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

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

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

Golder (2016b) reported that GHD had been commissioned by Defence, to undertake the remediation of the former DNSDC Refuelling Facility in accordance with the RAP prepared by GHD. These works are scheduled to be completed over a 12 - 18 month period commencing in June 2016. At the time the Golder (2016) report was prepared, it was understood there is no active remediation proposed within the Moorebank Avenue nor the MIC Property West (MPW), however, it was understood that this was going to be reviewed by GHD during the remediation activities. Golder (2016b) reported that, the proposed Multi Phase Vapour Extraction (MPVE) remediation activities will be extended to the off-site impacts (H. Milne, GHD 2016 *pers. Comm.* 28 April). It is also understood the remediation works will be reviewed by Accredited Contaminated Site Auditor (Andrew Lau from JBS&G), and that a Site Audit Statement will be prepared at the completion of the works.

Subsequently, Golder prepared a site management plan (SMP) for the portion of Moorebank Avenue above the LNAPL plume (Golder 2016c). The SMP provides controls to minimise to an acceptable level the human health risks associated with the LNAPL plume until such time that the remediation works being completed on behalf of Defence have been completed. The boundaries of the SMP are restricted to the Moorebank Avenue, and do not extend to the portion of the site underlain by LNAPL.

4.2.1 Previous investigation Study Boundaries

The Post Phase 2 ESA (Golder, 2014a) included several key data gaps that were considered outside the scope of this assessment, and subsequently not warranting further investigation at the time. These were relevant to the remediation activities but were considered to be subject to finalisation of detailed design or were to be addressed under separate cover as discussed below:

- *Surface water quality, to gather data to inform management of dewatering / discharges anticipated to be required to achieve the build design* – identified in the PB RAP (2014b)

  The dewatering / discharge requirements (if any) to achieve the build design will be subject to the Precinct detailed design. It is not considered a remediation activity. Hence it is considered premature to complete additional surface water quality sampling as part of the remediation works, however will require consideration as part of the general redevelopment of the site;

- *PFAS Investigations*

  The previous investigations have identified PFAS as chemicals of concern on the site, particularly in the former fire training area and the southern dust bowl. PFAS chemicals are an emerging chemical of concern and the approach to assessment and remediation is still developing and Australian criteria are under discussion. Additional investigations of the use and distribution of PFAS chemicals is being completed under a separate cover, and where required, a routine monitoring regime will be established as part of the Long Term Environmental Management Plan (LTEMP).

4.3 Contaminants of Potential Concern Investigated

The contaminants of interest assessed during the previous investigations have included:

- Total Recoverable Hydrocarbons (TRH) and Total Petroleum Hydrocarbons (TPH), including light non-aqueous phase liquids (LNAPL);
- Benzene, Toluene, Ethylbenzene and Xylene (BTEX compounds);
- Heavy metals / metalloids (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Polycyclic aromatic hydrocarbons (PAHs);
- Polychlorinated biphenyls (PCBs);
- Volatile organic compounds (VOCs);
- Semi volatile organic compounds (SVOCs);
- Asbestos;
- Perfluoroalkyl and polyfluoroalkyl substances (PFAS), (associated with Aqueous film forming foams (AFFF));
- Organophosphate pesticides (OPPs) and organochlorine pesticides (OCPs);
- Explosives, including residues and un-exploded ordnance (UXO); and
- Formaldehyde.

4.4 Key Contamination Issues

A summary of key contamination issues identified on the site and their distribution in the various environmental media at the site is summarised in Table 3. Based on the current information, the following key contamination risks and data gaps warrant specific discussion. The extent of areas that have been identified for management or remediation are discussed in Section 5.1.

- ***Buildings*** - A restricted number of the samples were taken beneath the site buildings or associated underground services, and it is considered that the identified contamination may be an underestimate. Although a limited number of samples have been assessed within or beneath buildings, the majority of activities on the site had low risk activities. However, pits, pipes and soil associated with buildings used for higher risk activities (i.e. workshops, hazardous goods stores etc.) is potentially contaminated. Therefore, additional soil investigation or remediation / management with associated validation is warranted following demolition.
- ***Underground Services*** - There is limited information on underground services including drains, historic water pipes and electrical cables which have potential to be constructed with hazardous materials or were used to convey contaminated substances. Services may comprise asbestos, asbestos conduit or include contaminated substances or hazardous materials (i.e. PCB cable fluid, or hydrocarbon impacted water). Therefore, additional soil investigation are warranted and proposed following demolition of the infrastructure.

- ***Anthropogenic fill materials*** - The proposed land use is predominantly commercial and industrial, and the validation of the site involves soil sampling and the assessment of the chemical concentrations against guidelines appropriate for the intended use of the site. However, buried waste materials have been identified (referred to as anthropogenic fill materials, and are identifiable through the presence of waste materials, odour and discolouration), and these materials may be physically/structurally unsuitable to remain in their current location (i.e. may be geotechnically unsuitable), although they may represent a low, acceptable contamination risk. This may result in a large volume of materials requiring onsite management and possible geotechnical rectification. Nevertheless, due to the heterogeneous nature of the waste materials, additional contaminated materials may be identified during the management and geotechnical rectification process.
- ***Asbestos in or on Soil –*** Asbestos has been identified in the soil on the site, however, its' distribution does not appear to be related to particular areas, or particular activities on the site. The asbestos identified is predominately asbestos containing materials (ACM), and was detected in the shallow soils. Management of potential asbestos finds needs to address worker health and safety, and provide practical materials handling protocols. The potential for encountering previously identified asbestos in wastes and soil will be managed through the Asbestos in Soils Management Plan (AMP). The AMP (Golder 2016a) provides a detailed assessment the stockpiled materials. The AMP also includes detailed descriptions on the preferred approaches to the remediation and /or management of asbestos in soils at each of these areas. Subsequently, reference should be made to AMP for the preferred approaches to the remediation and or management of asbestos in soils, and actions associated with the remediation of asbestos in soils have been excluded from this RAP.
- ***Perfluoroalkyl and polyfluoroalkyl substances (PFAS)*** – PFAS have been identified in the groundwater. There is growing public and regulator awareness of the issues associated with PFAS and the regulatory approach to PFAS is currently in development. The impacts may require future management, and further assessment being completed under a separate cover to determine if the identified impacts warrant direct remediation or management. As such it is recommended that PFAS concentrations identified during the remediation works be assessed and where required, a routine monitoring regime be established as part of the Long Term Environmental Management Plan (LTEMP).
- ***VOCs -*** Trichloroethylene (TCE) and cis-1,2-dichloroethene (cis DCE) were identified in soil and groundwater in the north western portion of the site. The reported shallow soil concentrations were below the tier 1 screening criteria and therefore considered to be low and acceptable. Vapour intrusion modelling was undertaken to potential assess risks posed by volatile chemicals to the identified populations where a complete exposure pathway was identified (Golder, 2015d). Vapour modelling was carried out to evaluate the following scenarios:

  - **Commercial Worker**: inhalation outdoors from maximum on-site soil vapours concentrations, and the risks were considered low and acceptable for commercial workers.
  - **Intrusive Worker**: inhalation in a trench evaluated using maximum on-site soil vapour concentrations, and the risks were considered low and acceptable for intrusive maintenance workers.

  A separate assessment of general public outdoors was not directly undertaken. However, the evaluation of inhalation for commercial workers and an intrusive maintenance worker is considered sufficiently conservative to also provide an assessment for members of the general public.

  Overall the risks associated with the VOCs were considered low and acceptable for the proposed open space land use including roads, road verges and woodland/riparian conservation areas. The Tier 2 QRA was based on the assumption that impacted area is not going to become a permanent place of work (i.e. no buildings are to be constructed in the area). If the site layout or use changes to include the construction of buildings with or a permanent workspace then the risk assessment will need to be revised, and direct remediation or management actions undertaken.

- ***Light Non Aqueous Phase Liquids –*** The investigations have determined that LNAPL is present beneath Moorebank Avenue and the eastern portion of the site. The LNAPL is likely to be associated with diesel fuels and is sourced from the former DNSDC refuelling facility located on the SIMTA property. Based on the Golder (2016b) investigations in 2016 (which were completed approximately eight months after the MPVE trials were completed in the area) the LNAPL was measured at approximately 1.76 m apparent thickness in monitoring well GW120 located near the former entrance to the SME (MIC Property West) at approximately 6.5 m depth below ground (Golder, 2016). The source of the LNAPL is understood to be scheduled for remediation by Defence, however, the extent of offsite remediation actions is yet to be determined. Further assessments are required to determine what management and or remediation actions are required to facilitate the development of the site in the areas overlying the LNAPL plume.

Table 3: Summary of Key Contamination Issues

Impacted Media	Key Contaminants								
	Explosives, UXO/ EOW	**TRH, BTEXN**	**TCE[5]**	**PAH**	**Other Organics**	**pH**	**Metals**	**Asbestos**	**Waste Materials / Aesthetics**
Fill and Natural Soil	Explosive residues have not been detected in soil. Items of UXO threat - propellant/primes in small arms ammunition blank cartridge cases, likely within the surface to near surface (10mm) with the potential for unexpected finds at greater depths.[6]	Present around the site. Primarily associated with petroleum storage infrastructure, vehicle maintenance areas, and tip sites.	Chlorinated compounds have been detected in soil, groundwater and soil vapour in a localised area in the north western corner of the site.	Present around the site at concentrations exceeding the ecological screening levels. However, was not reported above the health screening criteria.	OPP / OCPs (dieldrin) was detected beneath a building built in 1970's. Concentrations were below the adopted health screening criteria. PCBs are potentially present near high voltage electrical equipment, however have not been assessed.	Acidic soils have been identified on the site and will require management during construction.	Metals above the adopted health screening criteria were detected in the vicinity of the former grit blasting facility. Metals exceeding the EILs have been detected in the proposed riparian zone.	Present in many areas of the site at depths of up to 2m.	Waste, odour, discolouration. Aesthetics are unlikely to prevent the reuse of materials on a commercial / industrial site. Anthropogenic wastes may require management for geotechnical purposes.
Underground Services	Limited samples associated with services have been assessed and there is limited information on known services - sewers, drains, historic water pipes and electrical cables have potential to be constructed with hazardous materials. Services may comprise asbestos, asbestos conduit or include contaminated substances or hazardous materials (i.e. PCB cable fluid).								
Groundwater			Chlorinated hydrocarbons have been identified in groundwater. Localised to the north west corner of the site.		Perflourinated chemicals have been detected in groundwater. The materiality of these impacts requires further assessment.	Generally low pH across the site.	Background concentrations of cadmium, copper, nickel and zinc. Localised concentrations of elevated zinc.		

[5] Risks associated with the TCE impacts identified in the north western corner of the site have been assessed through a Tier 2 Quantitative Human Health Risk Assessment (refer to Golder 2016)

[6] Conclusions are drawn from "UXO Risk Review and Management Plan," prepared by G-Tek (reference number 14037GOLD for future management requirements.

5.0 REMEDIATION STRATEGY

A general remediation strategy was presented in the Preliminary RAP (PB, 2014a). The approach was to initially remove the known sources of contamination (such as USTs and hotspots), and subsequently use a combination of techniques to manage potentially contaminated materials should they be encountered during subsequent site development stages. The Preliminary RAP (PB, 2014b) included the following remediation activities;

- Removal of underground petroleum storage infrastructure;
- Excavation and offsite disposal of fill materials known to be impacted by contamination “hotspots” based on previous investigation data;
- Additional investigations to augment the existing data related to potential acid sulphate soils, surface water quality, residual sediments, TCE impacted groundwater beneath the north west corner of the site (where warranted these were completed as part of the Post Phase 2 ESA, Golder (2015a)); and
- Continued site risk management and assessment of remediation options to maximise reuse of resources and minimise importation of materials.

Each of the above mentioned remediation actions is discussed in greater detail below.

5.1 Remediation Requirements and Extent

The proposed remediation and validation program is based on the identified contamination and the nature of the intended land use, i.e. intermodal facilities and warehousing involving substantial covering of the site with pavements and buildings, as well as a riparian conservation zone (potentially with a public walking track or pathway) adjacent to the Georges River.

An estimate of the remediation requirement at each area nominated as requiring remediation are presented Section 7, and an overview of these area shown on Figure 3.

In summary the ‘remediation areas’ include:

- ***Fuel Infrastructure*** **-** the known underground storage tanks (USTs), petroleum infrastructure and associated hydrocarbon impacted soils;
- ***Hot Spots*** **-** the known nominated areas of soil contamination (‘hotspots’) including;
  - soils impacted with lead, and
  - soil impacted with petroleum hydrocarbons (in addition to those associated with USTs).
- ***Asbestos in soils*** **-** There are also several areas on the site which include soil known to be impacted with asbestos, including
  - known stockpiles of ACM impacted soils;
  - building demolition wastes; and
  - areas where anthropogenic fill materials have been placed and the soils are known to (or suspected) of containing asbestos.

  The AMP (Golder 2016a) provides a detailed assessment the asbestos in soils on the site including the stockpiles demolition and anthropogenic fill materials. The AMP also includes detailed descriptions on the preferred approaches to the remediation and /or management of asbestos in soils at each of these areas. As the remediation and management, including requirements for validation for asbestos in or on soils is described in detail within the AMP, the remediation and management of asbestos is not repeated within this RAP. Notwithstanding this, the remediation and management required in the AMP are considered to be remediation tasks required to be completed and validated, prior to a Site Audit

statement can be prepared, i.e. consistent with the remediation/management task nominated within this RAP.

The previous investigations on the site have also identified areas where foreign materials (wastes) have been buried (referred to as Anthropogenic Fill or Tip sites). These areas have been the subject of previous investigations, and the majority of the materials sampled reported chemical concentrations below the adopted investigation levels. Therefore they have not been nominated as areas requiring specific remediation. However, there is potential that previously unidentified contaminated materials are present within the identified tip sites and subsequently these have been nominated as 'high risk areas'. The location of the identified high risk areas are shown on Figure 3 (Appendix A).

5.1.1 Data Gaps

Limited assessment information is available and the following aspects should be assessed further as part of the remediation works;

- the assessment of materials beneath buildings suspected of housing PCBs or at buildings suspected of containing OCP impacted subgrade materials which were unable to be assessed while the site was operational;
- the assessment of underground utilities suspected as either being made of or suspected of containing hazardous or contaminated materials; and
- the management of LNAPL identified on the eastern portion of the site, which is sourced from the former DNSDC refuelling facility.

The areas requiring additional investigation have been nominated as 'investigation areas' and are shown on Figure 3 and detailed areas are shown in Figures 005A – 005I (Appendix A).

5.2 Remediation Options Appraisal

5.2.1 Regulatory Guidance

NSW EPA's preferred position on the selection of remediation options, as stated in the DEC, NSW (2006) *Auditor Guidelines,* specify the preferred order of options for site soil remediation and management to be as follows:

- On-site treatment of the soil so that the level of contaminant is either destroyed or the associated hazard is reduced to an acceptable level; and
- Off-site treatment of excavated soil, which, depending on the residual levels of contamination in the treated material is then returned to the site, removed to an approved waste disposal site or facility or used as fill for landfill.

Should it not be possible for either of these options to be implemented, the NSW EPA Auditor guidelines specify other options that should be considered as including:

- Removal of contaminated soil to an approved site or facility, followed where necessary by replacement with clean fill (if needed);
- Isolation of the soil by covering with a properly designed barrier;
- Choosing less sensitive land use to minimise the need for remedial works which may include partial remediation; and
- Leaving contaminated material in situ providing there is no immediate danger to the environment or community and the site has appropriate controls in place.

The NSW EPA Auditor guidelines also emphasises that:

- The appropriateness of any particular option will vary depending on a range of local factors; and

- Acceptance of a specific option or mix of options in any particular set of circumstances is a matter for the responsible authority.

5.2.2 Sustainability

The preferred remediation option should preferably incorporate sustainability concepts and principles. In particular it should, to the extent practicable, minimise the requirement for off-site waste disposal. In NSW achieving a reduction in waste generation and turning waste into recoverable resources is a priority for NSW EPA. Waste avoidance and resource recovery is promoted under the Waste Avoidance and Resource Recovery (WARR) Act 2001. An option with a low energy requirement is also preferable.

In summary, an objective of the preferred remediation option should be a net environmental benefit. This should also include consideration of impacts on other segments of the environment and energy consumption, carbon emissions and the conservation of fossil fuels.

5.2.3 Site Specific Constraints

As stated under ANZECC & NHMRC (1992) the appropriateness of a particular option is likely to depend on a range of local factors. For the SITE the site-specific constraints are identified as those constraints primarily associated with working within a commercial / industrial land use and setting, in particular the requirement to minimise noise, air quality and traffic impacts from the proposed works.

5.2.4 Appraisal Methodology

The appropriate remedial strategy for the site should allow for remediation goals to be achieved. However, there are different options for the remediation area which may be feasible. To establish the most appropriate strategy, a decision making process is required to enable differentiation of different options. The following factors have been adopted to assess the relative merits of potential remedial options:

- Technical feasibility;
- Environmental impact;
- Relative cost benefit;
- Timeframe; and
- Ongoing maintenance requirements.

From assessment of these issues, qualitative comparative analysis has been carried out.

It is important to note that in discussion of remedial strategy, there may be some decisions which are made on the basis of a single parameter. For example, if there is only one technically feasible option then the other factors (such as environmental impact, relative cost benefit and ongoing maintenance) are inconsequential to the selection of remedial strategy. Consequently, not all of these parameters need be assessed in each instance. However, where multiple parameter decisions are required, the above list can be used as an appropriate guideline.

5.3 Possible Remediation Options

The following presents a qualitative review, with consideration to the adopted decision making parameters, of each of the broad remediation activities required on the site. A detailed review of remediation options for each remediation areas is presented in Table 4.

The remediation on the site will be required to either treat or manage the following:

- Hydrocarbon impacted soils;
- Soils impacted with heavy metals (lead); and
- Asbestos in or on soils, which are provided in detail in the AMP (Golder, 2016b); and

The preferred remediation option will aim to:

- Minimise the adverse impact on development opportunity by on-site management;
- Maximise the re-use potential of the site materials;
- Minimise long term liability issues associated with the managed material; and
- Remediate/manage in a cost effective manner, the remaining material that cannot be reused onsite.

5.3.1.1 Do Nothing

Within the areas containing hydrocarbon impacted soils and soils impacted with lead, the identified soil contamination concentrations exceed the adopted assessment criteria for the proposed future land use, therefore to achieve the remediation objectives a do nothing approach is not viable.

5.3.1.2 Excavation and On-Site Soil Treatment

Excavation and on-site treatment option is the preferred option of NSW EPA under the remediation hierarchy and subject to the availability of a suitable technology as it presents an opportunity to incorporate sustainability concepts and principles through minimisation of disposal to land fill and beneficial reuse of treated soils.

5.3.1.3 Excavation and Off-Site Soil Treatment

Off-site treatment options for the site petroleum hydrocarbons and lead are proven and commercially available in Australia. The offsite treatment of soils impacted with asbestos are not commercially available within NSW.

The offsite treatment of soils impacted with petroleum hydrocarbons would not allow on-site reuse and would require off-site disposal and as such offers no advantages over the excavation and on-site treatment option. Based on the expected volume of soil impacted with lead, the implementation of an off-site treatment option provides no cost benefit when compared with an off-site disposal option. This option should be re-considered if significant contamination (i.e. Hazardous Waste) is encountered.

5.3.1.4 Excavation and Off Site Disposal

Whilst this option does not satisfy the objective of waste avoidance and resource recovery it is an option which is technically feasible particularly in regards to the lead and asbestos contamination. The merits of this approach also need to be considered in relation to the cost benefits, and should be re-considered if significant contamination, which inhibits on-site treatment is encountered or where capping and containment presents significant imposition to the future development of the site.

5.3.1.5 Consolidation and Isolation of Contaminated Soils

Although this method would be feasible and would meet remediation objectives it may not meet stakeholder expectations. Contamination is not removed or destroyed. Indefinite ongoing environmental management would be required through the implementation of a LTEMP.

The merits of this approach need to be considered in relation to the cost benefits, the potential impacts on future redevelopment (i.e. restriction on land use) and the ability to enforce a LTEMP.

Table 4: Assessment of Remediation Options

Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
Excavation and on site treatment.	***Technical feasibility*** On-site treatment options for petroleum hydrocarbon impacted soils are proven and commercially available. Landfarming / biopiling activities. Bioremediation will be completed in accordance with the EPA Best Practice Note: Landfarming (NSW EPA, 2014). ***Environmental impact*** The options maximises the re-use of materials on-site. The on-site treatment process will require management to reduce disruption to surrounding property owners/occupants, and environmental receptors. ***Relative cost benefit.*** This option is considered the most cost efficient. ***Timeframe;*** Treatment is likely to achieve the required project time frame. And there is sufficient space available on the site to complete ex-situ onsite treatment within an area of the site unlikely to impact on the immediate future works on site. ***Ongoing maintenance requirements.*** Subject to successful treatment, no further management is required.	***Technical feasibility*** On-site treatment options soils impacted with lead are proven and commercially available. Opportunities may exist to use future concrete batching plants to effect an encapsulation approach for the impacted materials. The application of a treatment method will require further assessment, and possibly the implementation of a pilot trail. ***Environmental impact*** The options maximises the re-use of materials on-site. The on-site treatment process will require management to reduce disruption to surrounding property owners/occupants, and environmental receptors. ***Relative cost benefit.*** A stand alone treatment plant is considered the cost prohibitive for the expected volume of lead impacted soils. Opportunities may exist to use future concrete batching plants to effect an encapsulation approach. ***Timeframe;*** The method is unlikely to achieve the required project time frame, unless impacted soils are excavated and temporally stockpiled until a treatment method is proven. ***Ongoing maintenance requirements.***	**Yes – Hydrocarbon impacted soils** Potential – Soils impacted with heavy metals (lead)

Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
		Subject to successful treatment, no further management is required.	
Excavation and offsite treatment.	***Technical feasibility*** Off-site treatment options for petroleum hydrocarbon impacted soils are proven and commercially available. ***Environmental impact*** The option does not maximise the re-use of materials on-site, and will require offsite transport and disposal of materials reducing the sustainability of the project. Offsite treatment facilities will need to hold appropriate Environmental Protection Licences. ***Relative cost benefit.*** This option is considered the less cost efficient when compared with other options. ***Timeframe;*** Treatment is likely to achieve the required project time frame. ***Ongoing maintenance requirements.*** No further management is required.	***Technical feasibility*** Offsite treatment options for soils impacted with lead are proven, however are not widely available. A specialised treatment process would need to be established at an existing treatment facility The application of a treatment method will require further assessment, and possibly the implementation of a pilot trail. ***Environmental impact*** The option does not maximise the re-use of materials on-site, and will require offsite transport and disposal of materials reducing the sustainability of the project. Offsite treatment facilities will need to hold appropriate Environmental Protection Licences. ***Relative cost benefit.*** This option is considered the cost prohibitive for the expected volume of lead impacted soils. ***Timeframe;*** Treatment is likely to achieve the required project time frame. ***Ongoing maintenance requirements.*** No further management is required.	No – Hydrocarbon impacted soils No – Soils impacted with heavy metals (lead)

Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
Excavation and offsite disposal.	***Technical feasibility*** Off-disposal options for petroleum hydrocarbon impacted soils are proven and commercially available. ***Environmental impact*** The option does not maximise the re-use of materials on-site, and will require offsite transport of materials reducing the sustainability of the project. The offsite disposal of materials is the least preferred approach of the NSW EPA. Disposal facilities will need to hold appropriate Environmental Protection Licences. ***Relative cost benefit.*** This option is considered the least cost efficient when compared with other options. ***Timeframe;*** Offsite disposal is likely to achieve the required project time frame. ***Ongoing maintenance requirements.*** No further management is required.	***Technical feasibility*** Off-disposal options for lead impacted soils are proven and commercially available. ***Environmental impact*** The option does not maximise the re-use of materials on-site, and will require offsite transport of materials reducing the sustainability of the project. The offsite disposal of materials is the least preferred approach of the NSW EPA. Disposal facilities will need to hold appropriate Environmental Protection Licences. ***Relative cost benefit.*** This option is considered the a cost efficient method when compared with other options, particularly given the anticipated volumes of impacted materials. ***Timeframe;*** Offsite disposal is likely to achieve the required project time frame. ***Ongoing maintenance requirements.*** No further management is required.	No – Hydrocarbon impacted soils **Yes – Soils impacted with heavy metals (lead)**
Consolidation and isolation.	***Technical feasibility*** An isolation strategy is only appropriate for contaminants which will not present a potential vapour risk to future site	***Technical feasibility*** An isolation strategy is only appropriate for contaminants which will not present a long term risk to offsite receptors through the migration of groundwater impacts. TCLP testing	No – Hydrocarbon impacted soils Potential – Soils impacted with

Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
	occupiers. This option is not suitable for soils impacted with soils impacted with volatile hydrocarbons. ***Environmental impact*** Not considered further due to technical constraints ***Relative cost benefit*** Not considered further due to technical constraints ***Timeframe*** Not considered further due to technical constraints ***Ongoing maintenance requirements*** Not considered further due to technical constraints	of the lead impacted soils indicated limited leachate generation. Further assessment is required to confirm if the materials present a risk through the migration of groundwater impacts. If so, engineering controls (i.e. engineered geo-liners and capping materials) would be required to prevent the generation and migration of leachate. ***Environmental impact*** The option minimises the requirement for offsite disposal increasing the sustainability of the project. Further assessment or engineering controls would be required to minimise risks through the migration of leachate. ***Relative cost benefit*** This option is considered the a relative cost efficient method when compared with other options, however, should engineering controls be required bases on the volume of impacted soils, costs to implement isolation would be less efficient. ***Timeframe*** Should further assessment demonstrate low and acceptable risks associated with leachate generation, this method will likely achieve the project requirements. Should engineering controls be required the method is unlikely to achieve the required project time frame, unless impacted soils are excavated and temporally stockpiled until an insolation areas is designed and installed.	heavy metals (lead)

Option	Hydrocarbon Impacted Soils	Soils impacted with heavy metals (lead)	Preferred Option?
		Ongoing maintenance requirements. The isolation strategy will need to consider the potential impacts on future redevelopment (i.e. restriction on land use) and the ability to enforce a LTEMP.	

6.0 ASSESSMENT AND VALIDATION CRITERIA

The preliminary RAP (PB, 2014b) included assessment criteria for soil, groundwater and sediments. These criteria were generally adopted as the assessment criteria for the investigation works undertaken by Golder in 2014 (Golder, 2015a), and were used to determine where remediation or management actions were warranted.

It is noted that the exceedance of an assessment criteria does not indicate that remediation and/or management is necessarily required. Where an exceedance occurs, further investigation and evaluation of conditions is warranted, and these may include undertaking a qualitative assessment of the risks posed by the exceedance, undertaking statistical analysis or undertaking a Tier 2 Quantitative Risk Assessment.

Subsequently, a staged approach will be used in the application of generic Tier 1 Soil and Groundwater criteria as validation criteria:

1) Analytical Results will be screened against the Tier 1 criteria applicable for the intended future land use;

2) Exceedances of the Tier 1 criteria will be qualitatively assessed taking into consideration the risk the exceedance may pose of the future land use (i.e. consideration of an exceedance of an ecological screening criteria for soils positioned within the proposed commercial / industrial development foot print);

3) Exceedances of the Tier 1 criteria will be examined using a range of summary statistics to ensure the analytical data set appropriately represents the source being considered and the exposure being evaluated (refer to Section 6.1);

4) Following the comparison of the analytical data against the generic Tier 1 criteria (including any adopted statistical analysis), a decision will be made in consultation with the Site Auditor as to whether there is value in completing a Tier 2 human health and / or ecological risk (refer to Section 6.2)

As a reference, generic Tier 1 Soil and Groundwater guidelines appropriate for the proposed land uses, and adopted during the site investigation stages, are presented in Appendix C.

6.1 Statistical Analysis

An exceedance of the Tier 1 assessment criteria indicates that there is an increased likelihood of an adverse impact on human health or ecological values, however, does not indicated that remediation and/or management is mandatory. The magnitude of the exceedance should be considered in the context of the potential exposure pathway and whether the exposure will results in harm. In accordance with the NEPM (NEPC, 2013), a qualitative risk assessment may be sufficient to evaluate the potential impact of minor exceedances of the Tier 1 assessment guidelines. The qualitative assessment of the classification or validation data would need to be supported by relevant statistical measurements.

The adopted statistical approach may examine a range of summary statistics including the contaminant range, median, arithmetic / geometric mean, standard deviation and 95% upper confidence limit (UCL). However, the adopted approach needs to ensure the metric appropriately represents the source being considered and it is appropriate for the exposure being evaluated (i.e. the statistic should be calculated for the relevant soil unit etc.).

As a minimum, when classifying or validating materials the maximum and 95% UCL of the arithmetic mean contaminant concentration is to be compared to the Tier 1 criteria. However, where there is sufficient data available, and it is appropriate, the arithmetic mean can also be compared with the adopted Tier 1 criteria (NEPC, 2013).

The implications of localised hotspots (i.e. elevated values relative to surrounding data) also need to be considered. To determine whether a hot spot does not exist and the results meet the following criteria (i.e. should the following not be met, a hot spot may be present):

- The standard deviation of the results are less than 50% of the relevant investigation or screening level; and

- No single value exceeds 250% of the relevant criteria.

6.2 Tier 2 Human Health Risk Assessment

Following the comparison of the analytical data against the generic Tier 1 criteria (including any adopted statistical analysis), a decision will be made in consultation with the Site Auditor as to whether there is value in completing a Tier 2 human health and / or ecological risk assessment or if the exceedances warrant additional specific remediation / or management actions. In accordance with the NEPM (NEPC, 2013) the response will be determined on an area specific basis and will be proportional to the potential risk posed to human health and/or the environment. Where appropriate the Tier 2 human health risk assessment will include the derivation of site specific trigger values (SSTLs), which will be adopted as the Remediation and / or Validation Criteria.

7.0 REMEDIATION AND VALIDATION ACTIVITIES

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

Further to this, site wide management approaches have been adopted for the management of EOW and UXO risks, and the management of asbestos in soils. This RAP is to be implemented in conjunction with these key documents:

- The **"UXO Risk Review and Management Plan,"** prepared by G-Tek (draft report dated 7 June 2016, reference number 14037GOLD, as amended).
- The **"Asbestos in Soils Management Plan,"** prepared by Golder Associates (draft report dated 4 July 2016 reference number 1416224-035-R-RevA, as amended).

7.1.1 Fuel Infrastructure Removal

The fuel infrastructure identified on the site includes underground storage tanks [USTs], fuel lines, bowsers, POLs and other petroleum related infrastructure is to be removed and the associated soil contamination remediated as part of the remediation works.

Removal works will be undertaken by an experienced licensed subcontractor. The USTs and associated infrastructure shall be decommissioned and removed, and shall be undertaken (as appropriate) in accordance with the following guidance documents:

- SafeWork NSW Factsheet 3_1 Dangerous Goods Abandoning Disused Underground Tanks;
- Standards Australia (2008). AS4976-2008. The removal and disposal of underground petroleum storage tanks;
- Clause 204 (2) of the *Work Health and Safety Regulation 2011*: Control of risks arising from installation or commissioning; and
- UPSS Technical Note: Decommissioning, Abandonment and Removal of UPSS.

The location and nature of the identified underground storage infrastructure are summarised in **Error! Reference source not found.** and are shown on Figures 004- A to 004-M (Appendix A). The underground storage infrastructure nominated for remediation is associated with fuel or waste oil infrastructure and does not include septic tanks associated with general ablutions.

The following is to be implemented at each location:

1) The USTs, pipe work and above ground infrastructure are to be emptied (if required), degassed and removed for off-site disposal for recycling to an appropriately licensed facility.
2) Where USTs and/or pipework cannot be removed immediately off-site, they will be temporarily placed on hardstand or plastic sheeting to mitigate the potential risk of contamination.
3) Photographic records of the condition of each of the tanks and fuel lines or pipe work are to be collected by the Environmental Consultant to assist in identifying potential contaminant sources within the area.
4) Soils will be excavated to facilitate the removal of the underground fuel infrastructure. Soil excavation works will be guided by the Environmental Consultant and excavated materials will be visually inspected and head space screened in the field with a portable photo-ionisation detector (PID) for the presence of volatile petroleum hydrocarbon contamination.
5) Upon removal of the fuel infrastructure the open excavations will be visually inspected and additional excavation of hydrocarbon impacted soils will be undertaken as required to the extent practicable.

Excavations will be extended until field observations (visual inspection and PID readings) indicate that contaminated soil above the adopted site remediation criteria (refer Appendix C) is likely to have been removed.

6) Excavation is generally anticipated to extent approximately 0.5m below the lowest depth of the tank. Grossly impacted soils observed to extend below this depth will be excavated to the extent practical, to mitigate potential risks to groundwater beneath the site.

7) The depth and extent of excavations will be continued until validated by the Environmental Consultant or until practicable limits of excavation are reached. The practicable limit of excavation will be evaluated by consideration of:

    a. Geotechnical constraints associated with excavation safety and excavation stabilisation requirements (e.g. benching, shoring);

    b. Geotechnical constraints associated with potential effects on nearby infrastructure; and

    c. Structural constraints if the excavation extends to close proximity of roadways/footpaths, buildings, below ground services/conduits. This may be of particular concern if 'chasing out' contaminated materials extends towards adjoining buildings.

8) Excavated soils will be transported to a contamination assessment and treatment area (CATA), where soils will be stockpiled to enable classification (refer to Section 7.2).

9) Soils evaluated as being impacted with hydrocarbons and /or soils reporting concentrations of hydrocarbons above the remediation validation criteria (refer to Section 6.0 and Appendix C) will be treated onsite through bioremediation (refer to Section 7.2.4).

10) If excavated materials cannot be carted directly to the CATA, the materials will be placed in designated stockpile areas comprising a paved surface or plastic sheeting to provide a separation layer between potentially contaminated soils and surface soils. Stockpiles will be covered to mitigate generation of dust or impacted surface water runoff.

11) Excavations will be maintained in accordance with SafeWork NSW (March 2000) Excavation Work, Code of Practice.

7.1.1.1 Validation of UST Pits and Petroleum Infrastructure Excavations

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

Validation samples will be collected in accordance with the EPA *Technical Note: Investigation of Service Station Sites*, and will include the following sampling requirements:

- UST Pit– minimum of two samples per tank, with samples collected from the each tank pit wall and floor, with samples recommended to be taken at or below the base of the tanks;
- UST Backfill Sands – minimum two samples;
- UST Pit water – minimum one sample;
- Dispensers – minimum one sample in backfill and one sample in natural soil;
- Fuel lines – minimum one sample every 5 lineal metres;
- Remote Fill Points – one sample per fill point (not expected to be required, as tanks observed on the site had direct fill points);

- Above ground fuel storage (POL, and drum stores etc) – minimum one sample per 25m^2; and
- Below ground waste oil/ wastewater tank – minimum two samples per tank.

Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the excavations will be considered to have been validated and nominated for backfilling. The validation sampling methods are described in Section 8.0.

Additional groundwater assessments will be undertaken at the completion of the tank removal works to verify that groundwater within the area does not present an unacceptable risk to future site users. Groundwater assessment will include the collection of samples from the existing groundwater monitoring wells available at each of the underground tanks. Groundwater samples will be collected in accordance with the method described in Section 8.0.

Upon receipt of groundwater sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the groundwater will be considered to have been validated and no further remediation works will be required.

Table 5: Underground Storage Infrastructure Remediation Areas

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST 0367/B_UST_001 (Refer to Figure 4-G)	TRH detected in PB_MW05 between 1.8 to 1.9 m, and 5.8 to 6.0 m depth.	Vertical – no soil TRH impact at 0.2 m or 1.2 m depth. Reduced PID levels recorded from 2.2 to 7.0 m depth. Lateral – no soil impact in PB_MW03 located approximately 20m to the north east during sampling in 2011 (PB, 2014a).	Limited information on lateral delineation. Unknown Materials Stored	Single UST positively identified by GPR survey, est. 3.5m length, 0.5m depth to top of tank. Based on tank length, the estimated volume is 10 kL. The position of the UST during the Golder investigation is shown in the image below. 	All samples for: ■ TRH and TPH ■ BTEXN ■ Lead Selected samples for ■ Asbestos – if observed ■ VOC / SVOCs – approx. 25% samples.	Commercial / Industrial

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST – Waste oil 3767S_UST_003 (Refer to Figure 004-D)	No impacts reported in soil in the Earthtech (2006) investigation locations completed in the vicinity of the UST.	A single in-ground concrete UST and associated in ground concrete triple interceptor trap (TIT). UST was identified adjacent to north eastern corner of Building 17.	An in ground concrete UST and associated TIT was identified during the Golder inspection (November 2014) on the north eastern corner of building 17.	The Golder 2014 inspection identified a UST and TIT at the north eastern corner of Building 16 (refer to image below). This has been inferred as UST_003. 	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed ■ PFAS – approx. 25% samples	Commercial / Industrial

UST – Waste oil 3767S_UST_004, and associated infrastructure (Refer to Figure 004-C)	No impacts reported in soil in the Earthtech (2006) investigation locations completed in the vicinity of the UST.	A single in-ground concrete UST, an associated in-ground concrete TIT and an above ground pump and coalescing plate oil/water separator were observed on the south eastern corner of building 16. An in ground vehicle maintenance trench as observed within building 16.		The Golder 2014 inspection identified a UST and TIT at the north eastern corner of Building 16 (refer to image below). The Golder 2014 inspection identified a drain connecting the Building 16 workshop with the waste oil tank and an inspection trench was observed within Building 16 (refer to images below).  	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed	Commercial / Industrial

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST – Waste oil UST_009 Additional UST (Refer to Figure 004-D)	No data currently available on soil and groundwater conditions surrounding the tank.	A single in-ground concrete UST, an associated in-ground concrete TIT were observed in an open grass area approximately 15m east of Building 18.	No data currently available on soil and groundwater conditions surrounding the tank.	The Golder 2014 inspection identified a UST and TIT approximately 15 east of Building 18 (refer to image below). This has been referred to as UST_009. 	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed ■ PFAS – approx. 25% samples	Commercial / Industrial
UST 3767S_UST_006 (Refer to Figure 004-E)	No impacts reported in soil in the PB (2014a) investigation locations completed in the vicinity of	Two in-ground concrete USTs are located on the western side of Building 358.	Unknown Material Stored The associated oil storage area	The Golder 2014 inspection identified the two USTs (refer to image below).	All samples for: ■ TRH and TPH ■ BTEXN	Commercial / Industrial

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
	the UST (PB_MW06 and PB_MW07).		was not observed during Golder inspections (November 2014).		■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed ■ PFAS – approx. 25% samples	
Interceptor Pit SWSS0285 (Refer to Figure 004-B)	No impacts reported in soil in the PB (2014a) investigation locations completed in the vicinity of the UST (PB_MW19 and MW076).	An in-ground concrete TIT is located on the western side of Building 20.	The Golder GPR investigation did not identify a UST in the vicinity of Building 20. An in-ground concrete TIT was identified during the Golder inspection	The Golder 2014 inspection identified a TIT west of Building 20 (refer to image below).	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs	Commercial / Industrial

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
			(November 2014). Unknown Material Stored		Selected samples for ■ Asbestos – if observed ■ PFAS – approx. 25% samples	
UST – Diesel UST 44467 (Refer to Figure 004-A)	Hydrocarbon impacts were not identified in soil in the immediate vicinity of the tank and fuel infrastructure. Hydrocarbons were detected in soil bore SW0207 completed approximatel	A single UST and pipe work associated with the adjacent bowser was confirmed during the GPR investigation. Based on the tank length, the tank volume is estimated at 25 kL.	Limited information on lateral delineation and limited information on soil concentrations in the immediate vicinity of the infrastructure. Low level hydrocarbon impacts in groundwater	The image below shows the area during the Golder 2014 inspection. 	All samples for: ■ TRH and TPH ■ BTEXN ■ PAHs ■ Phenols Selected samples for ■ Asbestos – if observed	Commercial / Industrial

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
	y 15 m south of the bowsers. These impacts are discussed further under "Vehicle Storage" below.		suggest releases may have occurred, however the concentrations do not suggest releases are significant.			
UST – Waste Oil UST_005 (Refer to Figure 004-F)	Hydrocarbon impacts were not identified in soil in the immediate vicinity of fuel infrastructure. Low level hydrocarbons were detected in soil bore SB097 completed approximately 15 m north west of the USTs.	Four in-ground concrete USTs, an associated in-ground concrete TIT and an above ground pump and coalescing plate oil/water separator were observed on the western side of Building 192.	Limited information on soil concentrations in the immediate vicinity of the infrastructure.	The image below shows the area during the Golder 2014 inspection. 	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed	Commercial / Industrial

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
					■ PFAS – approx. 25% samples	
UST – Waste Oil 03767_UST_010 (Refer to Figure 004-A)	Hydrocarbon impacts were not identified in soil in the immediate vicinity of fuel infrastructure.	A singe in-ground concrete UST, with several associated in-ground concrete separator pits were observed on the western side of vehicle wash down bays located at the northern end of the PRA yard.	Limited information on soil concentrations in the immediate vicinity of the infrastructure.	The image below shows the area during the Golder 2014 inspection. 	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed ■ PFAS – approx. 25% samples	Commercial / Industrial
USTs – Diesel	Low level TRH detected in groundwater	Unknown	Unknown if infrastructure is present.	D&M (1996) identified two disused 10 KL diesel USTs associated with former PRA yard.	All samples for:	Commercial / Industrial

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
UST-0367S_UST_008. Former PRA Yard. (Refer to Figure 004-J)	by PB (2014). A GPR survey did not identify the USTs, and intrusive investigations undertaken in the vicinity of the Former PRA Yard did not identify significant hydrocarbon contamination in soil (Golder, 2015).			The USTs were not located during CMPS&F (1998) GPR investigation and HLA (2005) reported the USTs as decommissioned, however, provided no supporting evidence. The former PRA yard is evident in the 1965, 1970 and 1978 aerial photographs, then appears in its current location in the 1989 aerial photograph. The former PRA yard was located to the west of Building 135, and appears to have occupied the area where Building 10 is currently positioned. Activities are inferred to be similar to the current PRA yard activities, and would have included heavy vehicle and plant storage and maintenance. A GPR survey of the area did not identify the USTs, and intrusive investigations undertaken in the vicinity of the Former PRA Yard did not identify significant hydrocarbon contamination in soil (Golder, 2015). The Contractor is to be aware of the potential for USTs to be present in the area, and a protocol for dealing with the discovery and remediation of previously unidentified USTs (and associated pipework) is to be included in the Contractors Environmental Management Plan. The Contractor is to provide support as required to the Environmental Consultant in the subsequent assessment of the area to determine if an	■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs Selected samples for ■ Asbestos – if observed ■ PFAS – approx. 25% samples	

ID	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
				unidentified UST is present. It is expected that the Environmental Consultant will completed additional test pitting and GPR investigations at the completion of the nominated demolition works.		

7.1.2 Hot Spot Remediation

The location and nature of the identified contamination hotspots requiring direct remediation are summarised in Table 6 and are shown on Figure 3 (Appendix A). The hot spots of soil contamination will be excavated and the subsequent excavation validated. The following is to be implemented at each location:

1) Impacted soils will be excavated and excavation works will be guided by the Environmental Consultant and excavated materials will be visually inspected and head space screened in the field with a portable photo-ionisation detector (PID) for the presence of volatile petroleum hydrocarbon contamination and or an x-ray fluorescence (XRF) detector for the heavy metal concentrations.

2) Excavations will be extended until field observations (visual inspection and PID / XRF readings) indicate that contaminated soil above the adopted site remediation criteria (refer Appendix C) is likely to have been removed.

3) The depth and extent of excavations will be continued until validated by the Environmental Consultant or until practicable limits of excavation are reached. The practicable limit of excavation will be evaluated by consideration of:

    a. Geotechnical constraints associated with excavation safety and excavation stabilisation requirements (e.g. benching, shoring);

    b. Geotechnical constraints associated with potential effects on nearby infrastructure; and

    c. Structural constraints if the excavation extends to close proximity of roadways/footpaths, buildings, below ground services/conduits. This may be of particular concern if 'chasing out' contaminated materials extends towards adjoining buildings.

4) Excavated soils will be transported to a contamination assessment and treatment area (CATA), where soils will be stockpiled to enable classification (refer to Section 7.2).

5) Soils evaluated as being impacted with hydrocarbons and /or soils reporting concentrations of hydrocarbons above the remediation validation criteria (refer to Appendix C) will be treated onsite through bioremediation (refer to Section 7.2.4).

6) Soil evaluated as being impacted with lead will be nominated for offsite disposal at an appropriately licensed waste facility. As contingency, and if technically feasible the impacted soils could be treated and contained onsite within either fixation or encapsulation. Should onsite treatment of lead impacted soils be considered further, a detail assessment of the treatment method will need to be undertaken and the preferred method developed in consultation with the Site Auditor.

7) If excavated materials can-not be carted directly to the CATA for temporary stockpiling or directly offsite for disposal, the materials will be placed in designated stockpile areas comprising a paved surface or plastic sheeting to provide a separation layer between potentially contaminated soils and surface soils. Stockpiles will be covered to mitigate generation of dust or impacted surface water runoff.

8) Excavations will be maintained in accordance with SafeWork NSW (March 2000) Excavation Work, Code of Practice.

7.1.2.1 Validation of Hotspot Excavations

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

Validation of the resulting excavation will be undertaken as follows:

- Validation soil sampling of the base of the excavations will be undertaken at a minimum of two samples and on a 10 m by 10 m grid with additional targeted sampling in areas of known or potential environmental concern for larger excavations;
- Validation soil samples from the walls of excavations will be applied to each depth unit within each excavation with a minimum of one validation sample per exposed face or per 10 m length of exposed face for every one metre depth of each depth unit will be collected.
- Validation soil samples will be submitted for laboratory analysis for contaminants identified as exceeding the relevant criteria during the assessment phase (i.e. those contaminants triggering the remediation) and those contaminants identified as being of concern through site observation and/or site history review.

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

Where validation samples record results in excess of the adopted remediation criteria (refer to Section 6.0 and Appendix C), further excavation of the material will be undertaken followed by collection of additional validation samples, as described above. The extent of further excavations will be evaluated by the Environmental Consultant and presented on a plan defining the excavation extents by co-ordinates and depth. The excavation validation sampling methods are described in Section 8.0.

Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Appendix C), the excavations will certified as validated and nominated for backfilling.

Additional groundwater assessments will be undertaken to at the completion of hotspot excavation works to verify that groundwater within the area does not present an unacceptable risk to future site users. Groundwater assessment will include the collection of samples from the existing groundwater monitoring wells available at each of the hot spot locations. Groundwater samples will be collected in accordance with the method described in Section 8.0.

Upon receipt of groundwater sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the groundwater will be considered to have been validated and no further remediation works will be required.

Where assessment, remediation and validation determine that contamination is likely to be extending off-site, it will be necessary to discuss implications with the Principal, the Contract Administrator, the Auditor and potentially the EPA.

Table 6: Hot Spot Remediation Areas

Location / Source	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
Grit Blast Facility, located within Bridging Yard. (Refer to Figure 004-I)	Lead in samples SS01 (2,430 mg/kg), SS02 (3,390 mg/kg) and SS04 (4,560 mg/kg) which exceeded the HILs for commercial / industrial land use (1,500 mg/kg).	Vertical – no lead impacts at 0.6m depth. Lateral – impacts have been delineated laterally		Impacts associated with former grit blast facility. Impacts appear to be associated with past practice of grit blasting in semi confined area, using copper slag as grit.	All samples for: ■ Heavy metals / metalloids	Commercial / Industrial
Hotspot within Anthropogenic Fill (Confirmed) Dust Bowl – Northern Portion – buried waste and former burning ground. (Refer to Figure 004-H)	TRH detected in SW0195-TP067 at 1.7m depth (2006 mg/kg). Asbestos fragments reported in SW0195-TP069 at 0.5m depth. Impacts are associated with waste fill materials, and former burning ground.	Vertical – no TRH impacts at 1.0m depth and 1.8m depth. Lateral – no TRH or asbestos impact in surrounding locations completed within 20 to 40 m. Estimated area of TRH impact: 500 – 1000 m^2. Impacts are within wider area of waste fill materials with waste reported up to 1.8m depth.	Impacts are within a wider area of waste materials and pockets of unidentified impact may be present in the remaining waste materials.	Impacts appear to be associated with anthropogenic fill, and past practice of burning trees and vegetation waste at the northern end of the dust bowl area. TRH impacts were described as tar-like substance combined with timber mulch. TRH concentrations exceed 2.5 times the NEPM Management Limits. TRH and xylene exceed 2.5 times ESLs.	All samples for: ■ TRH and TPH ■ BTEXN ■ Heavy metals / metalloids ■ VOCs ■ SVOCs ■ Asbestos ■ PFAS	Open Space / Recreational

Location / Source	Reported Impacts	Delineation	Uncertainties	Discussion	Validation Sample Analytical Schedule	End Use Criteria to be applied
				Asbestos fragments will require management during remediation. Estimated area of hot spot is 1340m^2.		

7.1.3 Stockpiles with Asbestos in Soils (Demolition Wastes)

The previous investigations on the site have identified areas where stockpiles of asbestos impacted soils and / or demolition wastes have been identified. An overview of the locations of the identified stockpiles are shown on Figure 3 and detailed locations of the stockpiles are shown on Figures 004-K, 004-L, and 004-M (Appendix A).

The AMP (Golder 2016a) provides a detailed assessment the stockpiled materials. The AMP also includes detailed descriptions on the preferred approaches to the remediation and /or management of asbestos in soils at each of these areas. Subsequently, reference should be made to AMP for the preferred approaches to the remediation and or management of the stockpiles containing asbestos impacted soils and / or demolitions wastes. To avoid duplication, the actions associated with the remediation of asbestos in soils have been excluded from this RAP.

7.1.4 Anthropogenic Fill (Wastes)

The previous investigations on the site have identified areas where foreign materials (wastes) have been buried (referred to as Anthropogenic Fill or Tip sites). An overview of the location of the identified tip sites are shown on Figure 3 and detailed locations are presented on Figures 006-A to 006-I (Appendix A). It is understood that materials within the tip sites are considered geotechnically unsuitable and rectification works are required for tip sites located within the foot print of the proposed development (i.e. outside of the proposed conservation zone). The geotechnical rectification activities are detailed in the Earth works specification (Golder, 2016b).

These areas have been the subject of previous investigations, and the majority of the materials sampled reported chemical concentrations below the adopted investigation levels, and therefore have not been nominated as areas requiring specific remediation. However, there is potential that previously unidentified contaminated materials are present within the identified tip sites, subsequently these have been nominated as ‘high risk areas’. Should these be encountered the unexpected finds protocol should be implemented (refer to Section 10.4).

There is also potential that the materials included in the anthropogenic fill areas include aesthetic concerns. Within the proposed commercial / industrial land use areas of the site (i.e. outside of the proposed conservation area) the aesthetic issues do not form a driver for remediation, nor would they necessitate the need to validate these areas of the site. However, for recreational open space land use aesthetic issues must be considered.

There are four anthropogenic fill areas within (or partly within) the proposed conservation zone (refer to Figure 006-B, 006-D, 006-G and 006-H, and based on the inspections of these areas during the previous investigations (Golder, 2015a and PB, 2014a) the areas in their current form do not present potential aesthetic concerns as the deleterious materials are suitably buried. Subsequently in their current form additional remediation works are not warranted within these areas as it is assumed the rehabilitation of these areas will not require to disturbance of these areas and appropriate cover will be maintained following the rehabilitation of the area.

If a previously unidentified tip site is encountered and there is a requirement for the materials to be excavated, and / or if adverse conditions are observed within a known tip site, then an assessment and validation process appropriate for the volume and character of the materials observed will be implemented. The implementation of an assessment and validation process will be undertaken in consultation with the Site Auditor (refer to Section 7.1.4.1).

The adverse conditions which may warrant additional assessment and validation include;

- highly malodours soils or seepage water (e.g. strong residual petroleum odours);
- hydrocarbon sheen on surface water;
- discoloured chemical deposits or soil staining with chemical waste other than of a minor nature;
- large monolithic deposits of materials (e.g. gypsum as powder, or plaster board);

- presence of putrescible refuse including material that may generate hazardous levels of ground gases (e.g. methane) such as large quantities of green waste or timber waste; and
- presence of objects which may indicate the presence of chemical contamination, such as drums, tanks or other such storage items.

To assist in this consideration, observations related to aesthetics including discolouration, odour and the presence of waste will be shown on the GIS Interface. Where warranted, such observations will also be supported by appropriate analytical testing. Observations will be made in accordance with the ranking shown in

Table 7: Ranking for Aesthetic Issues in Soil

Visible Contamination		Odourous Soil	
Rank	**Description**	**Rank**	**Description**
0	No visible evidence of contamination	A	No odour
1	Slight evidence of visual contamination (trace quantities)	B	Slightly offensive odour
2	Visible contamination (more than trace quantities)	C	Moderately offensive odour
3	Obviously contaminated (significant colour staining or sheen)	D	Strongly offensive odour

The ASC NEPM (NEPC, 2013) notes that geotechnical issues should be considered separately to contamination issues. It is expected that the geotechnical preparation of the site will require the placing engineering fill materials to raise the site to the proposed finished level. The geotechnical verification that an area has achieved the required geotechnical characteristics to allow filling, is also considered to provide sufficient evidence that the site area does not include significant volumes of anthropogenic fill (waste). Records of geotechnical testing and any improvement activities will be included within the Validation Report, and presented to the Site Auditor for review.

7.1.4.1 Assessment and/ or Validation of Anthropogenic Fill Excavations

<u>If adverse conditions, as described above are encountered within the anthropogenic tip sites, the following assessment and validation process will be implemented. The implementation of the following will be undertaken in consultation with the Site Auditor.</u>

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

Assessment and /or validation of the resulting excavation will be undertaken as follows:

- Soil sampling of the base of the excavations will be undertaken at a minimum of two samples and on a 10 m by 10 m grid with additional targeted sampling in areas of known or potential environmental concern for larger excavations;
- Soil samples from the walls of excavations will be applied to each depth unit within each excavation with a minimum of one validation sample per exposed face or per 10 m length of exposed face for every one metre depth of each depth unit will be collected.
- Soil samples will be submitted for laboratory analysis for contaminants identified as being of concern through the above mentioned site observations. These will generally be the following, however, the specific contaminants of interest will be refined in consultation with the Site Auditor;
  - TRH and TPH;
  - BTEXN;

  - Heavy metals / metalloids (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
  - Speciated PAHs;
  - Speciated phenols;
  - VOCs;
  - SVOCs;
  - PFAS;
  - OPPs / OCPs;
  - PCBs; and
  - Formaldehyde.
- The excavations will require an inspection by an occupational hygienist or competent person confirming no visible asbestos is remaining in place.
- Where validation samples record results in excess of the adopted remediation criteria (refer to Section 6.0 and Appendix C), further excavation of the material will be undertaken followed by collection of additional validation samples, as described above. The extent of further excavations will be evaluated by the Environmental Consultant and presented on a plan defining the excavation extents by co-ordinates and depth. The excavation validation sampling methods are described in Section 8.0.
- Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria as appropriate for the area of the site (refer to Section 6.0 to Appendix C), the excavations will be considered to have been validated and nominated for backfilling.
- Additional groundwater assessments will be undertaken at the completion of excavation works to verify that groundwater within the area does not present an unacceptable risk to future site users. Groundwater assessment will include the collection of samples from the existing groundwater monitoring wells available at each of the locations. If groundwater wells are not present, additional monitoring wells will be installed at the completion of the excavation works. Groundwater samples will be collected in accordance with the method described in Section 8.0.
- Upon receipt of groundwater sample results confirming that concentrations of residual contamination are below the adopted criteria as appropriate for the area of the site (refer to Section 6.0 and Appendix C), the groundwater will be considered to have been as validated and no further remediation works will be required.

7.2 Soil Classification and Treatment

As various small portions of the site are impacted it is proposed that one (or several) Contamination Assessment and Treatment Area (CATA) be established. The CATA will be capable of receiving, assessing, and subsequently treating impacted soils. This would include materials received from the fuel infrastructure removal excavations, the anthropogenic fill areas, the stockpiled demolition waste areas, hot spot areas and unexpected finds areas etc. The processes undertaken at the CATA will include:

- Stockpiling for initial materials classification (refer to Section 7.2.1);
- Sorting based on initial assessments;
- Treatment including:
  - Spreading, hand picking, and potentially screening for asbestos impacted soils (refer to AMP, Golder, 2016a);

  - Bio-piling or landfarming for hydrocarbon impacted soils (refer to Section 7.2.4); and
  - Fixation or encapsulation for lead impacted soils (if feasible, and if considered further details of the proposed method will be presented under a separate cover to this RAP)
- Dispatching materials classified for offsite disposal (refer to Section 7.2.6) or onsite isolation (refer to Section 7.2.5)

The material processed through the CATA can then be used on the site subject to being validated for onsite reuse. It is expected that the CATA will require an area of approximately 5000 m^2, and the nominated position of CATA are indicated on Figure 2.

7.2.1 Materials Tracking

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

- establish and maintain a nomenclature system for identification of all source and destination areas for soil both on and off the Site. This includes remediation excavations, stockpiles, soils for treatment or disposal (including final destination) and offsite sources of material;
- use appropriate signage to identify the soil class of the material (as defined by this RAP) and area number for each excavation prior to soil movement using the project documentation or in consultation with the Contract Administrator, prior to work being undertaken;
- complete a 'Record of Soil Movement' sheet identifying the source area number, class, volume and destination area of each load of material moved on or off-site;
- place the soil in an approved location for the material based on its soil class;
- maintain the location of the soil without mixing with other soil classes; and
- educate all operators in the requirements of the system.

7.2.2 Temporary Stockpiling

Materials delivered to the CATA will be stockpiled for classification, validation, and assessment for potential re-use and recycling.

7.2.2.1 Stockpile Storage Locations

The temporary stockpiling area will be defined within the CATA area with clear demarcation distinguishing the temporary stockpiling areas to other treatment areas.

7.2.2.2 Stockpile Surface Preparation

Prior to placement of a stockpile, the surface of any stockpile area will be prepared by:

- Establishing stormwater diversion around the stockpile areas as required by the CEMP;
- Establishing a leachate collection system for the stockpile areas as required by the CEMP.

Each stockpile must have a unique identifier and appropriate signage as part of the Materials Tracking Plan.

7.2.2.3 Stockpile Management

The stockpiles must be managed in accordance with the requirements of the approved CEMP and Materials Tracking Plan such that there is no unacceptable off-site impact as a result of stockpiling. As a minimum, the following will be implemented:

- Controls applied to minimise the generation of dust, unacceptable odours or vapours;
- Record the movement of all material into and out of the any stockpiles in accordance with the requirements of the Materials Tracking Plan;

- Manage all stormwater in the vicinity of any stockpiles to minimise the volume of water coming into contact with the stockpiles;
- Line all stockpiles suspected as Class 4 material (refer to Section 7.2.3) at the base and cover them with plastic sheeting or other approved material to minimise contamination of surface soils and leachate generation and dust generation;
- Manage and maintain stockpiles of different material types separately during the classification process;
- Manage runoff from any stockpiles in accordance with the CEMP; and
- Remove all stockpiled material to the satisfaction of the Superintendent.

7.2.2.4 Stockpile Classification

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

- Classification sampling will be undertaken by the Environmental Consultant;
- All stockpiles must be classified. Stockpiles of general fill may be classified visually based on their waste content and observations. All other stockpiles will be classified based on classification testing, with samples scheduled for laboratory analysis of the contaminants of concern commensurate with the source of the materials;
- Stockpiles must generally not be less than 200 m^3 in volume and not greater than 2,500 m^3 in volume. It is recognised that stockpiles from small excavation sources will be smaller than this;
- Classification testing will be undertaken by the Environmental Consultant, and classification samples will be collected from the stockpiles materials at the following sampling frequency:
  - One test per 25 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 2500m^3, the sampling frequency of one test per 250m^3 will be adopted).
  - Classification samples will be collected in accordance with the method described in Section 8.0.
- Laboratory analytical results will be compared to the adopted screening criteria for suitability for reuse or off-site disposal as applicable (refer to Section 6.0 and Appendix C).

7.2.3 Materials Classification

The following materials classification approach has been developed within the framework of the assessment, and remediation strategy adopted for the site, with the aim of providing the necessary criteria to maximise the potential reuse of materials on the site. However, site materials may also be constrained for reuse by their geotechnical properties and reference should be made to the Earthworks Specification (Golder, 2016b).

The geochemical classification of the materials comprises four general classes of materials as follows:

- **Class 1 – this material can be re-used on-site or off-site without restriction.**

  This class includes materials which satisfy the definition of VENM provided in the *Protection of Environment Operations Act 1997* (POEO Act), which is:

  "Natural material (such as clay, gravel, sand, soil or rock fines); that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues as a result of industrial, commercial, mining or agricultural activities; and that does not contain any sulfidic ores or soils or any other waste; and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice."

- **Class 2 – this material can be re-used on-site without restriction (i.e. within open space and/or commercial / industrial areas), but may require additional assessment or management if taken off-site.**

  This class includes materials with chemical concentrations below the adopted Tier 1 criteria (refer to Appendix C), however, due to the origin of the material (i.e. reworked natural fill materials) or the proximity of the materials to a historical site activity which has potentially caused contamination (i.e. fuel storage) do not satisfy the requirement of Class 1 materials. This would include materials which, following additional assessment, are likely to meet the NSW EPA classification of Excavated Natural Materials (ENM). However, the application of the NSW EPA ENM classification process is only applicable to materials scheduled to be taken offsite, materials proposed for re-used onsite do not need to satisfy the ENM classification process.

- **Class 3 – this material can be re-used onsite without restriction in commercial / industrial areas.**

  This class includes materials with chemical concentrations below the adopted Tier 1 commercial / industrial criteria (refer to Section 6.0 and Appendix C), however reported chemical concentrations which exceed Tier 1 open space criteria (refer to Section 6.0 and Appendix C). It could require management or remediation, if re-used on-site within open space areas (i.e. within the riparian zone) and would also require management or further assessment if taken off-site.

- **Class 4 – this material is likely to require treatment or direct management before it can be re-used on-site or is required to be taken off-site.**

  No criteria are needed for this class of soil as it is defined as soil that exceeds Class 3 criteria and will require treatment prior to reuse on site, or warrants consideration of potential offsite disposal. Refer to Section 6.0 and Appendix C for adopted assessment criteria.

7.2.4 Bioremediation / Landfarming

Bioremediation will be undertaken at the CATA, and the treatment process will be completed in accordance with the EPA *Best Practice Note: Landfarming* (NSW EPA, 2014). In general the process will involve spreading the materials in a thin layer, and stimulating the aerobic microbial activity within the soils through aeration and/or addition of nutrients and moisture.

The treatment process will be determined on a batch process, taking into consideration the baseline condition of the soils being treated. The initial assessments will include characterisation of

- the contaminant mass;
- the moisture content;
- the nutrient levels;
- the geochemical parameters including temperature, pH, oxygen etc

The initial assessment will then be used to determine how often the materials require aeration and whether there is a requirement for additional nutrients. The progress of the treatment process will be assessed with consideration of rate of carbon dioxide production, and biodegradation rates. Treated materials will then be validated in accordance with the validation criteria presented in Appendix C.

7.2.4.1 Landfarm Surface Preparation

Prior to placement of materials within a landfarm, the proposed treatment area will be prepared by:

- Establishing stormwater diversion around the landfarm areas as required by the CEMP;
- Establishing a leachate collection system for the landfarm areas as required by the CEMP.

Each landfarm must have a unique identifier and appropriate signage as part of the Materials Tracking Plan.

7.2.4.2 Landfarm Management

The treatment process will be managed in accordance with the requirements of the approved CEMP and Materials Tracking Plan such that there is no unacceptable off-site impact as a result of treatment process. As a minimum, this will include t:

- Generally create landfarms which are not less than 250 m^3 in volume and not greater than 2,500 m^3 in volume, with materials generally placed < 0.3 thick.
- Manage all landfarms to minimise the generation of dust, unacceptable odours or release of volatile emissions, control leachate and stormwater;
- Record the movement of all material into and out of the any landfarm in accordance with the requirements of the Materials Tracking Plan;
- Manage all stormwater in the vicinity of any landfarm to minimise the volume of water coming into contact with the stockpiles;
- Line all landfarms at the base and cover them with plastic sheeting or other approved material to minimise contamination of surface soils and leachate generation,
- Manage all volatile emissions using covers, structural enclosures, and abatement techniques to ensure emission present no health risks and achieve compliance with air quality standards;
- Manage and maintain landfarms of different material types separately during the classification process; and
- Manage leachate from any in accordance with the CEMP;

7.2.4.3 Landfarm Validation / Classification

Validation / Classification testing will be undertaken by the Environmental Consultant in accordance with the following:

- All landfarms must be validated;
- Classification / validation testing will be undertaken by the Environmental Consultant in accordance with validation sampling process presented in this RAP;
- Classification sampling will be collected from the land farm materials at the following sampling frequency:
  - One test per 25 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 2500m^3, the sampling frequency of one test per 250m^3 will be adopted).
- Classification samples will be collected in accordance with the method described in Section 8.0.
- Laboratory analytical results will be compared to the adopted screening criteria for suitability for reuse or off-site disposal as applicable (refer to Section 6.0 and Appendix C).

7.2.5 Consolidation / Isolation

The consolidation and isolation of asbestos impacted soils has been identified as a preferred approach for the management of asbestos impacted soils in the AMP (Golder, 2016a). However, an isolation strategy is only appropriate for contaminants which will not present a potential vapour risk to future site occupiers, and will not present a long term risk to offsite receptors through the migration of groundwater impacts.

As such, this may also be a feasible option for the management of the lead impacted soils, if it can be proven the materials will not present a long term risk to offsite receptors through the migration of groundwater impacts.

Where applied to the soils impacted with lead (or asbestos) the following conditions will need to be met:

- A nominally minimum cover of 0.5 m depth will be required, however, placement of materials at depths greater than 1.5 m is preferable to allow for the installation of future sub-surface utilities. Alternatively, the area is to be positioned in an area where the construction of future sub-surface utilities is excluded.
- In areas where the final design require less than 0.5 m of cover, the placement of a geo-textile barrier should be included to provide a warning of the presence of underlying soil contamination. The coverage should extent to 0.5 m beyond the internment area boundary, if practicable and parallel sheets to be fixed together to overlap by 0.2 m. Where applied the geo-textile barrier materials are to achieve the following criteria:
  - Water permeable
  - High Visibility
  - Rot proof and chemically inert; and
  - High tensile strength
- The capping materials should consist of fill materials proven to be free of contamination.

The final location of a containment area needs to be identified by the Head lessee (MIC) and the Principal's Representative (SIMTA). When considering the placement of an isolation area several key aspects need to be considered, and the proposed position will need to be nominated in consultation with the appointed Site Auditor. There is advantage in positioning an isolation area within an existing contaminated area where possible, however, this may not be feasible. Key considerations when positioning an isolation area include:

- Geotechnical suitability of the materials positioned beneath any proposed future structures, and reference should be made to the Earthworks Specification and / or any specific design requirements; and
- A position which will present a minimal impact to the proposed development and will minimise the potential for disturbance during the future operation of the site, such as beneath open space area, road ways or areas of permanent hardstand.

While the investigations completed across the site provide an indication of the potential volume of impacted materials, the final volume is not yet known. Furthermore, the detailed design of the proposed development is currently being developed. Therefore it is not yet possible to identify a suitable isolation area on the site. Planning for a consolidation and isolation location will need to also provide contingency for increased volumes, through either increasing the isolation area (if possible) or commencing off-site disposal.

As the final volume of materials requiring isolation is not yet known, a staged approach is proposed for the application of an isolation strategy across the site, with materials placed within a temporary stockpiling area (refer to Section 7.2.2) until an appropriate internment area can be established as part of the future development of the site.

7.2.5.1 Onsite Consolidation and Isolation Area Validation

The consolidation and isolation of impacted soils will require verification / validation. Therefore, the placement and capping materials will need to be validated or verified by the Environmental Consultant and presented to the Site Auditor within the RVR. The verification information will comprise:

- A description of the materials placed into the internment area, including details on the source of the materials, and pre-treatment completed and validation results of indicating the materials will not present

a potential vapour risk to future site occupiers, and will not present a long term risk to offsite receptors through the migration of groundwater impacts;

- Detailed survey of the internment area, including the surface levels and excavation extents prior to filling;
- Details of the filling process, including details of lifts, and any geotechnical improvement methods applied during the filling process;
- Survey of the site area following filling and installation of the final Separation Layer to confirm the thickness of soil (or the placement of geotextiles etc., if used);
- Information relating to the materials used in the Separation Layers such as the soil types, geotextile materials etc. (if required);
- Observation (including photographic records) of the Separation Layer installation works;
- Liaison with the Auditor for inspection of the Separation Layer works;
- Compilation of an as-constructed plan of the site showing the locations, depths and materials of the Separation Layers installed at the site for inclusion within the LTEMP.

7.2.6 Off Site Disposal

Whilst this option does not satisfy the objective of waste avoidance and resource recovery it is an option which is technically feasible particularly in regards to contamination. The merits of this approach also need to be considered in relation to the cost benefits, and should be considered if significant contamination, which inhibits on-site treatment is encountered or where capping and isolation presents a significant imposition to the future development of the site.

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

7.2.6.1 Waste Transporter Requirements

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

7.2.6.2 Waste Tracking Requirements

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

Wastes that need to be tracked need to be characterised in accordance with the NSW EPA (DECCW, NSW, 2009) *Waste Classification Guidelines, Part 1: Classifying Waste*. The following characteristics of the waste must also be determined:

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

Waste classification sampling will be undertaken by the Environmental Consultant in accordance with Section 7.2.2, with samples scheduled for contaminants of interest commensurate to the source of the materials being considered for offsite disposal.

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

7.2.6.3 Waste Disposal Facilities

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

7.2.6.4 Waste Records

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

7.2.7 Reinstatement of CATA

Upon completion of the use of the CATA the area will be reinstated, which will include:

- Remove all remaining stockpiled material for reuse or disposal in accordance with this RAP;
- Installation of appropriate drainage, grading and other controls to leave the CATA footprint surfaces in a free-draining state; and
- The Environmental Consultant will then undertake all necessary inspections or validation testing of the CATA footprint and request any additional reinstatement work to be undertaken. The validation inspections and sampling will include the following:
  - Inspection by an occupational hygienist or competent person confirming no visible asbestos is remaining in place.
  - Validation sampling using the gravimetric approach, as described within the ASC NEPM (NEPC, 2013), where the soil is tested using a representative number of individual 10L samples. If the treated soils comprises heterogeneous materials, then each individual 10L sample will be considered representative of specific soil materials present within the treated area. Additional laboratory analysis, in accordance with *AS4964 – 2004* may also be required to validate the materials.
  - Validation sampling will be collected on a grid-based validation sampling approach in accordance with Table 2 of the Australian Standard AS4482.1-2005 (AS4482.1, 2005) which provides guidance on the minimum number of sampling points for site characterisation using a square grid.
  - Validation samples will be collected in accordance with the sampling methods described in Section 8.0.
  - Validation samples will be scheduled for analysis of:
    - TRH / TPH, BTEXN;
    - Heavy metals / metalloids (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
    - Speciated PAHs;
    - Speciated phenols;
    - VOCs;
    - SVOCs;
    - Asbestos;
    - PFAS;

  - OPPs / OCPs;
  - PCBs; and
  - Formaldehyde.
- Upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), the footprint will be considered to have been validated.

7.3 Data Gap Assessments

7.3.1 Assessment / Validation of Demolished Buildings and Site Features

The additional assessment at buildings suspected of housing PCBs, buildings suspected as having OCP impacted subgrade materials, or buildings which require or have potential to require remediation (such as POLs, or vehicle workshops including within the PRA yard). The areas requiring additional investigation have been nominated as 'investigation areas' and are shown on Figure 3 and detailed areas are shown in Figures 005A – 005I (Appendix A).

The areas will be assessed using the following general methods:

- Following the demolition of the nominated building, samples of subgrade materials and underlying soils will be collected by the Environmental Consultant. The building foot print area must be subject to the assessment testing, including the side cast spoil from underground utilities removed from the area;
- The sampling will be used to determine the class of materials (refer to Section 7.2.3) and to determine what, if any, remedial action (such as additional excavation and validation) is required; and
- If further remedial action is required, then the excavation will be considered a remediation excavation, and the remediation excavation and validation testing process will be repeated as necessary until the material in the base and walls of the excavation meets the relevant soil criteria (refer to Section 6.0 and Appendix C), the excavations will be considered to have been validated and nominated for backfilling.

The sampling densities for the building footprints will be in general accordance with the NSW EPA Sampling Design Guidelines (1995), with a minimum of 2 samples collected from buildings with small foot prints (i.e. <200 m^2).

Samples will be collected in accordance with the methods described in Section 8.0.

Assessment soil samples will be submitted for laboratory analysis for contaminants identified as exceeding the relevant criteria during the assessment phase (i.e. those contaminants triggering the remediation) and those contaminants identified as being of concern through site observation and/or site history review.

7.3.2 Underground Services

The Validation Plan – Principles (Golder, 2015c) presented an overarching approach to the remediation high risk underground infrastructure present on the site and this has been adopted for the proposed remediation activities.

High risk underground services represent a potential risk associated with related contamination to the proposed development. As such there is the requirement for the high risk underground services on site to be excavated and validated as part of the remediation works. However, some could remain, for example beneath retained buildings, or those extending into the proposed conservation zones (i.e. the riparian zone).

The potential contamination issues associated with buried service lines are as follows:

- Release of contamination from the fabric of the material used to construct the conduit such as asbestos water pipes, hydrocarbons or polychlorinated biphenyls (PCBs) from telecommunication or power cables;

- Release of contaminants carried by each conduit such as effluent from process or discharge lines. The potential risk generated by this pathway is particularly important from areas where vehicle maintenance activities were undertaken on the site;
- Movement of contamination from other contaminant sources along the generally more permeable backfill around the service;
- Contamination of the backfill used to fill the service trench, such as backfilling with broken redundant asbestos conduit; and
- General contamination risk associated with the area through which they traverse.

Given these risks, it is impractical to reduce the contamination uncertainty through investigation. Instead it is proposed that the risk be reduced through active remediation and validation by removal of the redundant services. Therefore, the following underground utilities strategy is proposed:

Proposed Utilities to Be Removed

Only high risk utilities will be excavated and validated as part of active remediation. High risk utilities include:

- Effluent (i.e. wash down water, waste oil, dangerous good storage drains, triple interceptor traps, grease traps etc)
- Stormwater from heavy vehicle parking areas and open dangerous good storage areas; and
- Utilities constructed of ACM and other identified hazardous materials.

All other utilities are considered to be low risk and will remain in the ground unless removed through other excavations or found to be a conduit for contamination movement.

Asbestos Utilities

Identified utilities and pits, including those identified through the demolition process as containing asbestos (or other hazardous materials) will be removed by licensed contractors.

Identification of Utilities

Identification and verification of utilities will be as follows:

- High risk utilities associated with high risk buildings (such as those involving vehicle maintenance, chemical or explosive storage, or containing high voltage electrical equipment etc) will be inspected (prior to demolition, and when de-energised) to identify the location of these high risk utilities. These will be mapped for the position and likely route to facilitate removal;
- All utilities identified shall be recorded by a unique nomenclature system including the construction material and diameter and their point of identification and possible route surveyed.
- High risk utilities identified at the site will be mapped on the site GIS Interactive Map, and this mapping could support the ongoing remediation and development process.

Removal and Validation of High Risk Utilities

High risk underground utilities will be made safe and capped underground (where nominated by the Environmental Consultant and endorsed by the accredited Site Auditor), or removed using the following method:

- The narrowest practical trench to remove the utility will be excavated;
- The soil from the surface to the top of the utility must be excavated and side cast adjacent to the trench.
- Any fluids or liquids contained within the utility will pumped off and disposed in accordance with the waste management plan and methodology;

- Pipes with ACM must be removed and disposed in accordance with the required procedures for handling and disposing of ACM by appropriate licenced contractors;
- As the length and direction of the ACM pipes are not known, the excavation will start excavation from a point where the ACM pipe is positively identified and will use a methodology that identifies the pipe direction to allow removal of the pipe in an efficient manner. Should pipe branches made of ACM be identified then these must be marked and excavated in a similar manner. Excavation must continue until known ACM pipe identified has been removed;
- Should the utility cross the Site boundary, the remaining pipe opening must be sealed with a minimum plug of 0.3 m^3 of concrete; and
- The location of remaining pipes at the Site boundary are to be recorded by survey.

7.3.2.1 Validation of Service Trenches

Utility Trench Validation

The removal of high risk utilities shall be validated as follows:

- For stormwater and effluent lines the proposed validation approach is one sample per 50 m length of trench, with samples collected from the base of the trench and analysed for contaminants of interest for the utility.
- For smaller trench lengths, a minimum rate will be one sample per trench less than 10 m and two samples for trenches between 10 and 50 m length;
- Validation samples will be collected from the base only;
- Where visual or olfactory evidence of contamination is observed in trenches, further samples shall also be collected from the base of the trench or at the location of the contamination observed;
- As a minimum, validation samples will be submitted for analysis for the potential contaminants identified;
- For pipes made of ACM, validation is proposed via confirmation from an occupational hygienist that the trench is free of visible asbestos.
- Additional remediation and validation works will occur if observations or testing indicate areas of contamination.
- Should a high risk utility, asbestos pipe or pipe made of other hazardous materials be entering or exiting the site at the site boundary, the backfill around the pipe will be sampled for record by the collection and analysis of one sample for the contaminants of interest for the pipe. The location and level of the pipe at the site boundary shall be surveyed and recorded.
- The utility removal process will documented through the GIS Interactive Map, the process for removal will include the following:
  - All utilities removed shall be recorded by a unique nomenclature system;
  - Details of each pipe shall be recorded including the construction material and diameter and their location surveyed for depth and location;
  - Utility removal will be observed so that intersecting utilities can be documented and identified for removal if required;
  - All identified utilities will be confirmed against the mapped utilities as having been removed.

Should contamination conditions be identified during the underground services excavation that require remediation, the remediation and resulting validation will be undertaken consistent with the process described for the remediation of the Hot Spots (refer to Section 7.1.2).

Classification and Reuse of Utility Trench Spoil

The risk profile for soil contamination in the fill or backfill associated with the underground utilities is considered to be similar to that of the general site fill. As such, unless the utility trench spoil contains indications of contamination such as asbestos, unacceptable waste, odour or discolouration or is suspected of being impacted by leakage from a utility, then the trench spoil will be reused to backfill the trench following utility removal, or reused as engineering fill following the required geotechnical treatment. No further classification testing is required.

7.3.3 Light Non Aqueous Phase Liquids

The previous investigations have determined that LNAPL is present below the eastern portion of the site in the vicinity of the former entrance to the SME. Based on the previous investigations the LNAPL is likely to be associated with diesel fuels and is sourced from the former DNSDC refuelling facility located on the SIMTA property. The source of the LNAPL is understood to be scheduled for remediation by Defence, however, the extent of offsite remediation actions is yet to be determined.

Further assessments are required as part of the remediation program to determine what management and or remediation actions are required to facilitate the development of the site in the areas overlying the LNAPL plume.

The additional assessments will be determined following a detailed review of the outcomes of the remediation works completed by Defence, including any risk assessments undertaken in conjunction with the proposed remediation actions and the outcome of any offsite remediation or assessment works completed by Defence.

Subsequent to the outcome of the review of the Defence remediation actions, further assessments of the risks associated with residual LNAPL impacts may be required, particularly in relation to the detailed design of this portion of the site. Prior to commencing any additional investigations a Sampling Analysis and Quality Plan (SAQP) should be prepared in consultation with the Auditor. The SAQP is to be prepared in accordance with the Data Quality Objectives (DQO) process, as described in the NSW EAP Contaminated Site Auditor Guidelines (2997) and provide detail on the proposed investigation scope and the investigation methods. The SAQP is to consider the most appropriate investigation methods to achieve the objectives of the investigation.

7.4 Verification of Imported Soils

The verification of imported soils required to backfill remediation excavations will be based on a review by the Environmental Consultant of the information provided by the Remediation Contractor. Imported fill will meet specified geotechnical parameters as well as demonstration of the classification of imported soil by:

- A review of site use, history and material properties of the source of the material in order to assess potential for the presence of contaminants;
- Depending on the outcome of the review, soil samples may need to be collected if it cannot be established that the materials satisfy the definition of VENM (refer to Section 7.2.3). If required, sampling will be collected from the imported fill at the following sampling frequency and results screened against the adopted criteria suitable to classify the materials as Class 1 or Class 2 materials (refer to Section 7.2.3):
  - One test per 25 m^3 for soils assessed for volumes less than 200 m^3; or
  - The use of the 95% UCL value for the data set, with a total number of samples not less than 10 and a minimum sampling frequency of 1 per 500m^3; and
  - Testing shall be for the analytes identified as potential contaminants of concern through the review of the site use, and history of the material source;
- An inspection of the material on arrival at the Site to ensure that the material is consistent with information provided by the Remediation Contractor.

It should be noted that natural soil intended for use as backfill may contain concentrations of contaminants above the adopted validation criteria. Any background concentrations of contaminants need to be less than the validation criteria (Refer to Section 6.0 and Appendix C), unless agreed with Environmental Consultant and the Auditor.

8.0 INVESTIGATION / VALIDATION METHODOLOGIES

The validation and investigation works will require the implementation of a range of field investigation methodologies. The following provides a description of the methodologies that will be implemented during the works.

8.1 Pre-site works / Surveying

The following works will be undertaken by the Environmental Consultant prior to the site works commencing:

- Site inductions, including attendance of the site inductions required by the principal contractor.
- Consultation with site stakeholders, as required.
- Initial remediation area survey using a Trimble GPS and pre-marking the proposed remediation area locations will be undertaken in consultation with the Principal Contractor. The Principal Contractor will be responsible for the identification and isolation of underground services within each remediation area.

8.2 Excavation Sampling

The following works will be undertaken for excavation sampling:

- Excavation walls and materials excavated from remediation areas shall be logged in detail including the description of fill materials, soil types and the presence of absence or indicators of contamination (such as staining, odour, unusual colours, or ACM) and photographed with a linear scale indicating depth.
- Field screening of collected samples utilising a photo ionisation detector (PID). The PID will be calibrated daily, in accordance with the manufactures instructions. PID samples will comprise of an approximately equal volume of soil, placed in individual a ‘zip lock’ plastic bags and will be allowed to equilibrate to ambient temperature before being screened. Water vapour filters will be used, and the presence of moisture in the sample bag noted during sampling.
- Samples will be collected directly from the bucket of the excavator. Soil samples from the walls of excavations will be applied to each depth unit within each excavation with a minimum of one validation sample per exposed face or per 10 m length of exposed face for every one metre depth of each depth unit will be collected.
- Where a change in geological profile, subjective impacts or PID field screening reports potential volatile organic compounds additional samples will be collected, if possible.
- Where required, asbestos samples will be collected in accordance with the ASC NEPM (2013) and Western Australian Department of Health (WA DOH) *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (WA DoH, 2009)*:
    - Where ACM or Asbestos Fines (FA) are suspected or present – collection of at least one wetted 10 L sample from each relevant stratum (or 1 per 1 m depth) for screening through a <= 7 mm sieve or spread out for inspection on a contrasting colour material. Identified ACM or FA fragments are to be collected and weighted (or submitted to the laboratory for weighting) to calculate asbestos soil concentrations.
    - Where Asbestos Fibres (AF) are suspected or present – collection of one wetted 500ml sample from each relevant stratum or 1 m depth for submission to the laboratory for analysis (may be completed with ACM / FA sampling)
- The sample jars will be placed in a cool box filled with ice and delivered to NATA registered laboratories under Chain of Custody (COC) procedures. If warranted, couriers will be arranged to collect samples at 3 pm on Monday to Thursday and at 2 pm on Friday to meet the short holding time of some analytes.
- Test pits will be backfilled upon completion with backfill material compacted using the bucket of the backhoe in layers not more than 300 mm thick. Excess spoil will be mounded over the test pit. The

backhoe will be used to track over the test pit mound to aid in compaction. Where possible, the upper turf layer will be repositioned over the completed test pit to enable rapid site regeneration. Where required, additional non-invasive grass seeds will be spread over the test pit mound to enable rapid site regeneration.

- Remediation excavations will be back filled upon receipt of validation sample results confirming that concentrations of residual contamination are below the adopted criteria (refer to Section 6.0 and Appendix C), and the excavations is be considered to have been validated.
- All excavations will be back filled in accordance with the Earthworks Specification (Golder, 2016a).

8.3 Stockpile / Landfarm Sampling

The following works will be undertaken for stockpile sampling:

- Stockpile materials excavated from remediation areas shall be logged in detail including the description of fill materials, soil types and the presence of absence of indicators of contamination (such as staining, odour, unusual colours, or ACM) and photographed with a linear scale indicating depth.
- Field screening of collected samples utilising a photo ionisation detector (PID). The PID will be calibrated daily, in accordance with the manufactures instructions. PID samples will comprise of an approximately equal volume of soil, placed in individual zip lock bags and will be allowed to equilibrate to ambient temperature before being screened. Water vapour filters will be used, and the presence of moisture in the sample bag noted during sampling.
- Where the Environmental Consultant has observed the excavation, transport and placement of the stockpile and is confident the materials within the stockpile are uniform, from a single source and the sampling is occurring immediately following placement. Samples will be collected directly from the stockpile, by hand excavation to 0.1 m into the stockpile;
- Where the Environmental Consultant has not observed the generation of the stockpile samples will be collected with an excavator, or by hand excavation into the middle of the stockpile.
- Where required, asbestos samples will be collected in accordance with the ASC NEPM (2013) and Western Australian Department of Health (WA DOH) *Guidelines for the Assessment, Remediation and Management of Asbestos Contaminated Sites in Western Australia (WA DoH, 2009)*:
  - Where ACM or Asbestos Fines (FA) are suspected or present – collection of at least one wetted 10 L sample from each relevant stratum (or 1 per 1 m depth) for screening through a <= 7 mm sieve or spread out for inspection on a contrasting colour material. Identified ACM or FA fragments are to be collected and weighted (or submitted to the laboratory for weighting) to calculate asbestos soil concentrations.
  - Where Asbestos Fibres (AF) are suspected or present – collection of one wetted 500ml sample from each relevant stratum or 1 m depth for submission to the laboratory for analysis (may be completed with ACM / FA sampling)
- The sample jars will be placed in a cool box filled with ice and delivered to NATA registered laboratories under Chain of Custody (COC) procedures. If warranted, couriers will be arranged to collect samples at 3 pm on Monday to Thursday and at 2 pm on Friday to meet the short holding time of some analytes.

8.4 Groundwater Gauging and Groundwater Sampling

Each groundwater well will be initially gauged using an interface probe to record the thickness of Non aqueous phase liquids (NAPL), if present, static groundwater level and depth to the base of the well. Detection of NAPL in the well shall be confirmed using a bailer and a product sample will be obtained, if present. However, no groundwater sample will be obtained from wells containing NAPL.

Groundwater sampling will be undertaken general in accordance with the following method:

- Collection of groundwater samples using a low-flow micropurge or peristaltic groundwater pump to reduce disturbance to the water column, and therefore minimise changes to chemical concentrations due to oxidation or volatilisation.
- The pump intake will be suspended at a depth approximately 1.0 m below the top of the screened interval shown on the bore logs (or 1.0 m to 1.5 m below the water level if the screen extended into the unsaturated zone). A new pump bladder and new PVC air and water hoses will be used for each bore.
- Where possible, the groundwater will be pumped at a rate between 0.1 L/min to 0.5 L/min selected to prevent or minimise draw down of the standing water level (aiming for maximum drawdown of 0.1 m). The wells will then be pumped at this rate with the aim that the purge volume is greater than the draw down volume. Where continuous draw down is observed at around 0.1 L/min, then the groundwater level will be drawn down to just above the top of the screened interval, the bore allowed to recharge and then sampled at 0.1 L/min.
- The groundwater field parameters, pH, redox potential (using Ag/AgCl electrode), dissolved oxygen, temperature and conductivity will be measured using a calibrated multi parameter meter and a flow-through cell, which minimizes contact of groundwater with air during measurement. Descriptions of the water including, clarity, presence / absence of odour, and unusual colours will be recorded during sampling.
- Groundwater samples will be collected when the field parameters stabilised within acceptable limits (i.e. within 10% of previous two readings) and the water is not turbid. Sample bottles will be filled with bottles for the most volatile compounds filled first. Sample bottles will be filled, by minimising the agitation of the sample, and completely filling the bottles (i.e. no head space). Samples will be filtered in the field using a 45 micron filter for dissolved metals analysis. Should the sample remain turbid following purging, filtering of organic compound bottles will also be considered;
- Reusable sampling equipment and the interface probe will be decontaminated between locations by washing and brushing in a solution of phosphate free detergent solution followed by a rinse in tap water and a rinse in deionised water. The process will be repeated if visual or olfactory evidence of contamination remained.

Waste water from the purge and decontamination process will be collected, and then transferred to storage containers for temporary storage prior to being collected and transported by a licensed contractor to a licensed waste disposal facility. The Principal Contractor will be responsible for disposal of wastes generated during sampling.

8.4.1 Groundwater Sample Collection and Storage

Groundwater samples will be collected in bottles supplied by the laboratories containing the relevant preservatives. The sample bottles are to be supplied pre-spiked by the laboratories with preservatives as shown in

Table 8. The groundwater samples will be pumped directly to the sample bottles, minimising the agitation of the sample and completely filling the bottles. Samples for dissolved metals, will be vacuum filtered in the field through a new disposable 0.45 µm filter unit.

Table 8: Sample Volumes and Preservatives

Test Parameter/s	Bottles *(and Preservation)*
pH, total dissolved solids, cations, anions, alkalinity, sulphate, chloride, nitrate, nitrite, TKN, reactive phosphorus, fluoride	2 x 1,000 mL plastic (*none*)
Dissolved heavy metals (field filtered through 0.45 µm filter)	1 x 60 mL plastic (*nitric acid*)
Ammonia, total nitrogen, total phosphorus	1 x 125 mL plastic (*sulphuric acid*)
VOCs (inc. BTEX) / TRH(volatile)	2 x 40 mL amber vials (*hydrochloric acid*)
TRH(semi volatile), SVOC, PAHs (ultra-trace)	1 x 1000 mL amber glass (*none*)

Test Parameter/s	Bottles *(and Preservation)*
Ferrous Iron	60 mL plastic bottle *(hydrochloric acid)*
PFAS	60 mL plastic Bottle

The sample bottles will be placed in a cool box filled with ice and delivered to NATA registered laboratories under COC procedures. If warranted, couriers will be arranged to collect samples at 3 pm on Monday to Thursday and at 2 pm on Friday to meet the short holding time of some analytes.

The samples will be recorded and transported via the use of chain of custodies and stored in eskies with ice. The laboratory samples will be analysed using NATA accredited laboratories.

8.5 Nomenclature

All samples collected should will unique identification that facilitates tracking and cross-referencing of sample information. This will also include QA/QC samples that are uniquely numbered. Further details are provided in Appendix B.

8.6 Laboratory Analysis

Sample analysis will generally be completed using NATA registered methods (where available) and in accordance with Schedule B(3) of the ASC NEPM 2013. Analytical methods and limits of reporting are presented in Appendix D.

8.7 Quality Assurance and Quality Control

It is important that the data collected in the proposed site remediation validation program is of a quality suitable to meet the objectives of the validation works. Possible sources of error in the collection of soil and soil vapour data can arise in the collection, handling and analysis of samples. An effective field QA/QC program aims to minimise these sources of error and increase the reliability of the results. Details of the QA/QC program are provided in Appendix B.

9.0 ROLES AND RESPONSIBILITIES

9.1.1 General

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

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

To clarify, in respect of this RAP the abovementioned term "remediation" includes the implementation of a management approach where appropriate. The responsible person for the overall implementation of the RAP is the Head Lessee and/or their nominated representative or delegate. The Principal is considered to be the Head lessee (MIC) and it has been assumed the responsibilities will be delegated the Principal's Representative (SIMTA), herein referred to as the Superintendent.

9.1.2 Superintendent

The Superintendent's responsibilities include contract administration, quality control and compliance. The Superintendent's responsibilities also include liaison with stakeholders, including the Environmental Consultant, the Accredited Environmental Site Auditor and the EPA.

9.1.3 Environmental Consultant

The Environmental Consultant's responsibilities include:

- undertaking additional soil and groundwater assessment as required to validate the completed site remedial/management activities;
- supporting the Remediation Works, including by:
    a) providing on-site technical advice and management;
    b) undertaking investigation programs in areas previously inaccessible;
    c) undertaking validation testing and reporting;
    d) undertaking validation of excavations;
    e) stockpile validation and classification;
    f) site observations with respect to materials associated with remediation and other earthworks; and
    g) providing technical assistance to the Contractor, as required.
- upon completion of on-site Remediation Works, preparing a Remediation and Validation Report (RVR), and associated plans including AMP and or LTEMP; and
- as requested assisting liaison with the Accredited Environmental Site Auditor, Remediation Contractor and EPA.

9.1.4 Accredited Site Auditor

The site is currently subject to an Contaminated Site Audit in accordance with Part 4 of the *Contaminated Land Management Act, 1997.*

The Accredited Site Auditor's responsibilities include:

- approval of the Stage Specific RAPs prepared for the staged site development. Approval will consider the associated objectives, strategy, process and outcomes to be achieved during the remediation;
- ensuring the methods and materials used in the Remediation Works are to a standard commensurate to ensure the remediation of the site in accordance with this RAP;

- provide documentation in the form of a Site Audit Statement certifying that the site can be used for the proposed end land use;
- liaising with the Principal, the Contract Administrator, the Contractor and the Environmental Consultant to discuss/resolve on-site issues with respect to remediation decisions;
- liaising with the EPA as required; and
- endorsing other key deliverables for the project including the RVR(s) and associated plans including an AMP and or LTEMP.

9.1.5 Remediation Contractor Responsibilities

The Contractor's responsibilities include:

- obtaining all permits and Approvals to complete the remediation of the site, including those associated with excavation and disposal of contaminated soil from the site;
- development and compliance with and implementation of the approved Site Management Plans, Work Health and Safety Plan, Construction Environmental Management Plan (inclusive of the EOW and UXO, Asbestos, Heritage, Flora and Fauna, and Acidic Soils Management Plans), Quality Assurance Plan, Materials Tracking Plan and other management plans developed during the Remediation Works;
- implementation and compliance with the Materials Tracking System;
- achieving Remediation Completion in accordance with the requirements of the:
  a) Contract;
  b) the Specification;
  c) Drawings; and
  d) all other documents which form part of the Contract;
- completion of works as required by the Contract Administrator;
- gaining acceptance from the receiving landfill for material disposed off-site, based on the information provided by the Environmental Consultant. The Contractor must supplement this information including by providing additional sampling where required by the receiving landfill;
- full cooperation with all relevant consultants, subcontractors and Other Contractors on the Project
- collation and provision of all transport and disposal documentation related to off-site disposal of soils classified by the Environmental Consultant; and
- earthworks conformance testing for all site filling and operations in accordance with the required Earthworks Specification.

10.0 ENVIRONMENTAL MANAGEMENT

The following sections of the RAP outline the general environmental controls to be adopted to protect the environment both on-site and immediately surrounding the site. The controls aim to protect surface water, groundwater and air quality, cross contamination and to control odour, noise and vibration levels by preventing the release of dusts, contaminated soils, contaminated sediments and contaminated water to the extent practicable. Where visual observations or monitoring indicates unsatisfactory performance, then work methods and/or controls will be modified.

It is expected that the Contractor will prepare a CEMP for the works which will provide site specific environmental controls and will also stipulate the actions to be taken should additional contamination be identified during the development of the site (i.e. an unexpected finds protocol).

10.1 Environmental Aspects

Elements of the proposed works that can interact with the environment are termed 'environmental aspects'. For the proposed works, these are identified as broadly including the following:

- Surface water discharge;
- Dust/vapour emissions;
- Noise emission and vibration;
- Odour;
- Waste haulage;
- Fuel/oil leaks/spills; and
- Spillage of contaminated materials.

10.2 Environmental Controls

10.2.1 Site Access and Traffic

During the works traffic entering and exiting the site will be limited to the Contractors vehicles, remediation equipment (e.g. excavators) and trucks removing waste materials to off-site waste management facilities. The frequency and timing of truck movements will be a function of staging of the works by the appointed Contractor. A traffic management plan will be documented by the Contractor prior to the commencement work with due consideration given to designated routes for trucks to travel on. Heavy machinery will be utilised for the remediation works. These vehicles will be stored on site during the remediation phase.

Given the duration of the works and material to be removed from the site, it is considered that there will be a negligible impact on traffic conditions in the area. It is considered that any potential impact will be further managed and minimised with the implementation of the proposed mitigation measures.

- Traffic movements will be planned to minimise impacts to traffic flow in the vicinity of the site. Where possible, and subject to the staging of the works, one entry and one exit point will be utilised to avoid the need for vehicles turning on site;
- Public access to the site will be restricted by means of security fencing. Fencing will be covered with shade cloth;
- Hours of operation will be restricted to mitigate traffic and parking impacts on neighbours;
- The timing of truck arrivals shall be planned and coordinated to avoid congestion and excessive truck queuing / idling;
- Off-site parking is not expected to be required;

- There will be limited disturbance of site surface cover and therefore off-site tracking of sediment and soil is not expected to occur. Good housekeeping practices will be implemented and inspections will be undertaken. Identified sediment will be removed by sweeping;
- All loads will be covered except during loading and unloading activities; and
- Licenced transports will be engaged for the haulage of waste materials.

10.2.2 Surface Water, Erosion and Sedimentation

The nearest water course to the site is the Georges River to the west of the site. The river flows to the north. Potential impacts from the remediation works to local surface water are expected to be limited. The potential for increased sediment load or pollutant load from site run-off will be managed by erosion and sediment controls. The erosion and sediment control will be implemented by the appointed Contractor. Mitigation measures will include the following:

- Establishment of erosion and sediment measures prior to works commencing on the site and regular inspection and maintenance to confirm measures are in a functional condition throughout the works;
- Disturbance of site surface cover will be minimised where possible to reduce the potential for off-site tracking of sediment and soil;
- All site exits will remain paved during the works and truck tyres will be inspected prior to leaving site;
- The work areas will be enclosed within a sediment fence, erected on the down gradient perimeter of the works areas. The controls will ensure all run-off leaving the site is sediment-free;
- On-site stormwater inlets and kerb inlets will be protected using inlet filter devices;
- Good stockpile management practices will be put in place and stockpiled material will be stored within appropriate environmental controls (i.e. covered where practical) and outside of drainage lines;
- Should water accumulate in excavations across the site this will be treated as potentially contaminated water; and
- Maintenance on all stockpile control measures will be carried out on a daily, and during and following major storm events. Maintenance will be logged.

10.2.3 Air Quality

Due to the nature of the work there is potential that dust and odours will be generated for a short period of time during the works. Other short term impacts may exist in relation to increased exhaust fumes from equipment.

With the management of potential air quality impacts in accordance with the proposed mitigation measures, it is considered that local community impacts will be minimised. Potential impacts will be managed by good work practices, including:

- Trucks and construction plant entering the site should be well maintained in accordance with the manufacturer's specification. Vehicles with smoky exhausts (more than 10 seconds) shall be stood down for maintenance;
- Unnecessary idling for trucks and plant shall be avoided with engines turned off during periods of inactivity;
- All equipment shall be maintained in good working order;
- Dust retardant/ water spray will be used to prevent dust lift-off where necessary;
- Minimisation of number of stockpiles;
- Stockpiles of soil will require to be covered if remaining on-site for more than 24 hours;

- All dust generating loads will be covered except during loading and unloading activities; and
- Cessation of relevant works under adverse meteorological conditions such as high winds.

10.2.4 Odour Management

The objective of odour management is to control odours generated from the proposed works, and ensure minimal adverse impact on the air quality of the local area. There is potential that the excavation of hydrocarbon impacted soils during the remediation works may expose odorous materials/ volatile organic vapours.

Odour control measures will include, but not be limited to:

- During excavation of potentially contaminated materials a portable PID will be used to assess potential elevated volatile organic vapour concentrations;
- The area of contaminated soils exposed at any one time be minimised wherever possible by a localised staged program;
- Covering exposed surfaces, as required;
- Adequate maintenance of equipment and machinery to minimise exhaust emissions; and
- Conduct regular odour monitoring by olfactory observations.

10.2.5 Noise

The remediation works are likely to cause an increase in noise during the period of work (estimated to be approximately three to four weeks). With the management of noise in accordance with the proposed mitigation measures, it is considered that local community impacts will be minimised. Noise impacts will be managed by the following mitigation measures:

- Hours of operation will be restricted to 7:30 am to 6:00 pm from Monday to Friday, 8:00 am to 2:00 pm on Saturdays and at no time on Sundays and public holiday;
- The works will take place over a relatively short period of time;
- Where possible, the distance between noisy machinery and sensitive receptors will be maximised and noisy equipment/machinery will be oriented away from sensitive areas.
- Equipment will be well maintained;
- Unnecessary idling for trucks and plant shall be avoided with engines turned off during periods of inactivity (e.g. during loading);
- Remediation work will be carried out in accordance with this Work Plan, a copy of which will be located on site at all times during the works; and
- Complaints regarding excessive noise will be investigated and addressed appropriately.

10.2.6 General Waste Management

Works will include the implementation of measures to limit the need for waste disposal and the environmental impacts of waste. The Principle Contractor shall be responsible for safely handling, segregating and temporarily stockpiling wastes on the site. The proposed waste management approach is as follows:

- Waste materials generated on site will be managed so that the volume of waste transported to landfill is minimised;
- Wastes will be characterised and properly disposed of in order to minimise the potential for impacts to the environment; and

- Disposal of all contaminated soils is to be tracked by the Contractor and correlated with the waste disposal site operator's landfill records. This information will be provided to Golder for inclusion in the Remediation Validation Report.

10.2.6.1 Off-site Waste Disposal

If waste is required to be transported, it must be to a licensed off-site disposal facility licensed to accept such material. Material to be disposed off-site may include soil/fill impacted with concentrations of COPC in excess of the site remediation validation criteria.

All waste will be transported by a transporter licensed to transport the material and will have notified the licensed receiving landfill (or storage facility) of the type and quantity of each load of material being received. Each load of waste is required to be sealed at all times. Copies of all consignment authorities for each load will be retained in accordance with the *POEO (Waste) Regulation 2005* (Refer Section 3.4.1)

10.2.6.2 Waste Recycling

Where possible, buildings materials and concrete will be forwarded for recycling to an appropriately licenced recycling facility.

10.3 Environmental Control Performance Monitoring

10.3.1 Site Inspection Program

Regular site inspections will provide quantification of the effectiveness of the safeguards recommended. It will also enable auditing of the safeguard measures to ensure they achieve their objectives and to facilitate modification where necessary.

Site inspection will be undertaken during remediation in the following areas:

- Inspection of trucks used for transporting materials from the site to ensure that soil adhering to the wheels or undercarriage is minimised. Any accumulation of soil will be removed prior to departure from the site;
- Sedimentation control measures will be inspected weekly and after heavy rain. This will involve checking the sedimentation control structures are operating effectively, with no silt being discharged to stormwater. Corrective action will be instituted where necessary and a follow up inspection will be undertaken to verify the outcome of the corrective action;
- Inspection of soil segregation, stockpiling, testing and validation procedures and records; and
- Observation of site activities to assess the extent of dust generation from the work site.

Should routine site inspections and/or external parties identify a potential issue relating to the remediation works, potential issues will be logged, validated and where required, rectified.

10.4 Contingency Planning

10.4.1 Emergency Response Plan

An Emergency Response Plan will be prepared prior to the commencement of the remediation works. The purpose of the plan will be to identify possible emergency situations and to define procedures that would be used to ensure the safety of both on- and off-site personnel in the event of an emergency.

Emergency events may include but are not limited to:

- Oil or other contaminant spillage;
- Fire;
- Failure of any control structures; and
- Industrial accident.

In order to ensure that the environmental impact of such events is minimised, emergency procedures are to be followed. These may include:

- The first priority is the safety of any persons either workers or others involved in the events. Whatever reasonable actions necessary to protect the safety of potentially affected persons will be taken. The site-specific Health and Safety Plan (HASP) will outline actions to be taken in relation to safety of persons, if these circumstances eventuate.
- The second priority is to quickly minimise the environmental damage. All emergency action should take place as soon as possible after the event. Actions to be taken may include:
  - The containment of pollution by booms, silt fences or other means. Supplies of all pollution control equipment, as listed in the Contractor's EMP, should be maintained on site by the Contractor;
  - The temporary re-establishment of the control structure; and
  - The taking of appropriate samples to assess the extent of the problem.

In the event of an emergency situation arising, the Principal Contractor's site representatives will be contacted immediately after all persons are accounted for and all possible immediate actions to control the pollution have been taken.

10.4.2 Contingency Management Plan

Table 9 below summarises conditions that can reasonably be expected and the resulting problems they may cause, and how these problems may be resolved within the context of the works.

Table 9: Contingency

Anticipated Problem	Corrective Action by Contractor
Further contamination identified	Stop work, notify the Environmental Consultant and Principal. Manage in accordance with remediation objectives and strategy outlined in RAP refer to Section 9.4.2.1
Excessive rain/drainage	Cover exposed surfaces with plastic; or stop work until run-off is more manageable. Inspect and maintain sediment controls.
Excessive dust	Use of local and perimeter sprays, soaking of excavation areas, mobile sprays, covering with geofabric, monitoring of weather conditions or ceasing activity.
Equipment failures	Maintain spare equipment or parts; or maintain alternate rental options; or shut down affected operations until repairs are made.
Release of fuel/oil from machinery	Remove source, use spill kit to remove oil and make any repairs as required.
Silt fence fails	Stop work and repair fence to specifications.
Excessive noise	Identify source and review noise attenuation equipment and as necessary provide silencers on noisy equipment. Change work hours.
Excessive odours	Monitor for volatiles using PID in worker breathing zone and at boundary with residential properties (south of site). Use odour and volatile suppressing agents to eliminate or reduce odours as required.
Encounter suspected asbestos	Stop excavation and cover area. Notify the Principal, Environmental Consultant and Industrial Hygienist. Asbestos classification and management to be conducted by a suitably qualified/licensed contractor. Refer to AMP (Golder, 2016a)

10.4.2.1 Unexpected Finds Protocol

It is possible that workers may unexpectedly encounter unexpected contaminated materials. The adverse conditions which may warrant additional assessment include;

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

The immediate response should be on preventing the disturbance of material, while protecting workers in the immediate area and any surrounding receptors from potential exposure. The following procedure should be followed if unexpected contaminated materials are encountered.

1
- **STOP WORK**
- Fit appropriate PPE.
- Notify Superintendent and EC.
- Delineate the work are to prevent entry by others.

2
- Is the materal asbestos? (If yes refer to AMP)
- Superintendent to install appropraite environmental controls (refer to Section 9.2), including stormwater, sediment, odour and vapour controls.
- EC to undertake assessment in accordance with this RAP and EPA Guidelines.

3
- If materials assessed as presenting an unacceptable risk, EC to forumulate remedaition approach in consultation with Site Auditor and Superintendent.
- EC to supervise remediation and undertake validation in accordance with the objectives of this RAP.
- EC to submit assesment / validation to Superintendent, Site Manager and Site Auditor at completion of validation works.

11.0 OCCUPATIONAL HEALTH AND SAFETY

A site-specific Health and Safety Plan (HASP) incorporating the safe work method statements will be prepared in accordance with the requirements of SafeWork NSW. The implementation of the HASP will be the responsibility of Contractor during the works. At a minimum the plan shall include:

- Details of health and safety programme including an induction process for all personnel working on the site, as well as incident management and reporting plans;
- Safe work method statements (SWMSs) and/or Job Safety Analyses (JSAs);
- Emergency phone numbers;

- A map showing the shortest route to nearby hospitals or health centres;
- Daily toolbox meeting content and procedures;
- Definition of roles and responsibilities of personnel, including staff and subcontractors;
- Hazard identification procedures and control measures;
- Material safety data sheets;
- Soil, water and material handling procedures;
- Personal protective equipment requirements;
- Occupation health monitoring;
- Decontamination procedures; and
- Incident management.

Site workers and visitors shall be trained on the contents of site-specific health and safety plan prior to entry to the site.

12.0 VALIDATION REPORTING AND FUTURE SITE MANAGEMENT

12.1 Validation Reporting

A Remediation Validation Report will be prepared in general accordance with the requirements of the NSW EPA (1997[7]) Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites and the DEC, NSW (2006) Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (2nd Edition) (the Auditor Guidelines).

All field information and analytical data will be presented in the Remediation Validation Report.

The Remediation and Validation Report will be prepared for either the whole site, or sections of the site as considered suitable during the remediation works. These will considered in consultation with the Site Auditor, and where completed will be incorporated into the Construction Environmental Management Plan such that controls are enforced minimising the potential "re-contamination" of areas once validation has been achieved.

12.2 Long Term Environmental Management Plan

At this stage it is considered likely that a LTEMP will be required. It would be implemented following completion of the remediation works to provide a management, monitoring and review framework for the residual soil and groundwater issues and to manage any separation layers installed during the remediation works. The purpose of the LTEMP would be to:

- Assign the responsibilities for management of all aspects of the LTEMP;
- Summarise the nature of residual contamination for information of future occupiers;
- Protect human health and the environment from remnant residual contamination present on the site including that below the installed separation layers;
- Provide an unexpected finds protocol suitable for future redevelopment of the site;
- Address maintenance, monitoring and repair of any installed separation layers;
- Provide the monitoring and management framework for groundwater (i.e. post audit groundwater management plan) including monitoring requirements and reporting frequency; and
- Provide information to assess if contingency actions related to the management of residual contamination are required.

The potential time for closure and cessation of groundwater monitoring activities is when the compliance targets have been met on and off the site, and that the remaining risks to groundwater on and off the site are acceptable. Cessation of LTEMP is unlikely to occur unless further clean-up is undertaken.

12.3 Future Groundwater Monitoring and Management

Residual groundwater contamination is expected to exist on the site following development, it is therefore expected that ongoing groundwater management would be implemented on the site. A groundwater monitoring plan (GMP) is expected to be included within the LTEMP and be considered as part of the Site Audit for the site.

The purpose of the GMP is:

a) To nominate responsible parties for the residual groundwater issues;

b) To manage groundwater contamination at the site and to minimise potential harm to human health and the environment;

[7] Reprinted 2011

c) To document the performance of the management of the contamination to allow periodic reassessment of the management approach into the future.

An appropriate GMP would attempt to accomplish the following:

a) Establish whether the residual groundwater contamination plume is shrinking, stable or increasing, and whether natural attenuation and/or migration is occurring according to expectations though line-of-evidence collection;

b) Provide appropriate trigger levels (where available), based on the receptor of interest and identified contaminants;

c) Serve as a compliance program, so that potential impacts to down-gradient receptors are identified before adverse effect occurs (relative to above objectives); and

d) Detect changes in environmental conditions (e.g. hydrogeologic, geochemical or other changes) that may reduce the efficacy of any natural attenuation processes or that could lead to an change in the nature of impact.

A contingency plan is likely to be required should the established trigger levels be exceeded. The contingency plan describes the framework of increased management efforts to be used or active remediation options to be considered, should the monitoring indicate that contamination is found to be increasing or having an adverse effect on human or environmental health.

As far as possible, the development of a GMP will be undertaken as a part of the LTEMP submission to Environmental Auditor to allow all parties to be clear on the proposed management regime and responsibilities for the site.

13.0 IMPORTANT INFORMATION RELATING TO THIS REPORT

Your attention is drawn to the document titled - “Important Information Relating to this Report”, which is included in Appendix E of this report. The statements presented in that document are intended to inform a reader of the report about its proper use. There are important limitations as to who can use the report and how it can be used. It is important that a reader of the report understands and has realistic expectations about those matters. The Important Information document does not alter the obligations Golder Associates has under the contract between it and its client.

Report Signature Page

GOLDER ASSOCIATES PTY LTD

Greg Stratton
Principal Environmental Scientist

Gavin Butterfield
Principal Environmental Scientist

GVS/GB/gvs

A.B.N. 64 006 107 857

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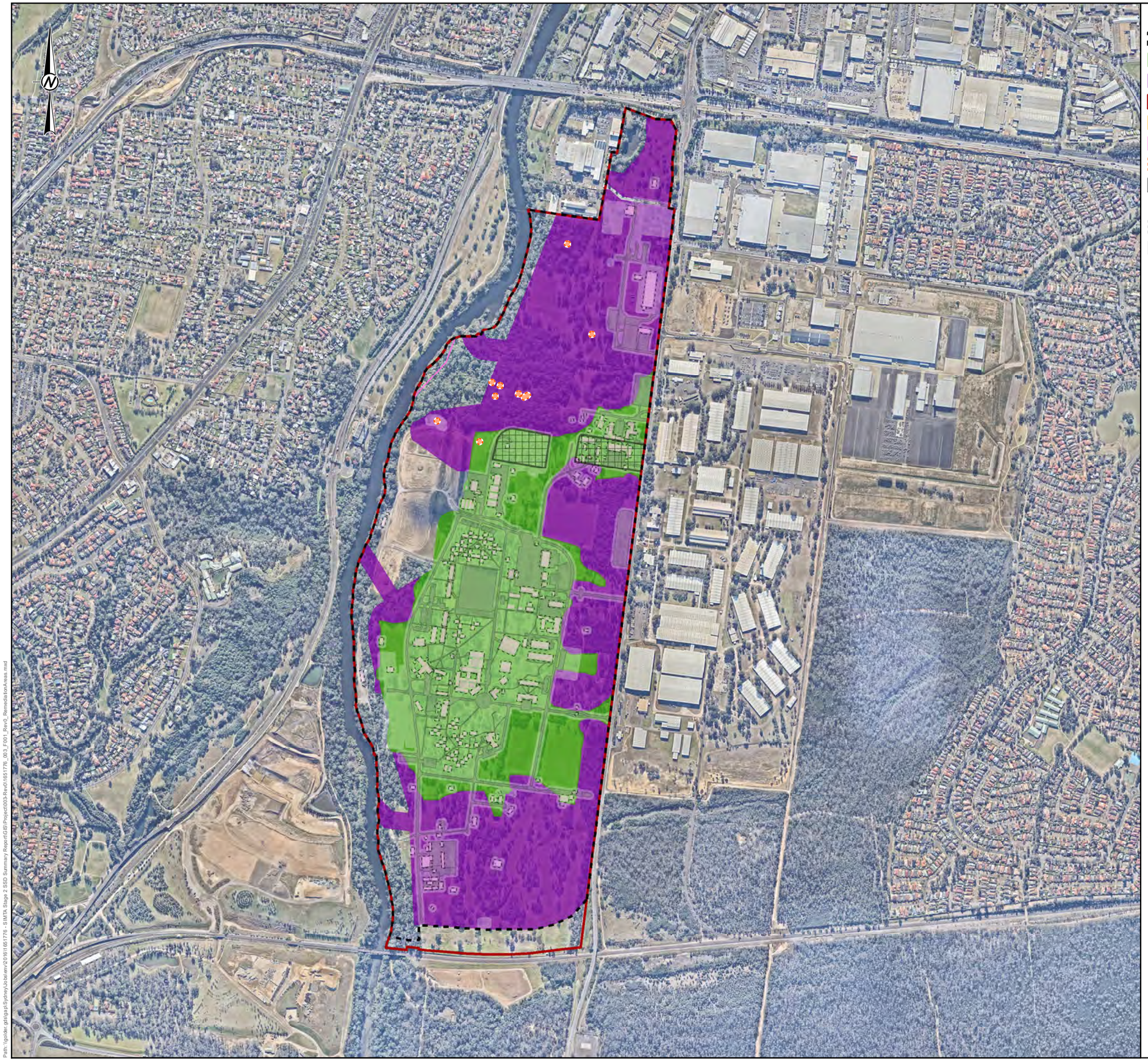
APPENDIX A

Figures



LEGEND

- RAP Site Boundary
- Priority Area 1
- Priority Area 2
- MIC Property West
- Moorebank Ave
- The Precinct (approximate)
- Asbestos detected
- Proposed works compound
- Existing buildings to be demolished
- Existing buildings to be demolished (3m buffer)
- Hardstand pavement

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder investigation area on this project.

0 250 500 750 1,000
METRES

REFERENCE SCALE: 1:12,500 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

TITLE
PROPERTY OVERVIEW

CONSULTANT
Golder Associates

YYYY-MM-DD	2016-08-05
PREPARED	KJS / KB
DESIGN	-
REVIEW	GVS
APPROVED	GVS

PROJECT No.	CONTROL	Rev.	FIGURE
1651776	005-R	0	**001**

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LEGEND

- RAP Site Boundary
- Allotment Boundary
- MIC Property West
- Cadastral Boundary

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder investigation area on this project.
2. Lot boundaries provided by Land and Property Information NSW
3. Property allocation.
Lot 100 & Lot 101 DP 1049508: Northern Commonwealth Land
Lot 1 DP 1197707: MIC Property West (MPW)
Lot 2 DP 1197707: Moorebank Avenue
Lot 1 DP 1048263: SIMTA Property
Lot 4 DP 1197707: MIC Property East - Bootland

0 250 500 750 1,000
METRES

REFERENCE SCALE: 1:12,500 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

TITLE
PROPERTY BOUNDARIES AND SITE BOUNDARY

CONSULTANT
Golder Associates

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

PROJECT No.	CONTROL	Rev.	FIGURE
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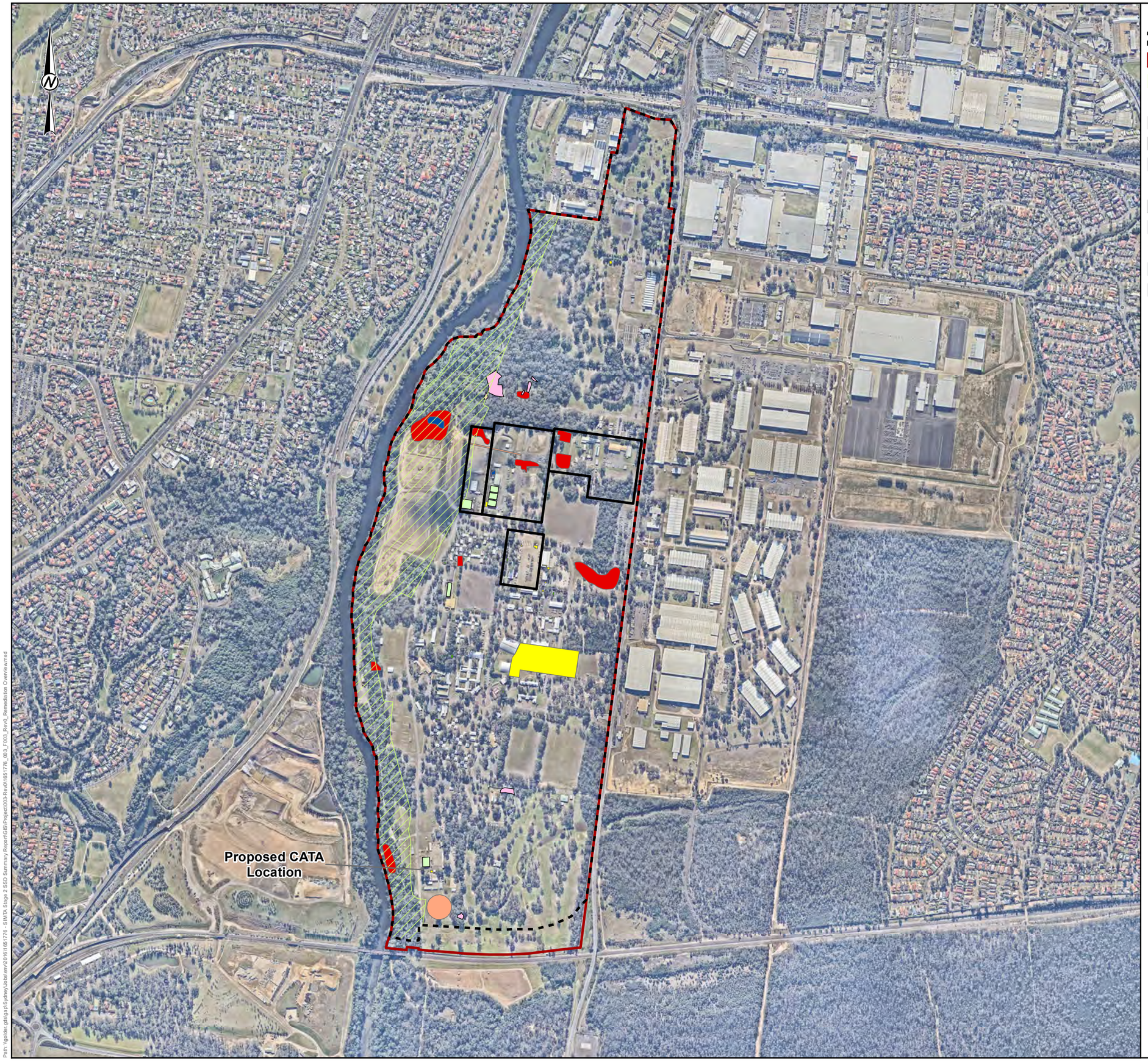

LEGEND

- RAP Site Boundary
- MIC Property West
- Conservation Area (approximate)

Stage 1 and 2 Remediation Areas

- Hotspot
- Stockpile
- USTs

Stage 1 and 2 Investigation Areas

- OCPs
- PCBs

Stage 1 and 2 High Risk Areas

- Anthropogenic Fill (confirmed)
- Anthropogenic Fill (potential)

NOTES

1. The Approximate Site Boundary represents the spatial extent of the Golder investigation area on this project.
2. Conservation Area digitised from Drawing PREC-RCG-AR-SKC-00002a (Masterplan Precinct, 09/06/2016 issue K)

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0 250 500 750 1,000 METRES

REFERENCE SCALE: 1:12,500 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

TITLE
REMEDIATION OVERVIEW

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	**003**

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PB_MW09
CPT120A
CPT120B
SB007_B
SB072
USTs
03767_UST_010
23.7m^2
GA-HP-6013
MW103
PB_MW12
PB_MW11
SB075
USTs
UST 44467
119.5m^2
SB087
SB074

LEGEND

RAP Site Boundary **Remediation Areas**

Investigation Locations USTs

- Borehole
- CPT
- Handpit
- Groundwater Well

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (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. 1651776 | CONTROL 005-R | Rev. 0 | FIGURE **004-A**

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LEGEND

RAP Site Boundary

Investigation Locations

CPT

Groundwater Well

Remediation Areas

USTs

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (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-B**

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LEGEND

RAP Site Boundary

Investigation Locations

Borehole

Groundwater Well

Test Pit

Remediation Areas

USTs

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
REMEDIATION AREAS

CONSULTANT
Golder Associates

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REVIEW	GVS
APPROVED	GVS

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

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

25mm

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LEGEND

- RAP Site Boundary

Investigation Locations

- Borehole
- CPT
- Handpit

Remediation Areas

- USTs

NOTES

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KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
REMEDIATION AREAS

CONSULTANT
Golder Associates

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APPROVED	GVS

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

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LEGEND

RAP Site Boundary

Investigation Locations

CPT

Groundwater Well

Surface Scrape

Remediation Areas

USTs

NOTES

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REFERENCE

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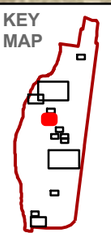
KEY MAP



CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE
REMEDIATION AREAS

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Golder Associates

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

LEGEND

RAP Site Boundary

Investigation Locations

Borehole

Groundwater Well

Sediment

Remediation Areas

USTs

NOTES

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REFERENCE

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KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (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. 1651776 | CONTROL 005-R | Rev. 0 | FIGURE **004-F**

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LEGEND

RAP Site Boundary

Investigation Locations

CPT

Groundwater Well

Locations with Asbestos detected

Vegetation exclusion area

Remediation Areas

USTs

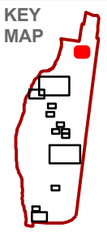
NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE 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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
REMEDIATION AREAS

CONSULTANT
Golder Associates

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

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

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LEGEND

- RAP Site Boundary
- Locations with Asbestos detected

Investigation Locations

- CPT
- Groundwater Well
- Sediment
- Test Pit
- Asbestos detected
- Vegetation exclusion area

Remediation Areas

- Hotspot

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

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DESIGN	-
REVIEW	GVS
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PROJECT No. 1651776 | CONTROL 005-R | Rev. 0 | FIGURE **004-H**

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LEGEND

RAP Site Boundary **Remediation Areas**

Investigation Locations Hotspot

- Borehole
- Handpit
- Test Pit
- Other

NOTES

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

REFERENCE

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KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE
REMEDIATION AREAS

CONSULTANT
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PREPARED	KJS / KB
DESIGN	-
REVIEW	GVS
APPROVED	GVS

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

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0

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LEGEND

- RAP Site Boundary

Investigation Locations

- Borehole
- CPT
- Hand auger
- Handpit
- Groundwater Well
- Sediment
- Surface Scrape
- Test Pit
- Vegetation exclusion area
- Non Aboriginal Heritage Area

Remediation Areas

- USTs

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE 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. 1651776 | CONTROL 005-R | Rev. 0 | FIGURE **004-J**

LEGEND

- RAP Site Boundary

Investigation Locations

- Groundwater Well
- Test Pit
- Vegetation exclusion area

Remediation Areas

- Stockpile

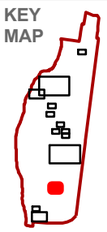
NOTES

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

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP



CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (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-K**

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GA-S-034
GA-S-033
TP073_B
TP068_C
TP066_A
TP067_C
TP069_C
TP065_A
TP070_C
TP072_B
TP062_B
TP063_C
TP071_C
TP060_C
TP061_C
TP064_C
TP029_A
TP009_B
TP010_B
TP008_B
TP006_B
GA-S-019
TP024_C
GA-BH-3102
TP028_B
GA-CPT-3102
GA-S-020
PB_TP09
TP007_B
TP005_B
GA-HP-6008
TP003
TP004_B
TP041_B
CPT-11
TP042_B
TP043_B
PB_BH07
GA-SS0003
GA-SS0004
TP034_B
PB_TP15
GA-TP-3107

Stockpile
Former STP SP4
122.5m^2

Stockpile
Former STP SP3
333m^2

Stockpile
Former STP SP2
86.2m^2

Stockpile
Former STP SP1
3257.7m^2

Stockpile
Former STP SP5
185.7m^2

Hotspot
Dustbowl
1339.5m^2

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. 1651776 | CONTROL 005-R | Rev. 0 | FIGURE **004-L**

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

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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. 1651776 | CONTROL 005-R | Rev. 0 | FIGURE **004-M**

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

25mm
0

Path: \\golder.gds\gal\Sydney\Jobs\env\2016\1651776 - SIMTA Stage 2 SSD Summary Report\GIS\Project\003-Rev0\1651776_003_F004_Rev0_RemediationAreas.mxd

LEGEND

- RAP Site Boundary
- Stage 1 and 2 Investigation Areas
- PCBs
- Investigation Locations
  - Borehole
  - CPT
  - Hand pit

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **005-A**

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

0 25mm

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LEGEND

- RAP Site Boundary
- Vegetation exclusion area

Stage 1 and 2 Investigation Areas

- OCPs;

Investigation Locations

- Borehole
- CPT
- Groundwater Well
- Surface Scrape
- Test Pit
- Other

NOTES

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

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 5.5 11 16.5 22 27.5
METRES

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

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **005-B**

LEGEND

RAP Site Boundary

Stage 1 and 2 Investigation Areas

OCPs;

Investigation Locations

Hand pit

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **005-C**

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

25mm 0

Path: \\golder.gbl\gal\Sydney\Jobs\env\2016\1651776 - SIMTA Stage 2 SSD Summary Report\GIS\Project\003-Rev0\1651776_003_F005_Rev0_InvestigationAreas.mxd

LEGEND

- RAP Site Boundary

Stage 1 and 2 Investigation Areas

- OCPs;

Investigation Locations

- Borehole
- Groundwater Well
- Other

NOTES

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

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **005-D**

LEGEND

- RAP Site Boundary
- Vegetation exclusion area
- Other

Stage 1 and 2 Investigation Areas

- OCPs;
- PCBs

Investigation Locations

- Surface Scrape
- Test Pit

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **005-E**

LEGEND

RAP Site Boundary

Stage 1 and 2 Investigation Areas

PCBs

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No.	CONTROL	Rev.	FIGURE
1651776	003-R	1	**005-F**

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

25mm

0

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LEGEND

- RAP Site Boundary
- Stage 1 and 2 Investigation Areas
- PCBs
- Investigation Locations
- CPT
- Hand pit

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **005-G**

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

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LEGEND

RAP Site Boundary

Stage 1 and 2 Investigation Areas

PCBs

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **005-H**

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

25mm

0

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LEGEND

- RAP Site Boundary
- Stage 1 and 2 Investigation Areas
  - PCBs
- Investigation Locations
  - Surface Scrape

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 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
INVESTIGATION AREAS

CONSULTANT
Golder Associates

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

PROJECT No.	CONTROL	Rev.	FIGURE
1651776	003-R	1	**005-I**

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

Path: \\golder.gds\gal\Sydney\Active\2016\1651776 - SIMTA Stage 2 SSD Summary Report\GIS\Project\003-Rev0\1651776_003_F005_Rev0_InvestigationAreas.mxd

LEGEND

RAP Site Boundary

Investigation Locations

Surface Scrape

Test Pit

Other

Stage 1 and 2 High Risk Areas

Anthropogenic Fill (confirmed)

NOTES

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

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

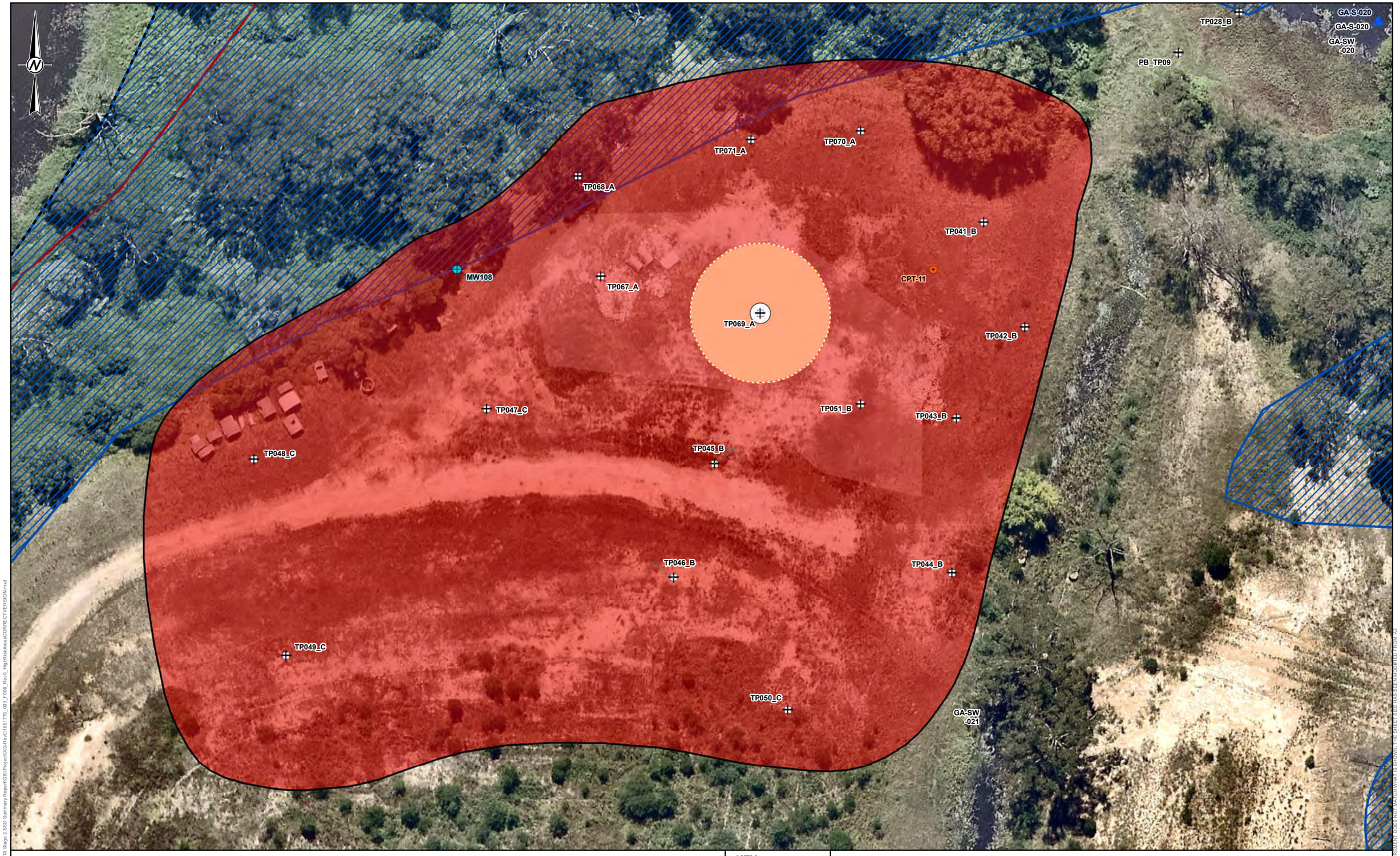
PROJECTION: GDA 1994 MGA Zone 56

TITLE
HIGH RISK AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-A**



LEGEND

RAP Site Boundary

Investigation Locations

CPT

Grounwater Well

Sediment

Test Pit

Locations with Asbestos detected

Asbestos detected

Vegetation exclusion area

Stage 1 and 2 High Risk Areas

Anthropogenic Fill (confirmed)

NOTES

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

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
HIGH RISK AREAS

CONSULTANT
Golder Associates

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

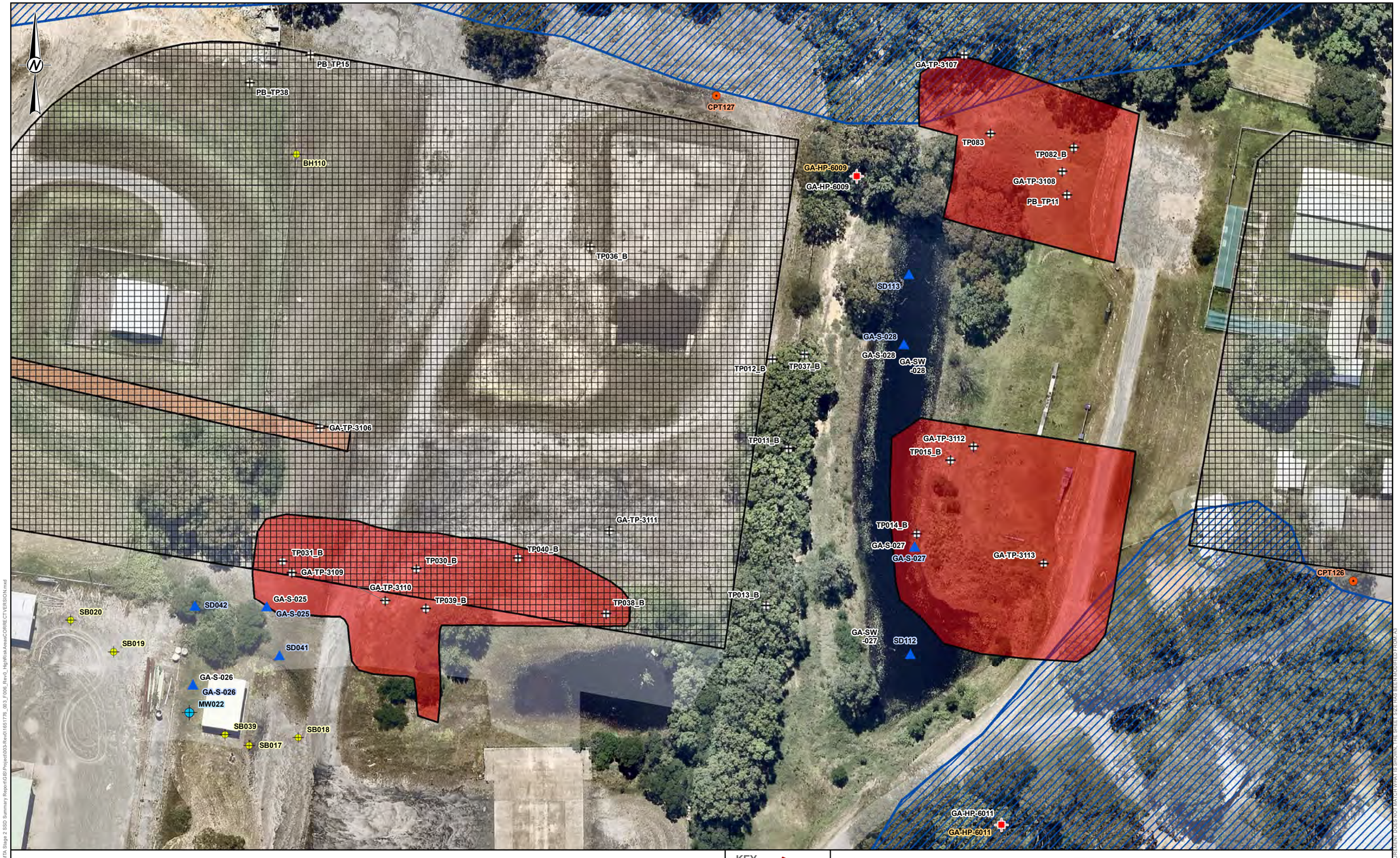
PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-B**

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\env\2016\1651776 - SIMTA Stage 2 SSD Summary Report\GIS\Project\003-Rev0\1651776_003_F006_Rev0_HighRiskAreasCORRECTVERSION.mxd



LEGEND

- RAP Site Boundary
- Proposed works compound

Investigation Locations

- Borehole
- CPT
- Hand pit
- Grounwater Well
- Sediment
- Test Pit
- Vegetation exclusion area

Stage 1 and 2 High Risk Areas

- Anthropogenic Fill (confirmed)
- Anthropogenic Fill (potential)

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER 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 8.5 17 25.5 34 42.5
METRES

REFERENCE SCALE: 1:750 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
HIGH RISK AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-C**

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

25mm

0

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LEGEND

- RAP Site Boundary
- Proposed works compound

Investigation Locations

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

Stage 1 and 2 High Risk Areas

- Anthropogenic Fill (confirmed)
- Anthropogenic Fill (potential)

NOTES

1. THE APPROXIMATE SITE BOUNDARY REPRESENTS THE SPATIAL EXTENT OF THE GOLDER 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
HIGH RISK AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-D**

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

25mm

0

Path: \\golder.gds\gal\Sydney\Jobs\env\2016\1651776 - SIMTA Stage 2 SSD Summary Report\GIS\Project\003-Rev0\1651776_003_F006_Rev0_HighRiskAreasCORRECTVERSION.mxd

GA-SW-034
GA-S-034
GA-S-034
GA-S-033
GA-S-033
STP_5
STP_4
STP_6
STP_3
STP_18
STP_2
STP_1
TP068_C
TP066_A
TP067_C
STP_ACM
Stockpile
ACM
STP_16
STP_17
STP_15
TP065_A
TP069_C
TP073_B
STP4_3
STP4_2
STP4_1
STP3_3
STP3_2
STP4_4
STP3_1
STP3_4
TP062_B
TP070_C
STP2_PAD
STP2_5
TP072_B
TP063_C
STP3_5
STP_7
STP_14
STP_8
STP5_3
STP_9
STP_13
STP2_2
STP2_4
STP2_6
STP3_6
TP071_C
TP060_C
STP_10
STP_12
TP009_B
TP029_A
TP010_B
STP5_4
STP_11
STP5_2
STP5_5
STP2_1
TP008_B
STP5_1
TP064_C
GA-SW
-019
GA-S-019
GA-S-019
TP006_B
GA-BH-3102
TP024_C
GA-BH-3102
GA-CPT-3102
GA-S-020
GA-SW
-020
GA-S-020
TP007_B
TP005_B
PB_TP09
TP028_B
GA-HP-6008
GA-HP-6008
TP003
TP004_B
TP041_B
CPT-11
TP042_B
TP043_B
PB_BH07
GA-SS0003
GA-SS0003
GA-SS0004
GA-SS0004
TP034_B
PB_TP15
GA-TP-3107

LEGEND

- RAP Site Boundary
- Proposed works compound

Investigation Locations

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

Stage 1 and 2 High Risk Areas

- Anthropogenic Fill (confirmed)

NOTES

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

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
HIGH RISK AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-E**

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

25mm
0

LEGEND

- RAP Site Boundary
- **Investigation Locations**
  - Borehole
  - CPT
  - Hand auger
  - Surface Scrape
  - Test Pit
  - Vegetation exclusion area

Stage 1 and 2 High Risk Areas

- Anthropogenic Fill (confirmed)

NOTES

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

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 8.5 17 25.5 34 42.5
METRES

REFERENCE SCALE: 1:750 (at A3)
PROJECTION: GDA 1994 MGA Zone 56

TITLE
HIGH RISK AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-F**

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

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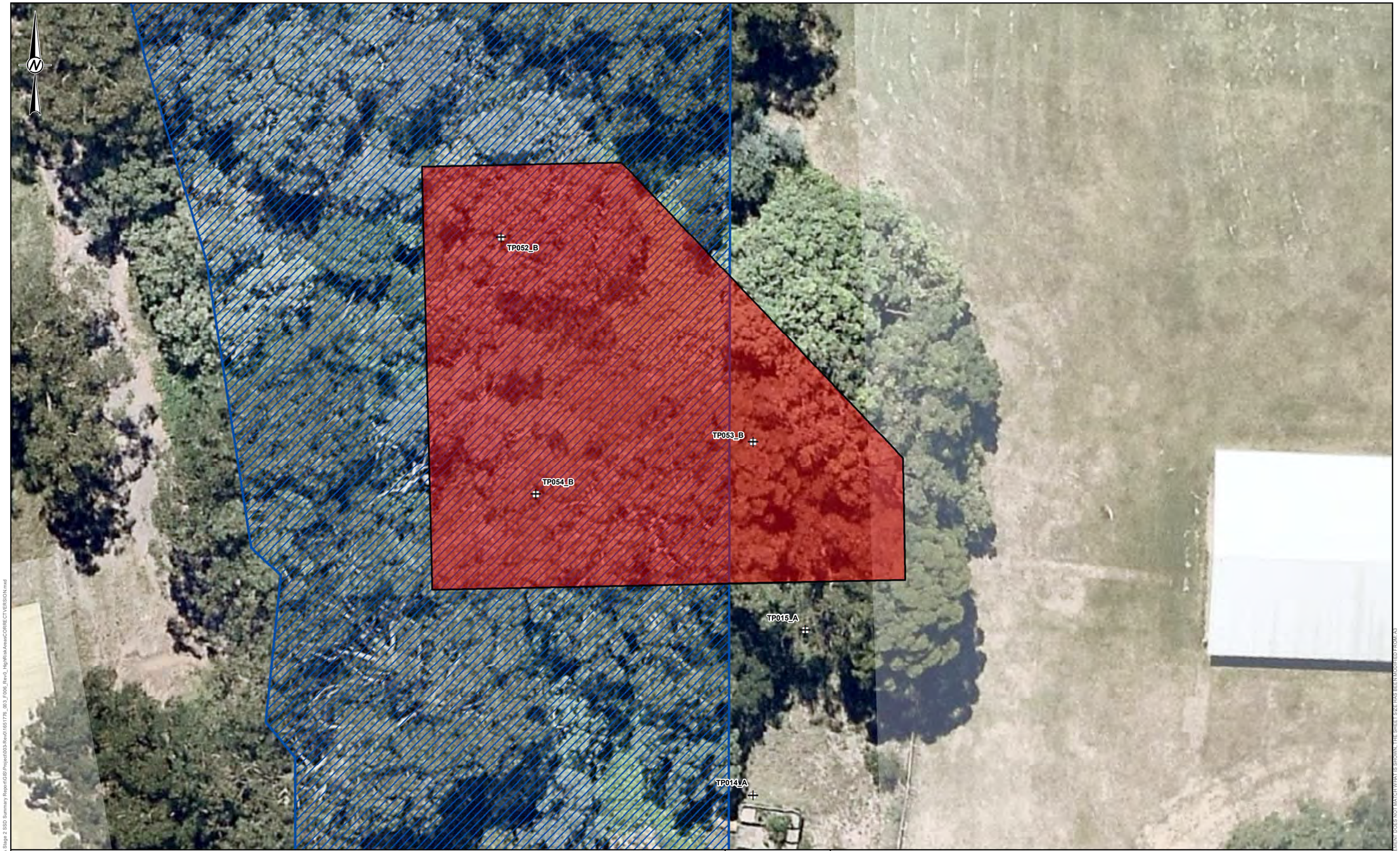

LEGEND

RAP Site Boundary

Investigation Locations

Test Pit

Vegetation exclusion area

Stage 1 and 2 High Risk Areas

Anthropogenic Fill (confirmed)

NOTES

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

REFERENCE

1. AERIAL PHOTOGRAPHY COPYRIGHT NEARMAP PTY LTD.

KEY MAP

CLIENT
TACTICAL GROUP

PROJECT
LAND PREPARATION WORKS – REMEDIATION ACTION PLAN

0 2.5 5 7.5 10 12.5
METRES

REFERENCE SCALE: 1:250 (at A3)

PROJECTION: GDA 1994 MGA Zone 56

TITLE
HIGH RISK AREAS

CONSULTANT
Golder Associates

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

PROJECT No. 1651776 | CONTROL 003-R | Rev. 1 | FIGURE **006-G**

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

25mm

0

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