiation of high explosive filling and often projected at high velocities over considerable distances from the point of initiation.

Free from Explosives (FFE): Explosive ordnance waste, fragmentation and related material that has been inspected and certified by a competent authority as containing no remnant explosive or energetic material.

Hazard Reduction Operation (HRO): An operation designed to reduce the EO/UXO hazard within the boundaries of an affected area (see also UXO Remediation).

Inert Ammunition (IA): An item of ammunition that contains no explosive, pyrotechnic, lachrymatory, radioactive, chemical, biological or other toxic components or substances. Note: Inert ammunition differs from drill ammunition in that it has not necessarily been specifically manufactured for instructional purposes. The inert state of the munition may have resulted from a render safe procedure or other process to remove all hazardous components and substances. It also refers to the state of the munition during manufacture prior to the filling or fitting of explosive or hazardous components and substances.

Military Produce: Any item identified as military in origin that is not ammunition-related.

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, i.e. 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 Remediation: An operation designed to reduce the EO/UXO hazard within the boundaries of an affected area (see also Hazard Reduction Operation).

UXO Safeguarding (Safeguarding): Protecting individuals or equipment from harm or damage by using appropriate measures to ensure no contact or interaction with UXO during traversing or conducting testing or minor works within an area potentially contaminated with UXO.

UXO Technical Survey: 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 and Field Validation Survey).

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1.0 EXECUTIVE SUMMARY

Site Address	Moorebank Avenue, Moorebank, NSW, The Site is generally bound in the: • North, by the M5 Motorway, • East, by Moorebank Avenue or MPE, • South, by the East Hills Railway Line, and, • West, by the Georges River.
UXO Threat Sources	Close training activities resulted in remnant blank small arms ammunition (SAA) widely across the Site. Some SAA have the potential to contain an unfired primer and unburned propellant and are, by definition, unexploded ordnance (UXO).
IA Threat Sources	Remnant inert ammunition (IA) training items have the potential to be remnant at varying depths in areas described as SW0182 – former Practice Mine and Bomb Disposal Area, SW0190 – former Bomb Disposal Training Area and SW0192 – potential Explosive Ordnance Drowning Area
UXO Risk Pathways	Intrusive construction activities within the southern (former SME) portion of the Site.
IA Risk Pathways	Engineering or levelling works with plant within areas SW0182, SW0190 and SW0192
Consequences/Receptors	Consequences of UXO initiation could include: • Lost time hand or eye injury to personnel. • Perceptual risk from visible items of inert ordnance. Consequences of IA interaction could include: • Delays to process in identifying and ensuring item is Free from Explosives (FFE). • Perceptual risk as an item is uncovered. • Damage to reputation or finances.
Key Findings	The northern portion of the Site is free of UXO/IA Risk. The former School of Military Engineering (SME) has UXO risk from unfired blank small arms ammunition (SAA) within close training areas (non-building) of the Site. The former School of Military Engineering (SME) has IA risk from inert training material from surface levels to greater depths within areas SW0182, SW0190 and SW0192.
UXO Risk Calculation Rating (Human Health)	**LOW / MEDIUM**
IA Risk Calculation – Specified Areas (Delay / Perception)	**Environmental Testing** — **LOW**
	Landscaping — **LOW / MEDIUM**
	Excavations — **HIGH**
	Re-contouring — **LOW / MEDIUM**

Risk Mitigation	UXO Management Plan/Protocol in place for action required in the event of a potential item of UXO/IA being discovered. UXO/IA potential included as part of Site-specific inductions and safety awareness training. Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to conduct remediation works in Areas SW0182, SW0190 and SW0192. Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to conduct safeguarding in areas where intrusive activities are required as part of Site woks in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.
Final UXO Risk Rating	**LOW**
Final IA Risk Rating	**LOW**

2.0 ASSESSMENT METHODOLOGY

Approach

This UXO risk assessment is based on the UK Construction Industry Research and Information Association (CIRIA) Guide C681 UXO which advocates a four (4) phase approach to managing UXO related risk on construction sites. Phase 1 – Preliminary Assessment, Phase 2 – Detailed Risk Assessment, Phase 3 – Risk Mitigation Design, Phase 4 – On Site Mitigation Works.

G-tek aims to meet the requirement of Phase 1 and Phase 2 assessment within this document, and has developed preliminary Phase 3 Risk Mitigation Design, which would need to be developed further for particular activities in particular parts of the Site.

Preliminary assessment is conducted through desktop review of available material including air photographs, files, records and maps from sources including, in this instance, Preliminary Site Investigation, Moorebank Defence Lands *(egis consulting, August 2000)*, Heritage Assessment, Moorebank Defence Site, Moorebank *(Graham Brooks and Associates Pty Ltd, May 2004)*, Stage 2 Environmental Investigations, Moorebank, NSW *(EarthTech, July 2006)*, Explosive Ordnance Assessment and Safeguarding, Moorebank Intermodal Terminal, Moorebank, NSW *(G-tek Australia Pty Limited, May 2011)* and, Phase 2 Environmental Site Assessment, Moorebank Intermodal Terminal *(Parsons Brinckerhoff, May 2014)*.

Field Validation Survey is conducted on Site through sampling surface and sub-surface areas of the Site to prove or disprove data discovered through preliminary assessment. Field validation has been variously conducted through formal investigation and in the process of environmental, geotechnical, heritage and other intrusive works across the Site (EarthTech, G-tek, Golder, GHD and others).

The assessment of the Risk Rating [RR] of a Site is a measure of the Probability [P] of an item of UXO being remnant within the Site, based on the Site History [SH] and then being both encountered and initiated as a result of Investigation Methodology [IM] being utilised times the Consequence [C] (or severity) of any such initiation. Consequence [C] is a factor of both the potential Depth [D] of the UXO and the Proximity of Sensitive Receptors [PSR] to the UXO at time of initiation.

From the Risk Rating developed, risk Mitigation Measures are developed to reduce the risk on Site for its intended use to as low as reasonably practical [ALARP].

Important Notes

The Risk Rating has been developed using available source material at the time of preparation; every endeavour has been made to obtain the widest range of appropriate material; key data is referenced and lesser material is available for review if required.

Should additional material become available from the client or other sources which may affect Probability of UXO within the Site, the Risk Rating and Mitigation Measures should be recalculated and reviewed based on the new data.

3.0 STAGE ONE – SITE LOCATION AND DESCRIPTION

Site Address

Moorebank Avenue, Moorebank, NSW

Site Description

The Site is currently vacant land previously occupied by Department of Defence units with the primary tenant being the School of Military Engineering, (SME) which occupied the southern two thirds of the Site in the area known as Steele Barracks.

The Site is generally bound in the:

- North, by the M5 Motorway,
- South, by the East Hills Railway Line,
- West, by the Georges River, and,
- East, by the current Moorebank Avenue alignment or MPE.

Buildings and compounds of various design and have generally been removed from the Site.

The northern portion of the Site contains stormwater retention ponds, and is thickly vegetated around the ponds.

The developable portion of the Site is indicated as the Blue hatched area; lands in the immediate proximity of the Georges River are non-developable (Green hatch) and the Moorebank Avenue Upgrade area is included as Yellow.

Site Characteristics

The Site is generally cut and fill from previous adaption of the land form to suit development of required Defence infrastructure, lower along the Georges River frontage and higher along Moorebank Avenue.

General terrain, buildings, soil types and associated heritage, geological, geotechnical and environmental characteristics of the Site have been discussed in previous and reviewed Reports and fall outside the scope of this unexploded ordnance (UXO) Review

Proposed Site Works

The Developable portion of the Site is the location of a proposed intermodal transfer facility, utilising rail, road and storage infrastructure to transfer containerised bulk goods between producers/users within Australia and ships loading/unloading at the Port facilities at Botany Bay. These works will require major redevelopment of the Site landforms and infrastructure including Moorebank Avenue.

4.0 STAGE TWO – DATA REVIEW

4.1 REVIEW OF HISTORICAL DATA

Site History

General Site history is well documented in Heritage Assessment, Moorebank Defence Site *(Graham Brooks and Associates Pty Ltd May 2004).*

Military Activity

The records indicate potential various military use of the area from the late1800's, but direct use of the Site really began during World War Two (WWII) when the School of Military Engineering (SME) was first developed on the Site and remained until recently transferred to new facilities at Holsworthy.

Site Area 1950's *(Graham Brooks and Associates Pty Ltd May 2004 p24)*

"To maintain optimal military capability the Army has to be highly mobile and able to be supplied with provisions, ammunition and equipment. At the same time mobility must be denied to hostile forces. In this diverse and demanding role you'll be trained to carry out the activities and infrastructure projects that support these needs, such as demolition and clearance, minefield clearance, field defence system construction, road and bridge-building and airfield construction."
(http://www.defencejobs.gov.au/army/jobs/CombatEngineer)

Training within SME occurred for base and supervisory field engineering roles, and explosive ordnance related activities included mine laying and recovery, demolition to create and deny access to areas, destruction of infrastructure and disposal of UXO in battlefield clearance and bomb disposal roles in time of war.

Introductory training was conducted within SME using primarily training or practice items containing propellant, pyrotechnics or particular simulant materials. Training was highly regulated and monitored and specified competency levels needed to be achieved prior to moving to higher level training using explosives.

Training using explosives was conducted away from SME, generally on an authorised demolitions range within a Defence range such as Holsworthy, or where a task was available for appropriate training outside a Defence area.

Sappers from 8 Troop performing a controlled demolition of the Weir on the Woronora River at Engadine, New South Wales in 1982. Sergeant Phil Palazzi after the demolition. *(https://en.wikipedia.org/wiki/17th_Construction_Squadron_(Australia))*

Stage 2 Environmental Investigations, Moorebank, NSW *(EarthTech, July 2006)* indicated four (4) areas of particular explosives related interest within the Site, three (3) remain within the Developable portion of the Site, and are detailed below.

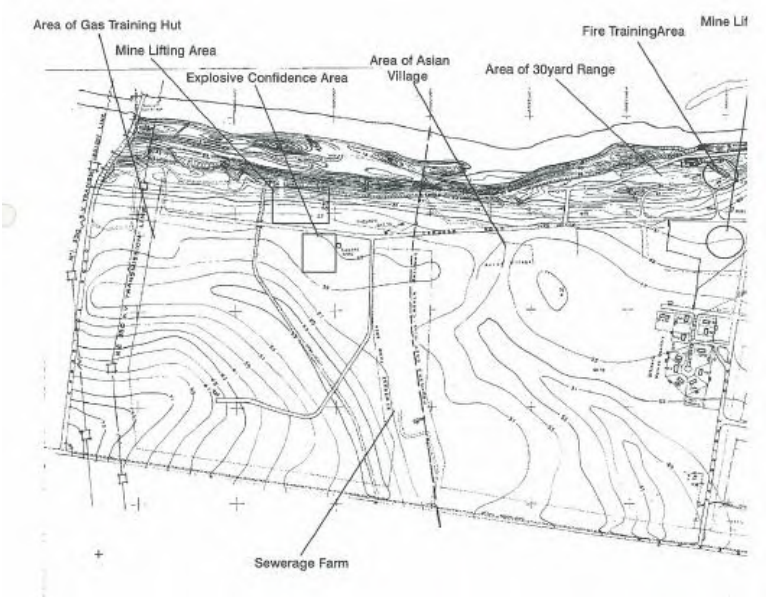
Practice Mine and Bomb Disposal (SW0182)

SW0182 Location *(EarthTech, July 2006)*

Assessed Risk Band/Priority Pre Remediation	Low 210
Remediation Warranted	No

Remediation is not considered to be warranted. *(EarthTech, July 2006)*

This area was previously identified in 2000 as a mine/minefield training area, and was associated with an explosives confidence course nearby. A second area was noted at that time further to the north, but the second area was not subsequently re-identified.



Area Map 1 *(egis consulting, August 2002, Appendix C UXO Report p20)*

This location still contained remnant practice (inert) anti-personnel and anti-tank mines at the time of G-tek Assessment in 2011 and, as these items could cause concern or alarm if located during construction works and/or removed from the site and used for criminal or other purposes. There is a potential for remnant inert mines (IA) of various natures to have been left in situ within Area SW0182.

G-tek does not agree with EarthTech that remediation be not considered to be warranted.

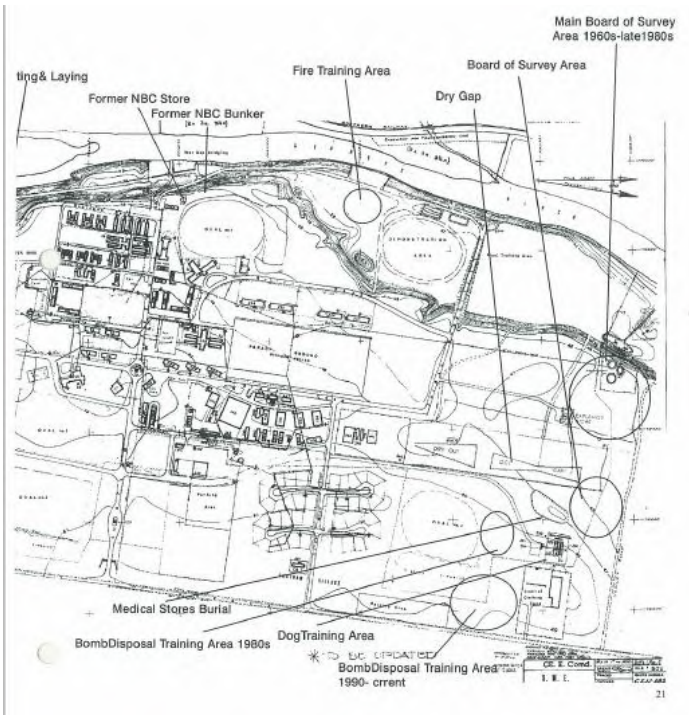
Bomb Disposal Training Area (SW0190)

SW0190 Location *(EarthTech, July 2006)*

Assessed Risk Band/Priority Pre Remediation	High 155
Remediation Warranted	Yes

A comprehensive UXO clearance required, including excavation of all potential targets identified by subsurface imaging survey. Clearance of waste metal contained within the fill in the area north of the dog agility training area is likely to be required to facilitate the UXO clearance *(EarthTech, July 2006).*

This area was identified in 2000 as earlier and current Bomb Training Areas (below).



Area Map 2 *(egis consulting, August 2002, Appendix C UXO Report p21)*

G-tek agrees with EarthTech that Remediation is warranted in areas of excavation.

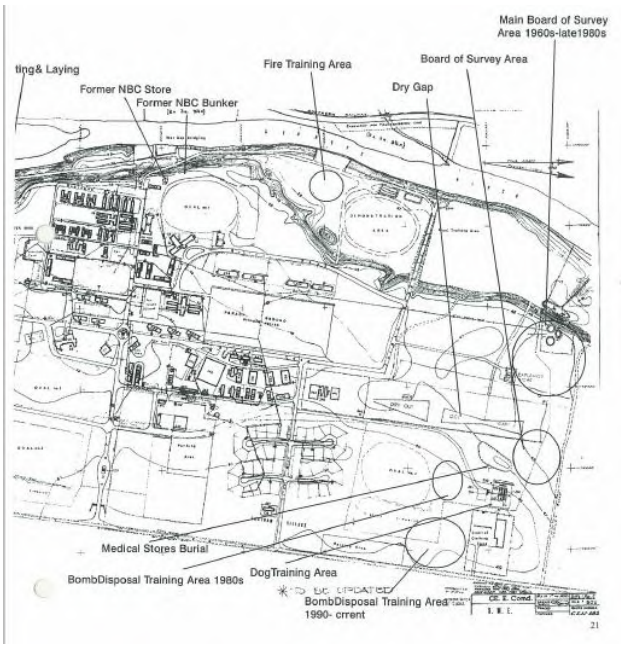
Potential Explosive Ordnance Drowning Area (SW0192)

SW0192 Location *(EarthTech, July 2006)*

Assessed Risk Band/Priority Pre Remediation	Low 185
Remediation Warranted	No

Remediation is not considered to be warranted *(EarthTech, July 2006)*

This area was previously identified as a medical stores burial area, adjacent to the dam, which, in 2000, contained minimal water.



Area Map 2 *(egis consulting, August 2002, Appendix C UXO Report p21)*

This location is contained within area SW0190 and the indicated dam was in all probability used as a bomb disposal training area and general dumping area for training items, including large aircraft munitions; such items could cause concern or alarm if located during construction works and/or removed from the site and used for criminal or other purposes.

G-tek does not agree with EarthTech that remediation be not considered to be warranted.

4.2 REVIEW OF FIELD VALIDATION DATA

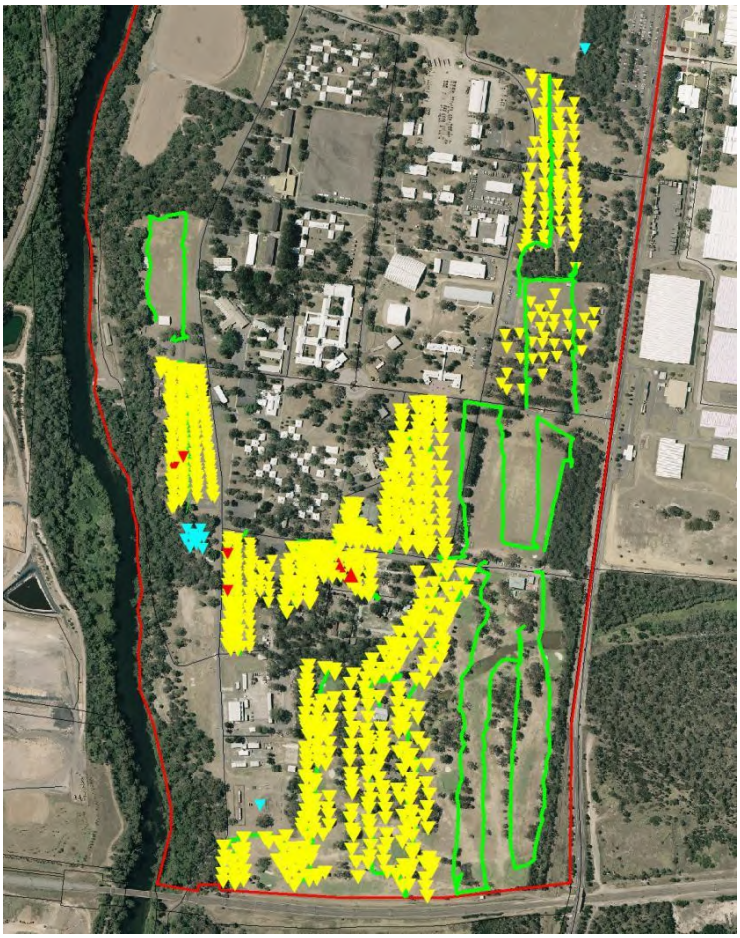
Conduct of Field Validation Survey (FVS)

G-tek has conducted UXO Field Validation Survey (FVS) and Safeguarding tasks within the Site. The primary task was reported in May 2011 [Explosive Ordnance Assessment and Safeguarding, Moorebank Intermodal Terminal, Moorebank, NSW *(G-tek Australia Pty Limited, May 2011)];* subsequent Safeguarding tasks have been conducted within the Site in support of environmental and geotechnical investigations including of surface sampling, hand auguring, drilling and test pitting tasks.

No explosive ordnance related finds were identified in the northern portion of the Site during G-tek Safeguarding tasks and all areas north of the former SME are considered free of potential IA/UXO contamination.

Outcomes of FVS

Findings of the FVS are summarised in the figure below, where **Yellow** indicates small arms ammunition (primarily empty fired blank cartridge cases), **Blue** inert training/practice items (IA) and **Red** inert explosive ordnance waste (EOW), primarily smoke grenade related.



G-tek FVS Finds *(G-tek Australia Pty Limited, May 2011 p9)*

The areas of the Site containing little built infrastructure have been widely used for field training in the use of personal weapons and equipment, presumably in both offensive and defensive roles. This activity included firing of blank ammunition and the use of pyrotechnic devices including smoke, flares and battle noise simulators. While the FVS focused on accessible areas, it is anticipated that the vegetated areas of the Site would have been similarly used.

The G-tek FVS reinforced the findings of aegis and EarthTech in EarthTech areas SW0182 – former Practice Mine Field and Bomb Disposal Area and SW0190 – Bomb Disposal Area.

Practice Anti-tank Mine – SW0182
(G-tek Australia Pty Limited, May 2011 p15 and p17)

Practice 500lb Aircraft Bomb – SW0190

The FVS did not confirm the findings of aegis and EarthTech in EarthTech area 25mSAR which was not accessible at the time of the FVS. G-tek however did identify a large quantity of small arms ammunition fired projectiles on the eastern side of the Site, including .30, .303 and .45 calibre; which would indicate that there had been a live firing small arms range somewhere in the area and that the rear stopbutt of the range had been dismantled and the soil and material spread in this area. The material may have come from the indicated 25mSAR and are indicated as the **Yellow** items in images below.

Small arms ammunition projectile finds *(G-tek Australia Pty Limited, May 2011 p11)*

The FVS did not confirm the findings of aegis and EarthTech in EarthTech area SW0192 – Potential Explosive Ordnance Drowning Area which was not accessible at the time of the FVS because of active Military dog training within the area. Subsequent Safeguarding tasks in the area indicated a high level of water in the dam, precluding investigation at that time.

5.0 STAGE THREE – DATA ANALYSIS

Have UXO been previously recovered from this Site?	No records have been located that indicate UXO have previously been recovered from this Site.
Is there data to indicate that IA may have been stored on this Site?	There is data to indicate use of the Site for the storage of EO within designated Explosive Storage Areas.
Is there data to indicate that IA may have been disposed in this Site?	There is no data to indicate that EO containing remnant explosive material may have been disposed within this Site.
Are there any other potential sources of IA/UXO that may have impacted on this Site?	The Site has been widely used for Combat Engineering training since WWII. That training has included the use of live small arms ammunition (SAA) and various pyrotechnic devices including signals, flares, smoke grenades and battle noise simulators, all widely used in the training of all soldiers for offensive and defensive operations as part of their duties. The Site has also been widely used for the training of Combat Engineers in their specialist roles in construction, bridging, watermanship, minefield laying, recovery and breaching, explosives detection using canines, explosives use in construction and denial operations and battlefield clearance of explosive remnants of war (ERW), particularly clearance of air delivered munitions (bombs). Because of the training nature of the Site, limited, controlled quantities of high explosives were stored or used on the site; these included electric and non-electric detonators, plastic explosive, gelignite, primers and both commercial and "home-made" explosives to allow both human and canine trainees to become familiar with the texture, smell and application of the material. **Mines** In addition to minor explosives stores, Combat Engineers were responsible for the laying, lifting and breaching of offensive and defensive minefields. Australia was an original signatory of the "Convention on the Prohibition of the Use, Stockpiling, Production and Transfer of Anti-Personnel Mines and on Their Destruction" and in December 1998 the Australian Parliament passed the Anti-Personnel Mines Convention Act. This legislation gives effect under Australian law to the provisions of the Mine Ban Convention. It creates offences relating to the placement, possession, development, production, acquisition, stockpiling and transfer of anti-personnel landmines by Australian citizens or members of the Australian Defence Force or on territory under Australian jurisdiction or control. In keeping with Australia's obligations under the Anti-Personnel Mine Ban Convention, the Australian Defence Force has destroyed Australia's stockpile of antipersonnel landmines. A small number of mines have been retained, as permitted by the Convention, for research and training purposes in support of Australia's work in humanitarian demining. (http://dfat.gov.au/international-relations/security/non-proliferation-disarmament-arms-control/conventional-weapons-missiles/Pages/convention-prohibition-use-stockpiling-production-transfer-anti-personnel-mines.aspx)

The items used within SME for training Combat Engineers in mine actions activities were either inert replica items for classroom/display use, or practice items for field training use; these generally emitted a coloured smoke to indicate that they had been activated.

Training on disposal of items containing high explosive was restricted to recognized Defence training ranges, such as Holsworthy.

Area SW0182 has the potential to contain remnant training mines.

Air Delivered Munitions

Combat Engineers conduct battlefield clearance tasks of ERW to assist mobility of combat forces and as a humanitarian responsibility. Battlefield clearance of air delivered munitions, particularly large aircraft bombs, may include the location of the item, excavation of pits or shafts to access the item and the construction of bunds or revetments to minimise the effects of blast or fragmentation if an item detonates.

From EarthTech 2006, it is understood that "The EOD training area was subject to partial clearance as part of the Stage 2 Investigation. However, the geophysical survey of the area was limited by the presence of existing buildings and several stands of bushland. Further, the geophysical survey was unable to identify specific anomalies in the northern portion of the EOD training area due to the presence of wide spread buried metal waste, and where specific anomalies were identified, only 20 of the 143 identified were investigated." *(EarthTech, July 2006 p374)*

The items used within SME were inert and, once recovered, were stored and re-used for subsequent exercises and training courses.

There is a potential for remnant inert air delivered munitions to have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192.

Other Explosive Remnants of War

Battlefield clearance activities will also require familiarisation and training with a range of allied and "enemy" land ordnance, including rocket, grenade, mortar and artillery ammunition, and it is anticipated that inert examples of a wide range of such items would also have been used for both classroom and field training activities, again for both human and canine trainees.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190 and, potentially, within Area SW0192.

6.0 STAGE FOUR – RISK ASSESSMENT

Items of UXO threat	Blank small arms ammunition (SAA) with unfired primer and propellant.
Maximum UXO penetration	Likely restricted to surface and near surface (10 mm) over the majority of the site but with the potential for some Unexpected Finds at greater depth in areas where surface re-grading or waste disposal pits have incorporated SAA.
Items of IA threat	Inert practice and training anti-personnel and anti-tank mines. Inert practice and training air delivered munitions, including rockets and bombs Inert practice and training land munitions, including rockets, mortars, grenades, and artillery projectiles
Maximum IA depth	Will vary across the Site according to training objectives; 0 – 10cm for mines, 0 – 5m for aircraft bombs, 0 – 2m for other air and land delivered munitions.
Risk pathways	Vegetation Reduction. Intrusive engineering or levelling works with plant.
Consequences/Receptors	Consequences of UXO initiation could include: • Lost time hand or eye injury to personnel. • Perceptual risk from visible items. Consequences of IA interaction could include: • Delays to process in identifying and ensuring item is Free from Explosives (FFE). • Perceptual risk as an item is uncovered. • Damage to reputation or finances.

UXO RISK CALCULATION – Health of Human Receptor

Activity	Probability [P] [SH x IM = P]	Consequence [C] [D x PSR = C]	Risk Rating [RR] [P x C =RR]
Environmental Testing	3x1=3	2x2=4	3x4=12
Landscaping	3x1=3	1x1=1	3x1=3
Excavations	3x1=3	1x1=1	3x1=3
Re-contouring	3x1=3	1x1=1	3x1=3
Risk Abbreviations: SH – Site History [1-3], IM – Investigation Methodology [1-3], D – Depth of Encounter [1-3], PSR – Proximity to Sensitive Receptors [1-3], RR – Risk Rating [1-81], ALARP – As Low as Reasonably Practical			
Risk Rating: 1-4 Low [Partly Tolerable], 5-12 Low-Medium [Partly Tolerable], 13-27 Medium-High [Intolerable], 28-81 High [Highly Intolerable]			

IA RISK CALCULATION – Delay/Perception

Activity	Probability [P] [SH x IM = P]	Consequence [C] [D x PSR = C]	Risk Rating [RR] [P x C =RR]
Environmental Testing	3x1=3	2x1=2	3x2=6
Landscaping	3x1=1	2x2=4	3x4=12
Excavations	3x2=6	3x2=6	6x6=36
Re-contouring	3x1=3	2x2=4	3x4=12
Risk Abbreviations: SH – Site History [1-3], IM – Investigation Methodology [1-3], D – Depth of Encounter [1-3], PSR – Proximity to Sensitive Receptors [1-3], RR – Risk Rating [1-81], ALARP – As Low as Reasonably Practical			
Risk Rating: 1-4 Low [Partly Tolerable], 5-12 Low-Medium [Partly Tolerable], 13-27 Medium-High [Intolerable], 28-81 High [Highly Intolerable]			

7.0 STAGE FIVE – RISK MITIGATION

Is the Site suitable for further UXO investigations	The current levels of remnant metallic contamination makes the Site unsuitable for further analogue or digital UXO investigation. Additional surface search in close training areas would reduce the number of blank cartridge cases and pyrotechnic ordnance waste in these areas and reduce potential for encounter.
Is the Site suitable for further IA investigation	Areas SW0182, SW0190 and SW0192 can be investigated with applied vegetation reduction and surface metallic debris removal requirements specific to each area. Balance of the Site requires no further IA investigation

Activity	Mitigation Measures to Reduce RR to ALARP	Final Risk Rating
General	UXO Management Plan/Protocol in place for action required in the event of a potential item of UXO/IA being discovered. UXO/IA potential included as part of Site-specific inductions and safety awareness training. IA Remediation works in areas SW0182, SW0190 and SW0192.	LOW
Environmental Testing	General, plus: Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard testing if surface search not conducted prior to requirement.	LOW
Landscaping	General, plus: Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard areas where holes are required for fencing or tree/shrub planting or trenches are required for irrigation or similar systems in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.	LOW
Excavations	General, plus: Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard areas where excavation is required as part of Site woks in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.	LOW
Re-contouring	General, plus: Engage a member of the Department of Defence Environmental and Heritage Panel F2 stream to safeguard areas where re-contouring is required as part of Site woks in Areas SW0182, SW0190 and SW0192 if remediation is not completed prior to works.	LOW
Final Risk Rating: 1-4 Low [Partly Tolerable], 5-12 Low-Medium [Partly Tolerable], 13-27 Medium-High [Intolerable], 28-81 High [Highly Intolerable]		

8.0 MANAGEMENT PLAN

Based on the UXO Risk Review conducted, the overall developable area of the Site can be divided into two (2) portions, Northern and Southern (former SME). The current alignment of Moorebank Avenue is not considered to contain any UXO or IA risk and upgrade works, where they impinge onto the Southern portion developable area, should be managed in the same way as the portion they fall into.

Northern Portion

The Northern portion is considered free of UXO and IA risk.

Southern Portion (SME)

The Southern portion, the area of the former School of Military Engineering (SME) is considered to contain UXO risk (primarily unfired blank small arms ammunition) generally across the portion.

Within the Southern portion, three (3) areas of IA risk are considered to be remnant:

SW0190 – Bomb Disposal Training Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ either on the surface or within the sub-surface of Area SW0190.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190.

SW0192 – Potential Explosive Ordnance Drowning Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ within Area SW0192.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ within Area SW0192.

SW0182 – in Practice Mine and Bomb Disposal

There is a potential for remnant inert mines (IA) of various natures to have been left in situ within Area SW0182.

Objective

The objective of this Management Plan (MP) is to provide a framework for addressing any discovery of potential unexploded ordnance (UXO) or Inert Ammunition (IA) to ensure a safe environment for all project staff, visitors and contractors within the Site.

This MP will be included within any hierarchy of management plans for works within the Site.

Unexploded Ordnance (UXO)

Risk assessment has indicated that the most likely item of UXO to be encountered within the Site is unfired small arms ammunition (SAA), particularly 5.56mm blank cartridges. Items will generally be on or near the surface and the majority of visible items will be empty/fired, containing no primer or propellant. Individual unfired items may be interspersed with the fired.

Blank SAA of various calibres

Any personnel travelling on the current natural surface of the Site will have a potential to encounter blank SAA, but the areas of the Site where blank SAA UXO encounter with a human receptor is most likely to occur is previously open or vegetated areas not in close proximity to the footprints of previous buildings or infrastructure which was in regular use when SME was occupied.

Inert Ammunition (IA)

Risk assessment has indicated inert ammunition of various calibres and natures is likely to be encountered in specific areas of the Site; inert air and land delivered munitions, including aircraft bombs, rockets, mortar and artillery projectiles are likely to be encountered at various depths with the former EOD Training and Ordnance Drowning Areas (SW0190 SW0192) while inert mines of various types are likely to be encountered in the former practice mine and bomb disposal area (SW0182).

Personnel with the highest potential for encountering remnant inert mines are those engaged in surface and near surface activities in area SW0182, while those with the highest potential for encountering other natures of IA in areas SW0190 and SW0192 are personnel conducting:

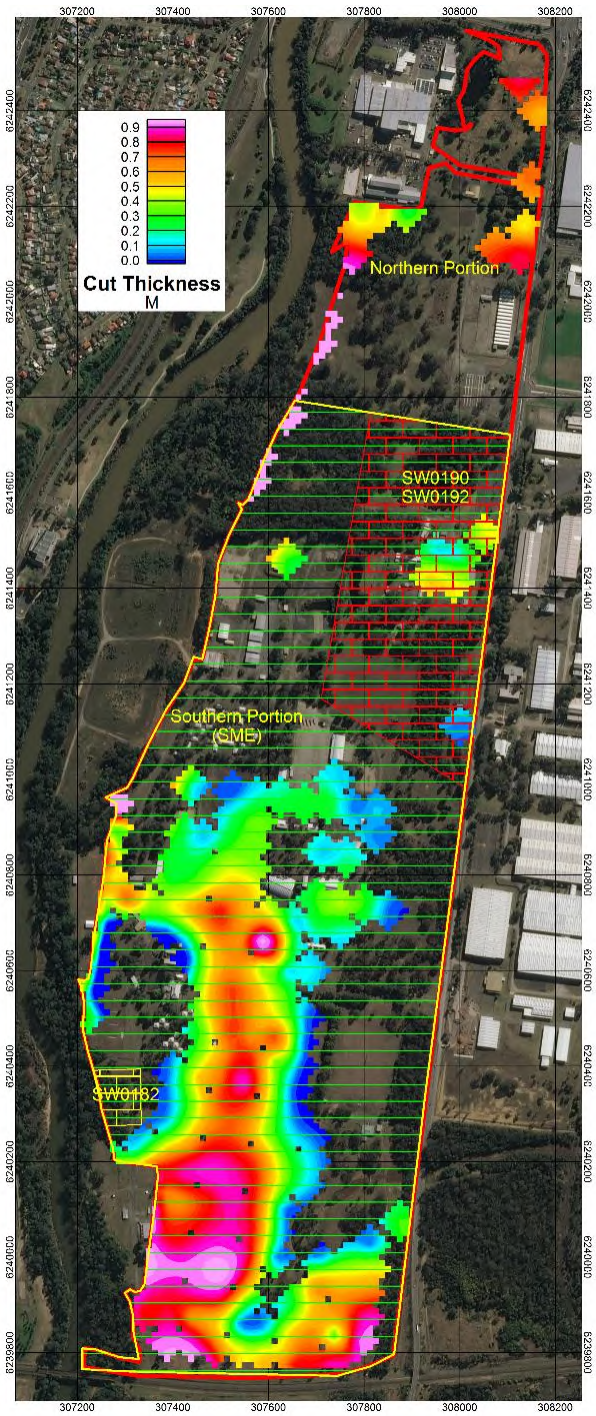
- Excavation and re-contouring.
- Unexploded Ordnance remediation.

This management plan documents the ongoing management actions necessary should remnant UXO/IA items be exposed as a consequence of fire, land clearing, survey, investigation or earthworks.

8.1 MANAGEMENT PLAN IMPLEMENTATION

The overall Site has been further reviewed in line with Client information received in relation to the boundaries of the Developable area and the anticipated cut/fill requirements within the Site; Management Plan implementation is based on this review. As Moorebank Avenue Upgrade Works impinge into the indicated Developable area, they are considered to have the same potential as the area they impinge into, and the same implementation process is to apply.

The Figure below indicates the Development area only and levels where cutting into the current natural levels is required as part of the development process; the balance of the area will have fill applied as part of the development.



Southern Portion (SME)

The Southern portion is considered to contain UXO risk (unfired blank small arms ammunition) generally across the portion.

Within the Southern portion, three (3) areas of IA risk are considered to be remnant:

SW0182 – Practice Mine and Bomb Disposal

There is a potential for remnant inert mines (IA) of various natures to have been left in situ within Area SW0182.

It is anticipated that this area will be filled as part of the development process, but, as any remnant practice mines will be remnant very close to the current natural surface level and will be disturbed/observed when any vehicles disturb the surface.

Because of the nature of the items, it is recommended that Remediation of this area occur prior to development.

SW0190 – Bomb Disposal Training Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ either on the surface or within the sub-surface of Area SW0190.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ either on the surface or within the sub-surface of Area SW0190.

The areas east and south of the fill contour line will require remediation if cut occurs greater than for topsoil removal.

SW0192 – Potential Explosive Ordnance Drowning Area

There is a potential for remnant inert air delivered munitions (IA) to have been left in situ within Area SW0192.

There is a potential for remnant inert ERW (IA) other than air delivered munitions to also have been left in situ within Area SW0192.

It is anticipated that this area will be filled and requires no prior remediation.

8.1.1 – Identify relevant personnel

As part of the preparatory planning for site works, appropriate management personnel should be designated with particular responsibilities in the event of EO/EOW being identified within the Site during works and, where necessary, appropriately qualified contractors/consultants are engaged to provide technical support.

An EO Contact List will be maintained as part of this MP detailing the name, position, responsibility and contact details of each individual who may need to be involved in any EO related matters on this Site. A suggested contact list format is included as Appendix 1 and specific contact details may be included in Site OHS signage and induction cards.

8.2.2 – Site inductions

The implementation of this management plan will involve EO awareness training as part of the overall induction for Site personnel. The procedures included in this management plan should be included in the safety induction for all staff engaged in Site works regardless of whether they are directly involved in intrusive investigation or excavation activities and are also relevant to the long-term operation of infrastructure within the Site.

Induction information should include:

- Overview of past military usage of the Site.
- Overview of potential EO that may be remnant within the Site.
- Name/details of designated responsible personnel to be contacted in event of the discovery of potential EO.
- Process to be followed in the event of locating potential EO during site works.

8.3.3 – Management process

The management process to be adopted should EO material be discovered during future site works is presented below and in the flowchart at Appendix 2.

8.3.3.1 Discovery of potential EO

If potential EO material is discovered during the course of Site works, such discovery is to be notified to the EO Manager as soon as practical. Material discovered will not be touched or moved and works that could move or disturb the items should not continue in their immediate vicinity; an exclusion zone of 5 m radius in all directions will be established and enforced, and the occupants of any buildings in close proximity to the exclusion zone will also be notified in case future evacuation of the building/s is required.

8.3.3.2 Assessment by the EO Manager

The EO Manager will assess the material and determine whether it is miscellaneous debris, inert EOW, a potential component from EO, or potential EO. Where the EO Manager can identify the item as non-munitions debris or harmless fragments of debris, the material should be removed from its location and disposed of appropriately. Works within the vicinity will resume on removal of the material.

Where the EO Manager considers the material to be potential EO, access restrictions will be maintained or the exclusion zone increased and the Site Manager shall be informed. The EO Manager will contact the appointed EO Contractor who will attend the Site and assess the material.

8.3.3.3 Classification and management by EO Contractor

On arrival at the site, the EO Contractor will be met and briefed by the EO Manager and will proceed to review and assess the discovered material. Such material will be classified by the EO Contractor as either:

- Category A – EO items which contain or potentially contain energetic material and could cause harm or injury;
- Category B – IA items which are easily recognised as inert items such as an empty cartridge cases or empty/expended flares which, while not dangerous, may cause alarm to a worker or member of the public, or works delay on discovery; or
- Category C – Non EO related waste or debris.

Should the EO Contractor assesses the Material to be Category C, the EO Contractor will inform the EO Manager and the material will be removed and appropriately disposed. Any access restrictions will be lifted and normal activities resumed in the vicinity.

If the EO Contractor identifies the Material to be Category B, the EO Contractor will inform the EO Manager and ensure appropriate dispose of the Material. Any access restrictions will be lifted and normal activities resumed in the vicinity.

If the EO Contractor identifies the material as Category A, the EO Contractor will inform the EO Manager, review and potentially extend exclusion zones and/or cause physical access barriers to be erected, and will liaise with the Department of Defence to ensure the timely and appropriate disposal of the material.

8.3.4 – Documentation

The designated EO Manager will maintain an EO incident log and record any reported EO finds, the outcomes of any assessments by both the EO Manager and the EO Contractor and the final disposition of the material that initiated the actions. These records should be maintained as Project Quality Records and available for Audit.

Appendices to Management Plan:

1. Explosive Ordnance Contact List (Suggested Format)
2. Explosive Ordnance Management Process Flow Chart

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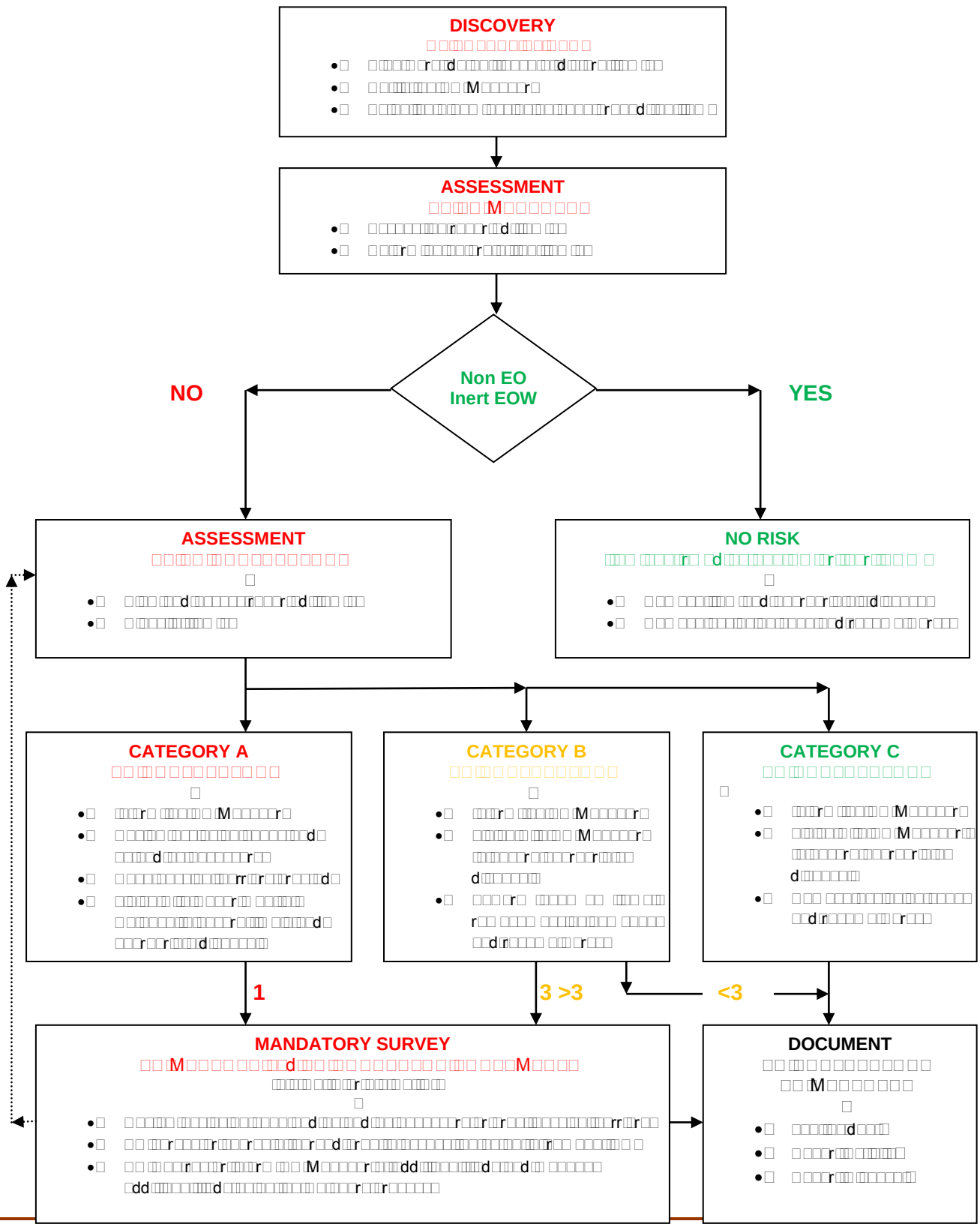
Appendix 2

Explosive Ordnance Management Process Flow Chart



Appendix G
MANAGEMENT COMMITMENTS

Qube makes the following management commitments in respect of hydrocarbons and waste materials, natural gas, liquid natural gas, and flammable and combustible liquids.

Conditions of Approval (CoA) – EPBC 2011/6086 – Management Commitments		
CoA	**Reference**	**Condition Requirement**
8b) and c)	**REMM 7A**	Minimise the risk of leakages involving natural gas, liquid natural gas (LNG) and flammable and combustible liquids to the atmosphere: - appropriate standards for a gas reticulation network, including AS 2944-1 (2007) and AS 2944-2 (2007), would be referred to in the detailed design process; - correct schedule pipes would be used; - a fire protection system would be installed if necessary, for gas users; - cathodic protection would be installed for external corrosion if appropriate; and - access to the Project site would be secure.
	REMM 7B	Minimise the risks of leakage of LNG and liquid petroleum gas (LPG) and flammable liquids during transport: - materials would be transported according to the Australian Dangerous Goods (ADG) Code, relevant standards, and regulations; and - contractors delivering the gas would be trained, competent and certified by the relevant authorities
	REMM 7C	Minimise hazards associated with venting of natural gas, LNG, and LPG: - LNG storage would be designed to AS/NZS 1596-2008 standards; - access to the Project site would be secure; and - significant separation distances to residences and other assets would be put in place.
8b) and c)	**REMM 7D**	Storage of flammable/combustible liquids would be carried out in accordance with AS 1940, with secondary containment in place and location away from drainage paths.
	REMM 7E	Standby or emergency generators and transformers would all have secondary containment.
	REMM 7F	Oil coolers would generally be located in areas where leaks and runoff are appropriately controlled at source or in a retention basin.
	REMM 7K	Other dangerous goods, including any waste materials present on the Project site, would be suitably contained, with secondary containment and runoff controls implemented where appropriate to prevent leaks or spills migrating to environmentally sensitive areas, in particular via stormwater systems that drain to the Georges River.
	FCMM 6F	This is covered in the LTEMP (EP Risk 2020).