Meadowbank Education and Employment Precinct Schools Project
Remedial Action Plan

SSD 18_9343
Prepared by Alliance Geotechnical
For School Infrastructure NSW
11 October 2019

DOCUMENT CONTROL

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EXECUTIVE SUMMARY

Alliance Geotechnical Pty Ltd (AG) was engaged by Woods Bagot Pty Ltd, to prepare a Remedial Action Plan (RAP) for the Meadowbank Education and Employment Precinct Schools Project, 2 Rhodes Street Meadowbank NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

AG has the following project appreciation:

- The site is being considered for redevelopment, comprising a primary school and secondary school;
- A Stage 1 Preliminary Site Investigation (PSI) and Stage 2 Detailed Site Investigation (DSI) of the site were reported initially by AG in February 2018 with ongoing typographical updates incorporated;
- The Stage 2 DSI were considered adequate in providing a reasonable characterisation of land contamination at the site, in those areas that were accessible at the time the Stage 2 DSI works were undertaken;
- AG prepared an initial Remedial Action Plan (RAP) for the site in July 2018 which provided a strategy for addressing contamination previously identified, as well as a strategy for addressing contamination related data gaps identified in the Stage 2 DSI. AG considered this is an industry accepted approach to managing sites where further contamination assessment works may be constrained by site accessibility, and that development consent for a site would incorporate a condition requiring implementation of all strategies in the RAP (including any supplementary contamination assessment works necessary);
- The initial RAP included remedial strategies for contamination identified at that time (by way of the previously reported Stage 2 DSI), and remedial strategies for unexpected finds (which may be identified by the recommended supplementary contamination assessment works and/or during planned remedial works);
- The site was demolished in mid-2019 which provided access to address the previously identified data gaps from the areas that were inaccessible during the Stage 2 DSI of the site;
- Supplementary contamination assessments were subsequently prepared by AG in July 2019 and September 2019 which adequately addressed the data gaps from previously inaccessible areas as well as delineated previous chemical and asbestos site action criteria exceedances from the Stage 2 DSI;
- A final RAP (this document) is now required to further refine the extent of remedial works required in those areas already nominated for remedial works, as well as confirm the extent of remedial works in areas which have been identified during supplementary contamination assessment works.

The objectives of this project were to:

- Prepare a consolidated RAP to address potentially unacceptable contamination exposure risks identified in all AG's previous contamination assessments, in the context of the proposed land use setting.

AG undertook the following scope of works to address the project objective:

- A desktop review; and
- Reporting.

The site history data was collected was assessed within the objectives of this project and in the context of the proposed development works. That assessment identified the following areas of environmental concern (AEC) and contaminants of potential concern (COPC) which either require assessment, further assessment, and/or remediation. The AEC identified are presented in attached **Figure 3** and **Figure 4**, and associated COPC are presented in the table below.

Table 1: AEC and COPC

Area of Environmental Concern	Contaminant of Potential concern	Media	Potential Receptors	Potential Exposure Pathway
AEC01	Lead	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC02	Lead	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC03	Lead	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC04	Benzo(a)pyrene	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC05	Benzo(a)pyrene	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC06	Benzo(a)pyrene	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC07	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation
AEC08	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation

Area of Environmental Concern	Contaminant of Potential concern	Media	Potential Receptors	Potential Exposure Pathway
AEC09	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation
AEC10	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation

The remedial goal for this site is to remediate potential soil contamination (where identified) to a level that does not present an unacceptable human health exposure risk, based on the proposed land use setting.

AG notes that the client's preferred remedial method may result in the need for:

- notation on a planning certificate for the site;
- a covenant registered on the title to the land;
- a long-term environmental management plan (EMP).

The known lateral extent of remediation on the site is considered to be, as a minimum, the following:

- AEC01 – lead impacted soils delineated around TP24;
- AEC02 – lead impacted soils delineated around TP22;
- AEC03 – lead impacted soils delineated around BH02;
- AEC04 – benzo(a)pyrene impacted soils delineated around TP23;
- AEC05 – benzo(a)pyrene impacted soils delineated around TP16
- AEC06 – benzo(a)pyrene impacted soils delineated around TP04;
- AEC07 – asbestos impacted soils within the northwest portion of the site;
- AEC08 – asbestos impacted soils within the southeast portion of the site;
- AEC09 – asbestos impacted soils within the southwest portion of the site; and
- AEC10 – asbestos impacted soils within the vicinity of TP07;

Refer to **Figure 3a, Figure 3b** and the **Soil Contamination Remediation Plan,** which indicates the areas which will be subject to remediation and the remedial strategy for each area to mitigate the risks to human health and the wider environment.

It is noted that the lateral extent of remediation may be altered, during remedial works based on site observations and validation soil sample analytical laboratory results.

Based on the extent of the remediation and the proposed site redevelopment works, remedial options considered appropriate for this site include:

- Insitu containment by capping;
- Ex-situ containment by capping; and
- Excavation and offsite disposal.

Taking into consideration the client's objectives for the site, and the nature and extent of the proposed site redevelopment works, the preferred remedial option for the site is a combination of:

- Excavation and offsite disposal; and
- Insitu containment by capping.

Based on the information presented in the historical contamination assessment reports, AG makes the following conclusions:

- Implementation of the strategies, methodologies and measures set out in this Remedial Action Plan would facilitate management and/or remediation of potentially unacceptable land contamination risks in current proposed development areas onsite;
- Should newly identified unacceptable land contamination risks be identified during supplementary assessment works, an addendum to this RAP may be required. The addendum should be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, a waste classification for those soils should be prepared by a suitably experienced environmental consultant;
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant; and
- A long-term EMP that documents all areas where residual contamination is still present on the site and all capping and isolation measures will be required.

This report must be read in conjunction with the limitations set out in **Section 12**.

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LIST OF ABBREVIATIONS

A list of the common abbreviations used throughout this report is provided below:

ACM	Asbestos Containing Material
AEC	Area of Environmental Concern
AG	Alliance Geotechnical Pty Ltd
AHD	Australian Height Datum
BTEX	Benzene, toluene, ethyl benzene, xylenes
COPC	Contaminant of Potential Concern
CSM	Conceptual Site Model
DP	Deposited Plan
DSI	Detailed Site Investigation
EPA	Environment Protection Authority
LOR	Limit of reporting
m	metres
m^2	square metres
m bgl	metres below ground level
mg/kg	milligrams per kilogram
NSW	New South Wales
OCP	Organochlorine pesticides
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PSI	Preliminary Site Investigation
RAP	Remedial Action Plan
RPD	Relative percentage difference
TRH	Total recoverable hydrocarbons
UCL	Upper Confidence Limit

1. INTRODUCTION

Alliance Geotechnical Pty Ltd (AG) was engaged by Woods Bagot Pty Ltd, to prepare a Remedial Action Plan (RAP) for the Meadowbank Education and Employment Precinct Schools Project, 2 Rhodes Street Meadowbank NSW (refer **Figure 1** with the 'site' boundaries outlined in **Figure 2**).

This report has been prepared by AG on behalf of the NSW Department of Education (the Applicant). It accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD 18_9343) for the Meadowbank Education and Employment Precinct Schools Project (hereafter referred to as MEEPSP) at 2 Rhodes Street, Meadowbank (the site).

MEEPSP will cater for 1,000 primary school students and 1,620 high school students. The proposal seeks consent for:

- A multi-level, multi-purpose, integrated school building with a primary school wing and high school wing. The school building is connected by a centralised library that is embedded into the landscape. The school building contains:
    - Collaborative general and specialist learning hubs, with a combination of enclosed and open spaces;
    - Adaptable classroom home bases;
    - Four level central library, with primary school library located on ground floor and high school library on levels 1 to 3.
    - Laboratories and workshops;
    - Staff workplaces;
    - Canteens;
    - Indoor gymnasium;
    - Multipurpose communal hall;
    - Outdoor learning, play and recreational areas (both covered and uncovered).
- Associated site landscaping and public domain improvements;
- An on-site car park for 60 parking spaces; and
- Construction of ancillary infrastructure and utilities as required.

The objective of this project is to:

- Prepare a remedial action plan to address potentially unacceptable contamination exposure risks on the site identified in the previous contamination reports completed for the site by AG.

The **Remedial Action Plan** is required by the Secretary's Environmental Assessment Requirements (SEARs) for SSD 18_9343. This table identifies the SEARs and relevant reference within this report.

Table 1.1 – SEARs and Relevant Reference

SEARs Item	Report Reference
13 Contamination	Whole Report

SEARs Item	Report Reference
Assess and quantify any soil and groundwater contamination and demonstrate that the site is suitable for the proposed use in accordance with SEPP 55.	
Include and assessment of the effectiveness and reliability of the measures and any residual impacts after these measures are implemented.	Section 6 and 11.

2. SITE IDENTIFICATION

The site is registered with NSW Land and Property Information as a Lot 10 in DP1232584.

A registered Lot survey plan of acquisition drawing provided by the client indicates the site is Lot 10 in DP1232584 being part of Lot 1 in DP837179.

The Section 10.7 (formally Section 149) planning certificate for the site (refer Alliance Geotechnical (2017a)) refers to the site as being Lot 10 in DP1232584, with a street address of 2 Rhodes Street, Meadowbank, NSW.

For the purpose of this investigation, the site will be defined as Lot 10 in DP1232584 being part of Lot 1 in DP837179.

The approximate geographic coordinates of the middle of the site, inferred from Google Earth were 33o48'46" S and 151o05'27" E.

The site is located in the City of Ryde jurisdiction with the locality of the site set out in **Figure 1**.

The general layout and boundary of the site is set out in **Figure 2**.

The entire site covers an area of 3.329 hectares (by Lot survey plan).

A copy of a detail and level survey and the Lot plan survey is presented in **Appendix A**.

3. GEOLOGY, ACID SULPHATE SOILS, TOPOGRAPHY AND HYDROGEOLOGY

3.1. Geology

A review of the Sydney 1;100,000 Geological Series Sheet 9130 (Edition 1) 1983, indicated that the site is underlain by Middle Triassic Hawkesbury Sandstone (Rh), which is comprised of medium to coarse grained quartz sandstone, very minor shale and laminite lenses. A portion of the eastern boundary of the site is in close proximity to Ashfield Shale, which is comprised of black to dark grey shale and laminite.

3.2. Acid Sulfate Soils

A review of the Prospect Parramatta Acid Sulfate Soil Risk Map (1:25,000 scale) indicates that the site is in a map class description of "*No Known Occurrence*". Land management activities are not likely to be affected by acid sulfate soil materials.

3.3. Topography

The site topography was generally undulating, with overall slopes generally towards the south and south west, and some localised slopes in the northern portion, towards the east.

The detail and level survey presented in **Appendix A** provides further information on surface contours and elevations.

3.4. Hydrogeology

Surface water courses proximal to the site included:

- Parramatta River located approximately 400m to the south of the site.

Based on distances to the nearest surface water course and the site topography, groundwater flow in the vicinity of the site is considered likely to be towards the south.

A review of the NSW Office of Water groundwater database (www. http://allwaterdata.water.nsw.gov.au/water) indicated there are three (3) registered groundwater features located within a 500m radius of the site (GW1048997, GW1048998, and GW1048999):

- GW1048997 with an authorised purpose for "monitoring bore". The water bearing zone for the feature was at 2.4m and the standing water level in that bore was measured at 2.32m.
- GW1048998 with an authorised purpose for "monitoring bore". The water bearing zone for the feature was at 2.1m and the standing water level in that bore was measured at 2.5m.
- GW1048999 with an authorised purpose for "monitoring bore". The water bearing zone for the feature was at 2.4m and the standing water level in that bore was measured at 2.32m.

Each of the three features were located to the west of the site, considered to be in an inferred down or cross gradient location, relative to the site.

4. PREVIOUS CONTAMINATION ASSESSMENTS

It is noted that various typographical updates of contamination assessment reports have been undertaken to date (at the request of a previous AG client (Woods Bagot Pty Ltd)). For the purposes of this RAP, the following reports, with the original investigation dates referenced, were considered during the development of this plan:

- AG 2018a, '*Stage 1 Preliminary Site Investigation, Portion of Lot 1 in DP837179 (Lot 10 in DP1232584), Meadowbank Education and Employment Precinct Schools Project, 2 Rhodes Street, Meadowbank, NSW*', dated June 2019, ref: 6179-ER-1-1 REV5;

- AG 2018b, '*Stage 2 Detailed Site Investigation, Portion of Lot 1 in DP837179 (Lot 10 in DP1232584), Meadowbank Education and Employment Precinct Schools Project, 2 Rhodes Street, Meadowbank, NSW', dated June 2019*, ref: 6179-ER-1-2 REV6;

- AG 2019a, '*Supplementary Contamination Assessment, Portion of Lot 1 in DP837179 (Lot 10 in DP1232584), Meadowbank Education and Employment Precinct Schools Project, 2 Rhodes Street, Meadowbank, NSW*', *dated July 2019*, ref: 9280-ER-1-1 REV1;

- AG 2019b, '*Additional Supplementary Contamination Assessment, Portion of Lot 1 in DP837179 (Lot 10 in DP1232584), Meadowbank Education and Employment Precinct Schools Project, 2 Rhodes Street, Meadowbank, NSW*', *dated Sept 2019*, ref: 9692-ER-1-1 REV1;

A summary of these reports is presented in **Section 4.1 to 4.4.**

4.1. AG 2018a

AG were engaged by the then client, Woods Bagot to conduct a Stage 1 Preliminary Site Investigation (PSI) for a portion of the Meadowbank Education and Employment Precinct Schools Project site at 2 Rhodes Street, Meadowbank, NSW (the site).

AG had the following project appreciation:

- TAFE and NSW Department of Education are in negotiations for the sale/purchase of the site;
- the site is being considered for redevelopment, comprising a primary school and secondary school; and
- contamination assessment works are required to inform the property transaction process and master planning process.

The objectives of this investigation were to:

- assess the potential for contamination to be present on the site as a result of past and current land use activities;
- provide advice on whether the site would be suitable (in the context of land contamination) for a primary school and secondary school land use setting; and
- provide recommendations for further investigation, management and/or remediation (if warranted).

The scope of works undertaken to address the investigation objectives, included:

- a desktop review;

- a site walkover;
- data assessment and reporting.

Alliance Geotechnical (2018a) reported that the predominant historical land title holdings for the site included the Metropolitan Water Sewerage and Drainage Board, and the Meadowbank Manufacturing Company.

The site history data collected and site walkover observations made were assessed within the objectives of the investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AEC) and contaminants of potential concern (COPC) which have the potential to be present onsite.

Based on AG's assessment of the desktop review and site walkover data, in the context of the proposed development scenario, AG concluded that:

- there is a moderate potential for land contamination to be present on the site, as a result of past and current land use activities; and
- further investigation would be required to make an assessment of the suitability of the site, for a primary school and secondary school land use setting.

Based on these conclusions, AG made the following recommendations:

- A Stage 2 Detailed Site Investigation (DSI) should be undertaken for the site. AG notes that, if a Stage 2 DSI is undertaken while the site remains operational and/or while existing buildings and infrastructure remain on the site, there will likely be constraints limiting further assessment of some areas of the site, which may increase uncertainty around the contamination status of the site; and
- The Stage 2 DSI should be undertaken by a suitably experienced environmental consultant.

4.2. AG 2018b

AG were engaged by the then client, Woods Bagot, to conduct a Stage 2 Detailed Site Investigation (DSI) for a portion of the Meadowbank Education and Employment Precinct Schools Project site at 2 Rhodes Street, Meadowbank, NSW (the site).

AG had the following project appreciation:

- TAFE and NSW Department of Education are in negotiations for the sale/purchase of the site;
- The site is being considered for redevelopment, comprising a primary school and secondary school; and
- contamination assessment works are required to inform the property transaction process and master planning process.

The objectives of this investigation were to:

- assess the nature and likely extent of identified contaminants of potential concern (COPC) in the identified areas of environmental concern;
- provide advice on whether the identified COPC present an unacceptable human health exposure risk (in the context of land contamination) for the proposed land use setting; and
- provide recommendations for further investigation, management and/or remediation (if warranted).

The scope of works undertaken to address the investigation objectives, included:

- a desktop review;
- intrusive drilling and soil sampling fieldwork;
- laboratory analysis; and
- data assessment and reporting.
    - The site history data collected and site walkover observations made were assessed within the objectives of this investigation and in the context of the proposed development works. That assessment identified areas of environmental concern (AEC) and contaminants of potential concern (COPC) which have the potential to be present on site. The identified AEC and associated COPC are presented in the table below.

ID	AEC	Land Use Activity	Contaminants of Potential Concern
AEC01	Embankment	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC02	Block Y1	Boat building and chemical storage / handling	Hydrocarbons and metals
AEC03	Block Y6	Boat building and chemical storage / handling	Hydrocarbons and metals
AEC04	Former dwelling	Uncontrolled demolition	Metals and asbestos
AEC05	Former dwelling	Uncontrolled demolition	Metals and asbestos
AEC06	Open space	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC07	Embankment	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC08	Former building	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC09	Former dwelling	Uncontrolled demolition	Metals and asbestos
AEC10	Former greenhouse	Pesticide storage / handling	Pesticides and metals
AEC11	Multipurpose courts	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC12	Embankment	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC13	Embankment	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos

ID	AEC	Land Use Activity	Contaminants of Potential Concern
AEC14	Former industrial building	Manufacturing and demolition	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos.
AEC15	Former industrial building	Manufacturing and demolition	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC16	Former industrial building	Manufacturing and demolition	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC17	Carpark and grassed area	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC18	Small embankment	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
AEC19	Embankment next to path	Uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos
-	General site footprint	Potential uncontrolled filling	Hydrocarbons, pesticides, polychlorinated biphenyl, metals, asbestos

Soil sampling was undertaken by AG on 13 and 14 January 2018. A total of 44 sampling points (BH01 to BH41 and SS01 to SS03) were established on site. Sampling points BH01 to BH41 were excavated using a track mounted drilling rig fitted with push tube and solid flight augers, or a hand auger where access was limited. Soil samples at SS01 to SS03 were collected as grab samples from the surface.

The logs for the sampling points established onsite, are presented in **Appendix B**

Based on AG's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed redevelopment scenario, AG made the following conclusions:

- the concentrations of identified contaminants of potential concern in the soils assessed are considered unlikely to present an unacceptable direct contact human health exposure risk, with the exception of:
    - lead in soil at BH02 (560mg/kg), lead in soil at BH22 (490mg/kg) and lead in soil at BH24 (610mg/kg);
    - benzo(a)pyrene (TEQ) in soil at BH04 (8.5mg/kg), BH16 (18mg/kg), and BH23 (8.4mg/kg); and
    - asbestos in soils in the vicinity of sampling points BH07, SS02, SS03, BH30, BH40 and BH41;
- the concentrations of identified contaminants of potential concern in the soils assessed are considered unlikely to present an unacceptable inhalation / vapour intrusion human health exposure risk;

- the concentrations of identified contaminants of potential concern in the soils assessed are considered unlikely to present a petroleum hydrocarbon management limit risk;

- the asbestos detected in the soils assessed, may present an unacceptable human health exposure risk and unacceptable aesthetics risk;

- the site could be made suitable for the proposed land use setting, subject to the further assessment, management and/or remediation of potential unacceptable contamination risks and those areas unable to be assessed.

Based on these conclusions, AG made the following recommendations:

- A Supplementary Contamination Assessment should be undertaken by a suitably experienced environmental consultant to:
  - further characterise the nature and extent of the elevated concentrations of lead in soil risks and benzo(a)pyrene (TEQ) in soil risks;
  - further characterise the nature and extent of asbestos in soil risks, and provide a quantitative assessment of those risks;
  - address data gaps associated with AEC13, the southern portion of AEC10, and the central portions of AEC02, AEC03, AEC09, AEC12, AEC14, AEC15, AEC16 (constrained due to the presence of existing structures and/or accessibility constraints);

- consideration should be given to removal of existing structure and accessibility constraints, prior to undertaking the supplementary contamination assessment. Removal of access constraints would likely also require provision for significant surface and pavement disturbance across the site to facilitate quantitative asbestos in soil risk assessment;

- pending the findings of the supplementary contamination assessment, a remedial action plan should be prepared to address unacceptable soil contamination related human health exposure risks. The RAP should be prepared by a suitably experience consultant with reference to NSW OEH (2011) and include (but not be limited to) the following:
  - a remedial goal for the site;
  - an assessment of remedial options available to address the identified asbestos risks. These options may include removal offsite, in-situ containment, ex-situ containment, or a combination of these:
    - Offsite removal would likely involve excavation and disposal of impacted materials. Subject to successful removal of all impacted material, it is unlikely that a long term operational environmental management plan (EMP) would be required for the proposed development site;

    - In-situ containment could include application of a capping layer across the site. Typically, concrete and/or asphalt pavements are adequate for non-exposed soils, while a minimum 0.5m thickness of clean fill (excluding planting media) would be required in unsealed areas (e.g. playgrounds, soft landscaping etc). Depending on design levels for the development, a portion of the impacted soils may require removal offsite to allow for capping layer thicknesses. This remedial strategy would likely require a long-term environmental management plan (EMP) for the proposed development site, and notification on the Section 149 planning certificate and/or title for the site;

- Ex-situ containment could include excavation and relocation of a portion of the impacted material elsewhere on the site, and application of a capping layer (similar to that discussed for in-situ containment). This remedial strategy would likely require a long term operational environmental management plan (EMP) for the proposed development site, and notification on the Section 149 planning certificate and/or title for the site;
- the proposed testing to validate the site after remediation;
- the proposed testing to validate the site after remediation;
- a contingency plan to address unexpected finds or if the selected remedial strategy fails; and
- a site management plan (for the remediation works).

4.3. AG 2019a

In early 2019, Ward Civil were engaged by Woods Bagot to undertake demolition and clearing of the site. Alliance Geotechnical Pty Ltd (AG) were subsequently engaged by Ward Civil, to undertake the Supplementary Contamination Assessment that was suggested in the initial RAP for the Meadowbank Education and Employment Precinct Schools Project, 2 Rhodes Street, Meadowbank, NSW.

The objectives of this investigation were to:

- Assess data gaps and delineate the identified contamination presented in the Stage 2 Detailed Site Investigation (DSI) completed by AG (AG 2018b);
- Assess the potential nature and extent of identified contaminants of potential concern on the site, with reference to the areas of environmental concern reported by AG in (AG, 2018b)
- Provide advice on whether the site would be suitable (in the context of land contamination) for the proposed land use setting;
- Provide recommendations for further investigation, management and/or remediation (if warranted).

The scope of works undertaken to address the investigation objectives, included:

- A desktop review of relevant information relating to the site;
- A site walkover to understand current site conditions;
- Conduct an intrusive site investigation using both excavator and utility-mounted drill rig to assess subsurface ground conditions and to facilitate the collection of representative soil samples;
- Laboratory analysis to compliment the in-situ testing completed during the field investigation; and
- Data assessment and report preparation.

Based on AG's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed redevelopment scenario, AG made the following conclusions:

<u>Data Gap Assessment (previously inaccessible areas)</u>

- the detected concentrations of identified contaminants of potential concern in the soils assessed are considered unlikely to present an unacceptable direct contact human health exposure risk;
- fibrous asbestos and asbestos fines detected in the soils assessed, may present an unacceptable human health exposure risk, at sampling points TP53 and TP57. Sampling point TP57 was considered to have been adequately delineated
- the detected concentrations of identified contaminants of potential concern in the soils assessed are considered unlikely to present an unacceptable inhalation / vapour intrusion human health exposure risk; and
- the detected concentrations of identified contaminants of potential concern in the soils assessed are considered unlikely to present a petroleum hydrocarbon management limit risk.

Chemical Delineation Assessment

- the extent of previously identified lead contamination at sampling points BH02, BH22 and BH24, was considered to have been adequately delineated; and
- the extent of previously identified benzo(a)pyrene contamination at sampling points BH04, BH16 and BH23, was considered to have been adequately delineated.

Asbestos Delineation Assessment

- the extent of previously identified asbestos contamination at sampling points SS02, SS03, BH07, BH30, BH40, TP04B, BH41 and TP53 was considered to have been adequately delineated;

Indicative Waste Classification

- General Solid Waste (Special Waste).

Based on these conclusions, AG made the following recommendations:

- The RAP could be updated to include the recently identified contamination risks onsite and outline the appropriate remedial measures to adequately remove the contamination pathway and associated human health exposure risks. It is recommended that any update to the RAP be undertaken by an appropriately experienced environmental consultant.

4.4. AG 2019b

AG were engaged by Woods Bagot Pty Ltd, to undertake a Supplementary Asbestos Assessment so to further delineate the extent of contamination identified in the previous contamination assessment of June 2019.

The objectives of this investigation were to:

- Assess data gaps and delineate the identified contamination presented in the Stage 2 Detailed Site Investigation (DSI) completed by AG (AG 2018b) and in the Supplementary Contamination Assessment (SCA) completed by AG in 2019 (AG, 2019a);
- Assess the potential nature and extent of identified contaminants of potential concern on the site, with reference to the areas of environmental concern reported by AG in (AG, 2018b & AG, 2019a);

- Provide advice on whether the site would be suitable (in the context of land contamination) for the proposed land use setting; and
- Provide recommendations for further investigation, management and/or remediation (if warranted).

The scope of works undertaken to address the investigation objectives, included:

- A desktop review of relevant information relating to the site;
- A site walkover to understand current site conditions;
- Conduct an intrusive site investigation using an excavator to assess subsurface ground conditions and to facilitate the collection of representative soil samples;
- Laboratory analysis to compliment the in-situ testing completed during the field investigation; and
- Data assessment and report preparation.

Based on AG's assessment of the desktop review information, fieldwork data and laboratory analytical data, in the context of the proposed redevelopment scenario, AG made the following conclusions:

Asbestos Delineation Assessment

- the detection of ACM in analysed fragments FCS01 and FCS-02 may present an unacceptable human health exposure risk. Widespread presumed ACM fragments have also been observed on surface soils in areas of the site and as such AG have adjusted the areas where remediation is required.

Based on these conclusions, AG make the following recommendations:

- A final site RAP be prepared and updated to include the overall identified contamination risks onsite and outline the appropriate remedial measures to adequately remove the contamination pathway and associated human health exposure risks. It is recommended that any update to the RAP be undertaken by an appropriately experienced environmental consultant.

5. REVISED CONCEPTUAL SITE MODEL

5.1. Areas of Environmental Concern and Contaminants of Potential Concern

Previous contamination investigations were assessed within the objectives of this project and in the context of the proposed development works. That assessment identified the following areas of environmental concern (AEC) and contaminants of potential concern (COPC) which either require assessment, further assessment, and/or remediation. The AECs have been updated to reflect a consolidated summary of known site contamination identified to date and is presented in **Figure 3a** and **Figure 3b** and associated COPC are presented in **Table 5.1**. Please note that previously referenced AECs may not have numerical consistency with the AECs as identified in this RAP.

Table 5.1. AEC and COPC

Area of Environmental Concern	Contaminant of Potential concern	Media	Receptor	Potential Exposure Pathway
AEC01	Lead	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC02	Lead	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC03	Lead	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC04	Benzo(a)pyrene	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC05	Benzo(a)pyrene	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC06	Benzo(a)pyrene	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Direct contact and/or ingestion
AEC07	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation

Area of Environmental Concern	Contaminant of Potential concern	Media	Receptor	Potential Exposure Pathway
AEC08	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation
AEC09	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation
AEC10	Asbestos	Soil	Site Users and Visitors. Future Construction and maintenance personal.	Inhalation

5.2. Land Use Setting

AG understands that the proposed development works includes a multi-level, multi-purpose, integrated school building with a primary school wing and high school wing.

Based on the proposed development works and guidance provided in Section 2.2 of NEPC (1999a), AG considers it reasonable to adopt the 'HIL A – residential' land use setting for the south eastern portion of the site, and 'HIL C – public open space' land use setting for the north western and southern portions of the site, for the purpose of assessing land contamination exposure risks.

5.3. Direct Contact – Human Health

Portions of the site will be covered with building footprints and hardstand areas, however some exposed soil areas will likely remain, in the form of playground areas, sporting fields, and general softscape. It is considered that a complete direct contact exposure pathway for may exist in these areas.

5.4. Inhalation / Vapour Intrusion – Human Health

In order for a potentially unacceptable inhalation / vapour intrusion human health exposure risk to exist, a primary vapour source (e.g. underground storage tank) or secondary vapour source (e.g. significantly contaminated soil or groundwater) is required.

The historical evidence reviewed did not indicate a potential for a primary source to be present on the site.

The same historical evidence indicated a potential land use activity to be uncontrolled filling. The excavation, transport, placement and spreading of imported (uncontrolled) fill material involves significant disturbance of soils which typically results in volatilisation of vapour producing contaminants.

A groundwater source of vapours was not identified for the site.

Vapours have not been identified in soils on site at concentrations which might present an unacceptable exposure risk.

5.5. Management Limits for Petroleum Hydrocarbon Compounds

NEPC (1999a) notes that there are a number of policy considerations which reflect the nature and properties of petroleum hydrocarbons:

- formation of observable light non-aqueous phase liquids (LNAPL);
- fire and explosive hazards; and
- effects on buried infrastructure (e.g. penetration of or damage to, in-ground services by hydrocarbons).

NEPC (1999a) includes 'management limits' to avoid or minimise these potential effects. Application of the management limits requires consideration of site-specific factors such as the depth of building basements and services and depth to groundwater, to determine the maximum depth to which the limits should apply. NEPC (1999a) also notes that management limits may have less relevance at operating industrial sites which have no or limited sensitive receptors in the area of potential impact, and when management limits are exceeded, further site-specific assessment and management may enable any identified risk to be addressed.

Given the nature of the identified contaminants of potential concern at the site, further assessment against these management limits is considered warranted.

5.6. Aesthetics – Human Health

Section 3.6.3 of NEPC (1999a) advises that there are no specific numeric aesthetic guidelines, however site assessment requires a balanced consideration of the quantity, type and distribution of foreign material or odours in relation to the specific land use and its sensitivity.

Portions of the site will be covered with building footprints and hardstand areas; however, some exposed soil areas will likely remain, in the form of playground areas, sporting fields, and general softscape. It is considered that a complete aesthetics exposure pathway for may exist in these areas.

5.7. Terrestrial Ecosystems

NEPC (1999) requires a pragmatic risk-based approach should be taken in applying ecological investigation and screening levels in residential and commercial / industrial land use settings.

It is noted that vegetation on site and on adjacent properties did not display evidence of significant or widespread phytotoxic impact (i.e. plant stress or dieback).

Further assessment of unacceptable risk to terrestrial ecosystems is considered not warranted.

6. REMEDIATION STRATEGY OPTIONS DISCUSSION

A range of soil remediation options have been considered for the site. The options considered include only those which are proven to be effective on past remediation or related projects. The following sections review each of the soil remediation option considered and outline the selection process used.

6.1. Remediation Strategy Development Rationale

Given the distribution of contamination has been defined, it is recommended that various remediation options be considered.

Due to the nature and distribution of the contaminant in the underlying soil matrix, an effective remediation approach for the site must be tailored towards the key impacted source material which is the impacted reworked imported fill material. A discussion of remediation options for impacted soil is provided in the below sections.

6.2. Remediation Options for Impacted Soil

The potential list of remediation options associated with impacted soil is extensive.

Consequently, only relevant remediation strategies that have been considered which include the following:

- Institutional controls / do nothing;
- Capping and Isolation/on-site treatment; and
- Excavation and off-site disposal.

Treatment Option	Description	Advantages			Disadvantages		
		Technical	Financial	Logistical	Technical	Financial	Logistical
Do Nothing Scenario	No remedial action taken. Impacted soil left in-situ.	Lowest greenhouse emissions. Not considered a significant human health risk as long as the site is not disturbed.	No short-term remedial costs incurred. No operation and maintenance required.	No disturbance to site required. Existing landscape can be retained. No odour or dust management is required.	As the site is to be developed for 'education' purposes, direct access to soil will not be restricted. This option is not protective of human health including site development workers and future tenants of the site in the long term, given increased likelihood for adverse effects with prolonged exposure. On-going liabilities including human health and the environment would remain.	Potential for future liability (e.g. EPA notices and potential health impacts to site users if exposed to unsafe levels for a long period of time.)	A long-term environmental management plan will need to be developed for site users and potential future excavation or maintenance requirements. Impacted material would remain on-site indefinitely.
Capping and Isolation of impacted soils	Soil removal, capping and isolation to restrict direct access to soil. Some impacted soil left in-situ.	Protective of human health including construction/ maintenance workers. Direct access to soil will be restricted and can be isolated with	Potentially lower costs through greater confidence of delivery through strategic planning (no time delays).	Moderate excavation is required to remove all the identified AECs across the entire site. Limited environmental management required during the	Some impacted material would remain on-site indefinitely. Not suitable for asbestos impacted soil identified in the top 3 metres of the site as a notation would be placed on the planning certificate.	Moderate disposal costs incurred in addition to the cost of importing clean soil material.	A long-term environmental management plan will need to be developed for site users and potential future excavation or maintenance requirements.

Treatment Option	Description	Advantages			Disadvantages		
		Technical	Financial	Logistical	Technical	Financial	Logistical
		the appropriate mitigation measures.		works (e.g. dust, noise) ~ 2 months to remediate the site.	Consideration must be given to the existing drainage easement on site and the area will be required to be designed and constructed to a standard that satisfies Sydney Water/ Council development standards. Ecological impacts from loss of existing trees on the site.		Impacted material would remain on-site indefinitely.
Excavation & Offsite Disposal	Removal of all identified contaminated soil to an EPA licensed waste facility. Validation sampling to demonstrate the conditions of the residual soil impact. Reinstatement of excavated	Protective of human health including future tenants and construction workers. Facilitate future development of the entire site. No long-term EMP will be required.	No onsite operation and maintenance required.	No ongoing management required as the impacted soil will have been removed offsite.	Based on the soil investigation results, for off-site disposal purposes, the impacted soil to be excavated and removed offsite would require waste classification in accordance with the NSW EPA *Waste Classification Guidelines 2014.* Ecological impacts from loss of existing trees on the site.	Very high remedial cost incurred to remediate and backfill the entire site.	Major excavation works is required. Odour, vapour and dust management required during the excavation works. May increase truck traffic in area to transport contaminated soil for a short period of time.

Treatment Option	Description	Advantages			Disadvantages		
		Technical	Financial	Logistical	Technical	Financial	Logistical
	areas with material validated as suitable for the intended land use.						

6.3 Selected Remediation Strategy

Based on AG's assessment detailed above and our understanding of the project objectives, the remedial strategies will comprise a combination of 'excavation and offsite disposal' of selected areas and 'capping and isolation of impacted soils'.

Below is a summary of the remediation strategies in respect of AECs.

Excavation & Offsite Disposal

- Lead and benzo(a)pyrene impacted soils identified within AEC01, AEC02, AEC04 and AEC06 are proposed to be excavated for offsite disposal. Waste classification analysis will be required to be carried out on all soil materials to facilitate offsite disposal in accordance with the NSW EPA *Waste Classification Guidelines 2014*; and
- Asbestos impacted soils identified within AEC07, AEC08 and AEC10 are proposed to be excavated for offsite disposal. Waste classification analysis will be required to be carried out on all soil materials to facilitate offsite disposal in accordance with the NSW EPA *Waste Classification Guidelines 2014*.

Excavation & Offsite Disposal followed by Onsite Capping & Isolation of Impacted Soils

Asbestos impacted soils identified within AEC09 are proposed to be excavated to a maximum depth of 1m below ground surface for offsite disposal. In nominated areas where native trees are located, the extent of excavation shall be reduced to 500mm below ground surface. Waste classification analysis will be required to be carried out on all soil materials to facilitate offsite disposal in accordance with the NSW EPA *Waste Classification Guidelines 2014*. The capping strategy within AEC09 of remaining soil material has been prepared in accordance with relevant sections of WA DOH (2009). The containment by capping strategy is primarily focussed on isolating the fill material using appropriate barriers to prevent the disturbance and generation of potentially harmful materials. This will be carried out by:

- placement of geo-textile membrane (marker layer) over contaminated fill material, ensuring the geotextile membrane comprises:
    - Water permeable;
    - Highly visible;
    - Rot-proof and chemically inert;
    - High tensile strength;
    - Covers contaminated area and 0.5m, beyond contaminated boundary (if practical); and
    - Parallel sheets to be fixed together or overlap by a minimum of 20cm.
- Ensure a capping layer of clean fill (ENM or VENM) is placed over geo-textile membrane to the nominal depth of up to 1.0m; and
- Vegetate/landscape the surface of the capping layer, to protect the clean fill capping layer from natural erosion and/or anthropogenic disturbances.

To preserve the ecological significance of native trees onsite, it is proposed to hand pick visible construction and demolition waste and potential asbestos containing material in selected areas under the tree canopies, where feasible. It is noted that soil materials in surrounding comprises predominantly horticultural soils and so the strategy is to minimise the impacts of tree removal by

handpicking (where possible) construction and demolition waste in adjacent soils. This strategy shall be subject to ongoing review, subject to the levels of contamination found during the hand-picking exercise and remediation works.

Lead impacted soils identified within AEC03 will be capped with 500mm of clean fill (ENM or VENM) and planted with native grasses. This area will be fenced off and made inaccessible prior to future occupation.

Benzo(a)pyrene impacted soils identified within AEC05 are not proposed for remediation but will instead by contained onsite by a sealed decking structure over the identified AEC. Therefore, due to the depth to identified contamination and the proposed development concept within AEC05, AG deem the risk to human health as minimal with no further remedial action required.

Refer to **Figure 3a, Figure 3b** and the **Soil Contamination Remediation Plan** which indicate the areas which will be subject to remediation and the remedial strategy for each area to mitigate the risks to human health and the wider environment.

7. REMEDIAL ACTION PLAN

7.1. Remedial Goal

The remedial goal for this site is to remediate potential soil contamination (where identified) to a level that does not present an unacceptable human health exposure risk, based on the proposed land use setting.

7.2. Remediation Extent

The lateral extent of remediation on the site is considered to be, as a minimum, the following:

- AEC01 – lead impacted soils delineated around TP24;
- AEC02 – lead impacted soils delineated around TP22;
- AEC03 – lead impacted soils delineated around BH02;
- AEC04 – benzo(a)pyrene impacted soils delineated around TP23;
- AEC05 – benzo(a)pyrene impacted soils delineated around TP16
- AEC06 – benzo(a)pyrene impacted soils delineated around TP04;
- AEC07 – asbestos impacted soils within the northwest portion of the site;
- AEC08 – asbestos impacted soils within the southeast portion of the site;
- AEC09 – asbestos impacted soils within the southwest portion of the site; and
- AEC10 – asbestos impacted soils within the northwest portion of the site.

Refer to **Figure 3a, Figure 3b** and the **Soil Contamination Remediation Plan**, which indicate the areas which will be subject to remediation and the remedial strategy for each area to mitigate the risks to human health and the wider environment.

It is noted that the lateral extent of remediation may be altered, during remedial works based on site observations and validation soil sample analytical laboratory results.

7.3. Sequence of Works for Remediation

7.3.1. Remediation Schedule

Remediation works will likely be completed in 1 to 3 months from council approval. It is expected that remediation timeframes will be further refined following appointment of the remediation contractor, and the staging of the remediation tasks in the contractor's works program.

7.3.2. Notifications and Approvals

The proposed remediation works would likely be classed as Category 1 under SEPP55, which require consent from the planning authority.

The following information will also be provided to the planning consent authority as part of the development application for the remediation works:

- copies of the contamination assessment report and this RAP;
- contact details of the contractor appointed to undertake the remediation works (when appointed);

- contact details of the parties responsible (if not the remediation contractor) for ensuring remediation works comply with relevant regulatory requirements.

A notification will be submitted to SafeWork NSW prior to undertaking asbestos removal works (where applicable). The removal works will be undertaken by a suitably licensed contractor.

It is noted that:

- where remedial works requires demolition, excavation or shoring, development consent or a construction certificate may be required from the planning consent authority; and
- where remedial works occur adjacent to Roads and Maritime Services (RMS) controlled assets, further approvals may be needed to address RMS requirements. It is expected that any such requirements would be identified by Council during the 30-day notification period.

Within one month of completion of remediation and validation works, a notification will be submitted to the planning consent authority.

7.3.3. Remediation Works

The following remediation works, is based on data available at the time of preparing this RAP.

7.3.3.1. AEC01 – Lead Impacted Soils

The inferred likely extent of remediation will be marked out. Impacted soils will be excavated and removed from site, for offsite disposal, in accordance with the relevant waste classification.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 8**.

7.3.3.2. AEC02 – Lead Impacted Soils

The inferred likely extent of remediation will be marked out. Impacted soils will be excavated and removed from site, for offsite disposal, in accordance with the relevant waste classification.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 8**.

7.3.3.3. AEC03 – Lead Impacted Soils

The inferred likely extent of remediation will be marked out. Impacted soils identified will be capped with 500mm of clean fill (ENM or VENM) and planted with native grasses. This area will be fenced off and made inaccessible prior to future occupation.

The validation strategy for the residual soils is set out in **Section 8**.

7.3.3.4. AEC04 – Benzo(a)pyrene Impacted Soils

The inferred likely extent of remediation will be marked out. Impacted soils will be excavated and removed from site, for offsite disposal, in accordance with the relevant waste classification.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 8**.

7.3.3.5. AEC05 – Benzo(a)pyrene Impacted Soils

Benzo(a)pyrene impacted soils identified within AEC05 are not proposed for remediation but will instead by contained onsite by a sealed decking structure over the identified AEC.

7.3.3.6. AEC06 – Benzo(a)pyrene Impacted Soils

The inferred likely extent of remediation will be marked out. Impacted soils will be excavated and removed from site, for offsite disposal, in accordance with the relevant waste classification.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 8**.

7.3.3.7. AEC07 – Asbestos Impacted Soils

Impacted soils within AEC07 will be excavated to a maximum depth of 0.3m below ground surface and removed from site, for offsite disposal, in accordance with the relevant waste classification and SafeWork Codes of Practice.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 8.**

7.3.3.8. AEC08 – Asbestos Impacted Soils

Impacted soils within AEC08 will be excavated to a maximum depth of 0.3m below ground surface and removed from site, for offsite disposal, in accordance with the relevant waste classification and SafeWork Codes of Practice.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 8**.

7.3.3.9. AEC09 – Asbestos Impacted Soils

Impacted soils within AEC09 will be excavated to a maximum depth of 1m below ground surface and removed from site, for offsite disposal, in accordance with the relevant waste classification and SafeWork Codes of Practice. In nominated areas where native trees are located, the extent of excavation shall be reduced to 500mm below ground surface.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The capping strategy within AEC09 of remaining soil material has been prepared in accordance with relevant sections of WA DOH (2009). The containment by capping strategy is primarily focussed on isolating the fill material using appropriate barriers to prevent the disturbance and generation of potentially harmful materials. This will be carried out by:

- placement of geo-textile membrane (marker layer) over contaminated fill material, ensuring the geotextile membrane comprises:
    - Water permeable;
    - Highly visible;
    - Rot-proof and chemically inert;
    - High tensile strength;
    - Covers contaminated area and 0.5m, beyond contaminated boundary (if practical); and
    - Parallel sheets to be fixed together or overlap by a minimum of 20cm.
- Ensure a capping layer of clean fill (ENM or VENM) is placed over geo-textile membrane to the nominal depth of up to 1.0m; and
- Vegetate/landscape the surface of the capping layer, to protect the clean fill capping layer from natural erosion and/or anthropogenic disturbances.

To preserve the ecological significance of native trees onsite, it is proposed to hand pick visible construction and demolition waste and potential asbestos containing material in selected areas under the tree canopies, where feasible. It is noted that soil materials in surrounding comprises predominantly horticultural soils and so the strategy is to minimise the impacts of tree removal by handpicking (where possible) construction and demolition waste in adjacent soils. This strategy shall be subject to ongoing review, subject to the levels of contamination found during the hand-picking exercise and remediation works.

The validation strategy for the residual soils is set out in **Section 8.**

7.3.3.10. AEC10 – Asbestos Impacted Soils

Impacted soils within AEC10 will be excavated to a maximum depth of 0.4m below ground surface and removed from site, for offsite disposal, in accordance with the relevant waste classification and SafeWork Codes of Practice.

The remediation contractor will retain transport and disposal records for all wastes removed off site.

The validation strategy for the residual soils is set out in **Section 8**.

7.3.4. Backfilling

Should remedial excavations require backfilling, then backfill soils will be limited to:

- Virgin excavated natural material (VENM);
- Excavated natural material (ENM); or
- Other material that is the subject of a resource recovery exemption and the placement of that material is within the lawful constraints of the resource recovery exemption (and does not present an unacceptable exposure risk to human health or the environment, within the context of the proposed land use setting).

Consideration will be given to geotechnical engineering requirements associated with backfilling; however, those requirements will be specified by others elsewhere.

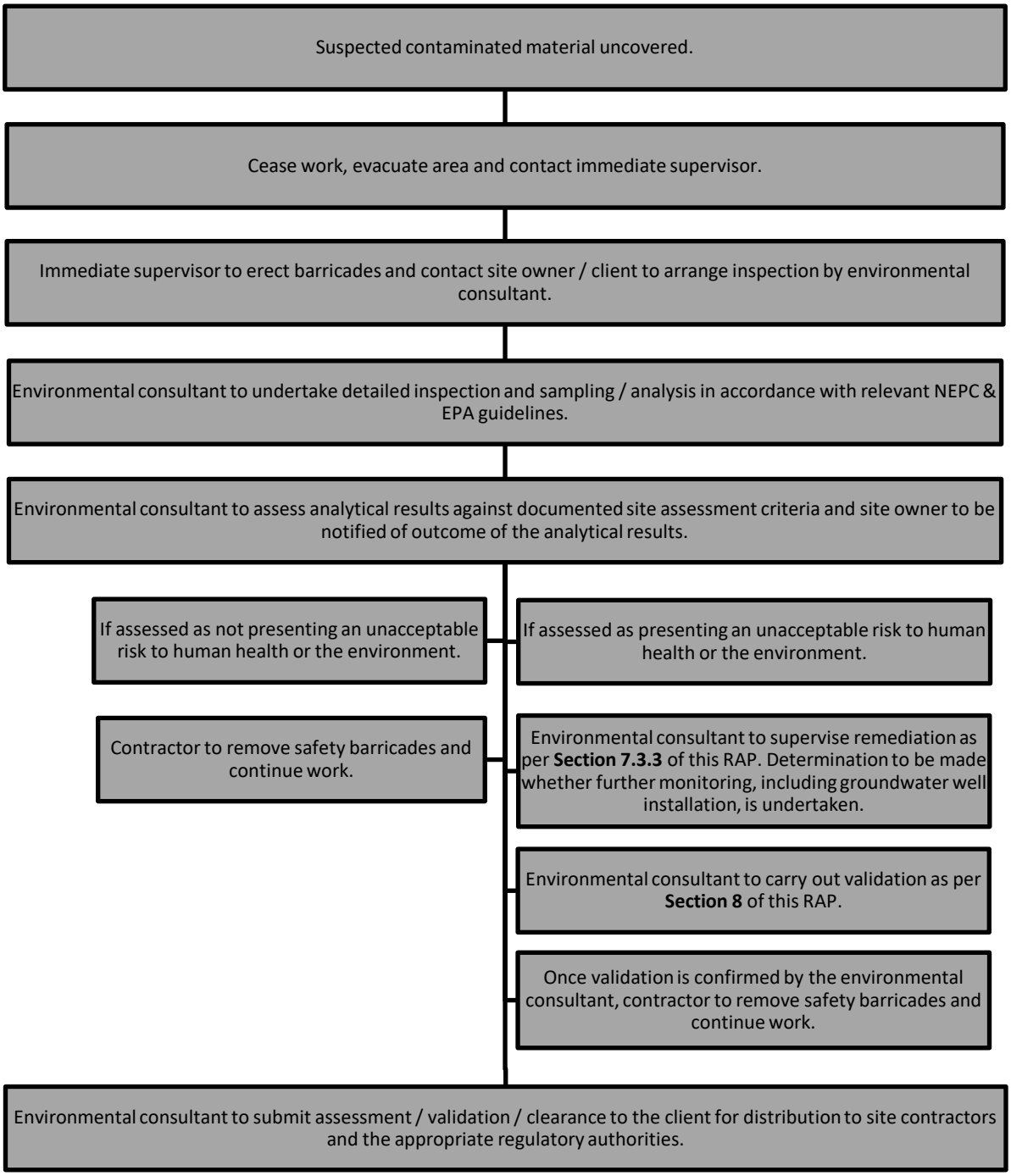
7.3.5. Unexpected Finds Protocol

The contamination assessments to date have not indicated the presence of significant soil contamination that is unacceptable for the proposed land use beyond the area of remediation described in this RAP. However, it is possible that unexpected finds may be present within the fill material. To this end, an unexpected finds protocol has been compiled, and is summarised herein. Unexpected finds could include, but are not limited to:

- Other underground storage tanks that are previously not identified;
- Buried containers and drums;
- Phase separated hydrocarbons;
- Powders and other suspicious buried material;
- Potentially hazardous materials; and
- Evidence of contamination including significant staining, odours and discolouration.

In the event that any material suspected of containing potentially hazardous substances is found during remediation works, the following unexpected finds protocol is to be followed:

Unexpected Finds Protocol



8. VALIDATION DATA QUALITY OBJECTIVES

Appendix B of NEPC (1999b) provides guidance on the development of data quality objectives (DQO) using a seven-step process.

The DQO for this project are set out in **Sections 8.1** to **8.7** of this report.

8.1. Step 1: State the problem

The first step involves summarising the contamination problem that will require new data and identifying the resources available to resolve the problem.

The objective of this project is to assess whether the remedial goal has been achieved, and whether the site presents an unacceptable human health exposure risk, for the proposed land use setting.

This project is being undertaken because:

- the site is the subject of redevelopment works; and
- historically identified areas of environmental concern on the site, have the potential to present an unacceptable human health exposure risk in the context of the proposed land use setting.

The project team identified for this project includes Alliance Geotechnical Pty Ltd, the developer and the planning consent authority.

The regulatory authorities identified for this investigation include NSW EPA, SafeWork NSW and the local Council.

8.2. Step 2: Identify the decision/goal of the study

The second step involves identifying decisions that need to be made about the contamination problem and the new environmental data required to make them.

The decisions that need to be made during this investigation include:

- Is the environmental data collected for the project, suitable for assessing relevant land contamination exposure risks?
- Do the concentrations of identified contaminants of potential concern (COPC) present an unacceptable exposure risk to identified receptors, for the proposed land use setting?
- Is the site suitable for the proposed land use setting, in the context of land contamination?

8.3. Step 3: Identify the information inputs

The third step involves identifying the information needed to support decisions and whether new environmental data will be needed.

The inputs required to make the decisions set out in **Section 8.2** for this investigation, will include:

- data obtained during searches of the site's history;
- the nature and extent of sampling at the site, including both density and distribution;
- samples of relevant site media;

- the measured physical and/or chemical parameters of the site media samples (including field screening and laboratory analysis, where relevant); and
- assessment criteria adopted for each of the media sampled.

Taking into consideration the objectives of this project, and the conceptual site model and land use setting presented in **Section 5** of this project, the assessment criteria relevant to the proposed land use setting have been adopted for this investigation

- Human health direct contact – HILs in Table 1A (1) in NEPC (1999a) and HSLs in Table B4 of Friebel, E & Nadebaum, P (2011);
- Human health inhalation/vapour intrusion – HSLs in Table 1 (A) in NEPC (1999a);
- Human health (asbestos) – HSLs in Table 7 of NEPC (1999a);
- Petroleum hydrocarbon compounds (management limits) – Table 1 B(7) of NEPC (1999a); and
- Aesthetics – no highly malodorous site media (e.g. strong residual petroleum hydrocarbon odours, hydrogen sulphide in site media, organosulfur compounds), no hydrocarbon sheen on surface water, no discoloured chemical deposits or soil staining with chemical waste other than of a very minor nature, no large monolithic deposits of otherwise low risk material (e.g. gypsum as powder or plasterboard, cement kiln dust), no presence of putrescible refuse including material that may generate hazardous levels of methane such as a deep-fill profile of green waste or large quantities of timber waste, and no soils containing residue from animal burial (e.g. former abattoir sites).

8.4. Step 4: Define the boundaries of the study

The fourth step involves specifying the spatial and temporal aspects of the environmental media that the data must represent to support decisions.

The spatial extent of the project will be limited to the site as defined by its boundaries.

The temporal boundaries of the project include:

- the project timeframes presented in the AG proposal for this project, and subsequent remediation contractor works program;
- unacceptable weather conditions at the time of undertaking fieldwork, including rainfall, cold and/or heat;
- access availability of the site (to be defined by the site owner/representative); and
- availability of AG field staff (typically normal daylight working hours, Monday to Friday).

The lateral extent that contamination is expected to be distributed across, based on the conceptual site model, is defined by the inferred boundaries of the areas of environmental concern (AEC).

The vertical extent that contamination is expected to be distributed across, based on the conceptual site model and the project scope, is limited to shallow fill material.

The scale of the decisions required will be based on the entire site.

Constraints which may affect the carrying out of this investigation may include access limitations, presence of above and below ground infrastructure, and hazards creating health and safety risks.

8.5. Step 5: Develop the analytical approach (or decision rule)

The fifth step involves defining the parameter of interest, specifying the action level, and integrating information from Steps 1 to 4 into a single statement that gives a logical basis for choosing between alternative actions.

8.5.1. Rinsate Blanks

One rinsate blank will be collected and scheduled for analysis, for each day of sampling undertaken, if non-disposable sampling equipment was used on that day. The rinsate blank will be analysed for at least one of the analytes the sample/s collected that day are being scheduled for analysis for (with the exception of asbestos).

8.5.2. Trip Spikes and Trip Blank Samples

One trip spike and trip blank sample will be used and scheduled for analysis, for each day of sampling undertaken, if site samples being collected that day are being analysed for volatile contaminants of concern (typically BTEX and/or TRH C_6-C_{10}).

8.5.3. Field Duplicates and Field Triplicates

Field duplicate and Field triplicates will be collected at a rate of one per twenty (5%) site samples collected. The duplicates and triplicates collected will be analysed for at least one of the analytes that the parent sample of the duplicate/triplicate is being scheduled for analysis for (with the exception of asbestos).

The relevant percent difference (RPD) of concentrations of relevant analytes, between the parent sample and the duplicate/triplicate will be calculated.

8.5.4. Laboratory Analysis Quality Assurance / Quality Control

The analytical laboratory QA/QC program will typically include laboratory method blank samples, matrix spike samples, surrogate spike samples, laboratory control samples, and laboratory duplicate samples.

8.5.5. If/Then Decision Rules

AG has adopted the following 'if/then' decision rules for this investigation:

- If the result of the assessment of field data and laboratory analytical data is considered acceptable, then that field data and laboratory analytical data is suitable for interpretation within the scope of this investigation; and
- If the field data and laboratory analytical data is within the constraints of the assessment criteria adopted for this investigation (refer **Section 8.3**), then the contamination exposure risks to identified receptors, are considered acceptable.

In the event the assessment of field data and/or laboratory analytical data results in the data being not suitable for interpretation, then AG will determine if additional data is required to allow interpretation to be undertaken.

In the event that field data and/or laboratory analytical data exceeds the assessment criteria adopted for this investigation (refer **Section 8.3**), AG will undertake an assessment of the exceedance in the context of the project objectives to determine if additional data is required and whether management and/or remediation is required.

8.6. Step 6: Specify the performance or acceptance criteria

The sixth step involves specifying the decision maker's acceptable limits on decision errors, which are used to establish performance goals for limiting uncertainties in the data. When assessing contaminated land, there are generally two types of errors in decision making:

- Contamination exposure risks for a specific land use setting are acceptable, when they are not; and
- Contamination exposure risks for a specific land use setting are not acceptable, when they are.

AG will mitigate the risk of decision error by:

- Calculation of the 95% upper confidence limit (UCL) statistic to assess the mean concentration of relevant contaminants of potential concern;
- Assignment of fieldwork tasks to suitably experienced AG consulting staff, and suitably experienced contractors;
- Assignment of laboratory analytical tasks to reputable NATA accredited laboratories;
- Assignment of data interpretation tasks to suitably experienced AG consulting staff, and outsourcing to technical experts where required.

AG will also adopt a range of data quality indicators (DQI) to facilitate assessment of the completeness, comparability, representativeness, precision and accuracy (bias).

Completeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Critical locations sampled	Refer **Section 8.7.1**	Critical samples analysed according to DQO	Refer **Section 8.7.7**
Critical samples collected	Refer **Section 8.7.1**	Analytes analysed according to DQO	Refer **Section 8.7.7**
SOPs appropriate and complied with	100%	Appropriate laboratory analytical methods and LORs	Refer **Section 8.7.7**
Field documentation complete	All sampling point logs, calibration logs and chain of custody forms	Sample documentation complete	All sample receipt advices, all certificates of analysis

		Sample extraction and holding times complied with	Refer **Section 8.7.8**
Comparability			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Same SOPs used on each occasion	100%	Same analytical methods used by primary laboratory	Refer **Section 8.7.8**
Climatic conditions	Samples stored in insulated containers with ice, immediately after collection	Same LORs at primary laboratory	Refer **Section 8.7.8**
Same types of samples collected, and handled/preserved in same manner	All soil samples same size, all stored in insulated containers with ice	Same laboratory for primary sample analysis	All primary samples to SGS Environmental
		Same analytical measurement units	Refer **Section 8.7.8**
Representativeness			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Appropriate media sampled according to SAQP	Refer Section 8.4	Samples analysed according to SAQP	Refer **Section 8.7.7**
Media identified in SAQP sampled	Refer Section 8.4		
Precision			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**

Field duplicate / triplicate RPD	Minimum 5% duplicates and triplicates No limit for analytical results <10 times LOR 50% for analytical results 10-20 times LOR 30% for analytical results >20 times LOR	Laboratory duplicates	No exceedances of laboratory acceptance criteria
SOPs appropriate and complied with	100%		
Accuracy (bias)			
Field Considerations	**Assessment Criterion**	**Laboratory Considerations**	**Assessment Criterion**
Rinsate blanks	Less than laboratory limit of reporting	Laboratory method blank	No exceedances of laboratory acceptance criteria
Field trip spikes	Recoveries between 60% and 140%	Matrix spike recovery	No exceedances of laboratory acceptance criteria
Field trip blanks	Analyte concentration <LOR	Surrogate spike recovery	No exceedances of laboratory acceptance criteria
		Laboratory control sample recovery	No exceedances of laboratory acceptance criteria

8.7. Step 7: Develop the plan for obtaining data

The seventh step involves identifying the most resource effective sampling and analysis design for generating the data that is required to satisfy the DQOs.

8.7.1. Validation Sampling

Validation should focus on collecting clear evidence to assess whether the key objectives have been met. Validation sampling programs should identify and delineate the lateral and vertical extent of contamination (if any) and arrive at a scientifically defensible and statistically valid data set which characterises the chemical concentrations and human health risk present at the site.

An appropriately experienced environmental consultant should be present onsite at all stages of the remediation works, to assess the extent of remediation required to render the site suitable for the proposed development. Site observations and field screening equipment can be used to assist in decision-making in relation to:

- The location and extent of any excavations to trace contamination or whether to remove additional soil;
- Create a more focused sample collection (number and location) and laboratory analysis; and
- The need to consider (or implement) any specific health and safety measures.

A judgemental validation sampling pattern will be carried, with one soil sample collected from the floor (per 25m^2) and one soil sample collected from each wall (per 5 linear meters) of the remedial excavation footprints.

The validation sampling arrangements for this project are presented in **Table 8.7.1**.

Table 8.7.1 Applicable Validation Sampling

Area of Environmental Concern	Validation Scenario	Validation Sampling
AEC01	Excavation and removal of contaminated fill material and validation of excavation base and walls.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant. Fill material within the AEC will be excavated down to a maximum depth of 0.3m bgs. Collect one 250ml jar soil sample per 25 m^2 from the base of the excavation footprint. Collect one 250ml jar soil samples per 5 linear meters of excavation wall (minimum one per wall). Samples are to be analysed for lead by a NATA accredited lab.

Area of Environmental Concern	Validation Scenario	Validation Sampling
AEC02	Excavation and removal of contaminated fill material and validation of excavation base and walls.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant. Fill material within the AEC will be excavated down to a maximum depth of 1.3m bgs. Collect one 250ml jar soil sample per 25 m^2 from the base of the excavation footprint. Collect one 250ml jar soil samples per 5 linear meters of excavation wall (minimum one per wall). Samples are to be analysed for lead by a NATA accredited lab.
AEC03	Not required	Not required
AEC04	Excavation and removal of contaminated fill material and validation of excavation base and walls.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant. Fill material within the AEC will be excavated down to a maximum depth of 0.2m bgs. PID screening will be conducted on samples collected on areas of potential impact. Collect one 250ml jar soil sample per 25 m^2 from the base of the excavation footprint. Collect one 250ml jar soil samples per 5 linear meters of excavation wall (minimum one per wall). Samples are to be analysed for benzo(a)pyrene by a NATA accredited lab.
AEC05	Not required.	Not required.

Area of Environmental Concern	Validation Scenario	Validation Sampling
AEC06	Excavation and removal of contaminated fill material and validation of excavation base and walls.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant Fill material within the AEC will be excavated down to a maximum depth of 0.2m bgs. PID screening will be conducted on samples collected on areas of potential impact. Collect one 250ml jar soil sample per 25 m^2 from the base of the excavation footprint. Collect one 250ml jar soil samples per 5 linear meters of excavation wall (minimum one per wall). Samples are to be analysed for benzo(a)pyrene by a NATA accredited lab.
AEC07	Excavation and removal of contaminated fill material and validation of excavation base and walls.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant. Fill material within the AEC will be excavated down to a maximum depth of 0.3m below ground surface. Collect one 500ml asbestos bag soil sample per 25 m^2 from the base of the excavation footprint. Collect one 500ml asbestos bag soil sample per 5 linear meters of excavation wall (minimum one per wall). Samples are to be analysed for asbestos 0.001% by a NATA accredited lab.

Area of Environmental Concern	Validation Scenario	Validation Sampling
AEC08	Excavation and removal of contaminated fill material and validation of excavation base.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant. Fill material within the AEC will be excavated down to a maximum depth of 0.3m below ground surface. Collect one 500ml asbestos bag soil sample per 25 m^2 from the base of the excavation footprint. Collect one 500ml asbestos bag soil sample per 5 linear meters of excavation wall (minimum one per wall). Samples are to be analysed for asbestos 0.001% by a NATA accredited lab.
AEC09	Excavation and removal of contaminated fill material.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant. Fill material within the AEC will be excavated down to a maximum depth of 1.0m below ground surface.
AEC10	Excavation and removal of contaminated fill material and validation of excavation base and walls.	A systematic visual assessment of the base and walls of the excavation will be undertaken by an environmental consultant. Fill material within the AEC will be excavated down to a maximum depth of 0.4m below ground surface. Collect one 500ml asbestos bag soil sample per 25 m^2 from the base of the excavation footprint. Collect one 500ml asbestos bag soil sample per 5 linear meters of excavation wall (minimum one per wall). Samples are to be analysed for asbestos 0.001% by a NATA accredited lab.
Waste Classification	-	Quantity dependent – refer to NSW EPA *Waste Classification Guidelines (2014).*
Imported Fill – VENM	-	1 per $100m^3$ or 3 samples per stockpile / site

Area of Environmental Concern	Validation Scenario	Validation Sampling
Imported Fill - ENM	-	Quantity dependent – refer to the Excavated Natural Material (ENM) exemption order for further details.

The quantity and movement of all waste materials excavated and removed offsite will be tracked by the **remedial contractor.** All waste disposal dockets issued by the suitably licensed waste receiving facility will be retained by the **remedial contractor** for reconciliation against the material tracking records, and for inclusion in the final site validation report. This will demonstrate that the waste was appropriately disposed to licensed facilities.

The site validation report will be issued by a suitably experienced environmental consultant.

If visual or olfactory observations indicated a potential for soil contamination to be present, then collection of additional validation samples will be considered.

The location of each sampling point will be marked on a site plan.

8.7.2. Sampling Methodology

Grab soil samples will be collected at each required sampling point directly from the base and walls of the excavation. Depending on the depth of the excavation footprint, an excavator may be required to obtain samples. In these instances, samples will be collected from soils in the centre of the excavator bucket, to avoid cross contamination from the excavator bucket.

Sampling will be guided by a combination of visual evidence (ACM), olfactory evidence (hydrocarbon odours) and soil headspace screening (PID).

Observations of the materials encountered during sampling will be recorded on the relevant field observation log with photographic record.

8.7.3. Identification, Storage and Handling of Samples

Sample identifiers will be used for each sample collected, based on the sampling point number and the depth/interval the sample was collected from, e.g. a sample collected from AEC01 from the excavation footprint base, would be identified as AEC01-Base.

Project samples will be stored in laboratory prepared glass jars or zip-lock bags if collected for asbestos).

Reference will also be made to Table 5 in WA DOH (2009) for the sampling and screening of fill soils for the presence of asbestos, where practical. Subsequently, application of asbestos screening criteria published in NEPC (1999a) may be limited.

Soil samples in glass jars will be placed in insulated container/s with ice.

Samples will be transported to the relevant analytical laboratory, with chain of custody (COC) documentation that includes the following information:

- AG project identification number
- Each sample identifier
- Date each sample was collected
- Sample type (e.g. soil or water)
- Container type/s for each sample collected
- Preservation method used for each sample (e.g. ice)
- Analytical requirements for each sample and turnaround times
- Date and time of dispatch and receipt of samples (including signatures)

8.7.4. Headspace Screening

Where the contaminants of potential concern include volatiles, project soil samples will be subjected to field screening for ionisable volatile organic compounds (VOC), using a photo-ionisation detector (PID). The results of field screening will be recorded on sampling point log.

8.7.5. Decontamination

In the event that non-disposable sampling equipment is used, that equipment will be decontaminated before and in between sampling events, to mitigate potential for cross contamination between samples collected. The decontamination methodology to be adopted for this project will include:

- Washing relevant sampling equipment using potable water with a phosphate free detergent (i.e. Decon 90 or similar) mixed into the water;
- Rinsing the washed non-disposable sampling equipment with distilled or de-ionised water; and
- Air drying as required.

8.7.6. Laboratory Selection

The analytical laboratories used for this project will be NATA accredited for the analysis undertaken.

8.7.7. Laboratory Analytical Schedule

Project samples will be scheduled for NATA accredited laboratory analysis, using a combination of:

- Observations made in the field of the media sampled;
- Headspace screening results (where available);
- The contaminants of potential concern (COPC) identified for the area of environmental concern that the sample was collected from.

Based on site history, AG has adopted the laboratory analytical schedule presented in **Table 8.7.7** for this project.

Table 8.7.7 Laboratory Analytical Schedule

AEC	Analytical Schedule	No. of samples
AEC01	Lead	As per Table 8.7.1

AEC	Analytical Schedule	No. of samples
AEC02	Lead	As per Table 8.7.1
AEC03	N/A	N/A
AEC04	PAHs	As per Table 8.7.1
AEC05	N/A	N/A
AEC06	PAHs	As per Table 8.7.1
AEC07	Asbestos (ACM and 0.001%)	As per Table 8.7.1
AEC08	Asbestos (ACM and 0.001%)	As per Table 8.7.1
AEC09	N/A	N/A
AEC10	Asbestos (ACM and 0.001%)	As per Table 8.7.1

8.7.8. Laboratory Holding Times, Analytical Methods and Limits of Reporting

The laboratory holding times, analytical methods and limits of reporting (LOR) being used for this project, are presented in **Table 8.7.8**.

Table 8.7.8 Laboratory Holding Times, Analytical Methods and Limits of Reporting

Analyte	Holding Time	Analytical Method	Limit of Reporting (mg/kg)
BTEX and TRH C_6-C_{10}	14 days	USEPA 5030, 8260B and 8020	0.2-0.5
TRH >C_{10}-C_{40}	14 days	USEPA 8015B & C	20-100
PAH	14 days	USEPA 8270	0.1-0.5
VOC	14 days	USEPA 8260	0.1-0.5
Metals	14 days	USEPA 8015B & C	0.05 – 2
Asbestos	No limit	AS4964:2004	Absence / presence
Asbestos	No limit	Inhouse Method	0.001% w/w

9. REPORTING

9.1. Site Validation Report

At the completion of remediation works, a site validation report will be prepared with reference to the relevant sections of NSW OEH (2011). The site validation report will include:

- An executive summary;
- The scope of reporting work undertaken;
- Site identification details;
- A summary of site history;
- A summary of site condition and the surrounding environment;
- A summary of geology and hydrogeology;
- Information on the remediation works undertaken;
- The results of field and laboratory work;
- An assessment of field and laboratory quality assurance / quality control data;
- A discussion on site validation;
- Information on ongoing site monitoring requirements (if any); and
- Conclusions and recommendations.

10. SITE MANAGEMENT PLAN

The following site management plan will apply during undertaking of the remediation tasks.

10.1. Soil and Stormwater Management

10.1.1. Site Access/Egress

Vehicle access and egress to the site will be stabilised to prevent tracking of sediment onto roads and footpaths. Soil, mud and other similar materials will be removed from the roadway adjacent the access/egress point by sweeping, shovelling or a means other than washing, on a daily basis, or as required.

Trucks will be loaded adjacent to the remediation excavation (where practical). Spills of excavated soil will be scraped / swept up and combined with the soil being disposed offsite.

Soil and sediment will be broomed or washed off vehicle/plant tyres and tracks, prior to vehicles/plant leaving the remediation works zone. This soil and sediment will be scraped / swept up and managed onsite or disposed of, depending on its contamination status.

A site-specific sediment and erosion control plan will be prepared and maintained by the remediation contractor, to suit staging of the remediation works. Erosion and sediment control measures will be maintained in a functional condition. Sediment laden stormwater runoff will be controlled using measures outlined in Landcom 2004, '*Managing Urban Stormwater - Soils and Construction'* (the Blue Book).

10.1.2. Stockpiles

Stockpiles of soil or other materials:

- will not be placed on footpaths or nature strips, unless approved by Council;
- will be placed away from gutters, stormwater pits and other drainage lines;
- will be stored in a secure area and be covered if remaining on site for more than 24 hours; and
- will generally be constructed as low elongated mounds on level surfaces.

10.1.3. Excavation Pump Out

Should excavations require pumping out, water will be analysed for total suspended solids, pH, metals and petroleum hydrocarbons. Should analytical results be less than relevant marine ecosystem groundwater investigation levels in ANZECC (2000), excavation water may be discharged to stormwater.

Should analytical results exceed ANZECC (2000) criteria, other options for disposal will be considered, including:

- discharge to sewer (with prior approval from Sydney Water with a Trade Waste Agreement);
- removal and offsite disposal by a liquid waste contractor.

10.1.4. Rehabilitation and Landscaping

Stabilisation of exposed areas on the site, where required, will be undertaken in a progressive manner, as stages of remediation works are completed. Stabilisation will be maintained until such time as site redevelopment works commence.

As site redevelopment works are expected to be undertaken in conjunction with remediation works, revegetation of the site is considered unlikely to be required.

10.2. Waste Management

Removal of materials from site for recycling and/or disposal, will be undertaken with reference to the relevant provisions of the Protection of the Environment Operations Act (1997), SafeWork NSW and NSW EPA (2014).

The **remediation contractor** will maintain detailed records of materials removed from the site, including date/time of removal, quantities of materials, transport company details and vehicle registration details.

The **remediation contractor** will retain records verifying lawful disposal of the materials, including weighbridge / tipping dockets from the waste receiver.

10.3. Groundwater Management

Should dewatering of the site be required, development consent may be required from the planning consent authority. Dewatering may also require approvals from the NSW Department of Primary Industry – Water and WaterNSW.

10.4. Noise Control

Noise levels from the site during the project will not exceed the limits indicated in AS2436-1981.

No 'offensive noise' as defined under the Protection of the Environment Operations Act 1997 will be created during remediation works/activities.

Plant and equipment will be fitted with noise attenuation devices (e.g. mufflers on exhausts). Consideration will be given to use of reversing alarms other than the standard pulsed tonal alarms.

Vehicle access roads will be designed in such a way to minimise the need for plant and vehicles to reverse (e.g. provision of a turning circle adjacent to the remediation works zone).

10.5. Dust Control

Dust may be generated during remediation works and associated tasks. To mitigate risk of dust emissions migrating beyond the site boundary, consideration will be given to implementing the following procedures:

- erection of dust screens around the perimeter of the site (e.g. fencing with shade cloth attached);
- securely covering all loads entering or exiting the site;
- use of water sprays across the site to suppress dust;

- covering stockpiles of contaminated soil remaining on site for more than 24 hours;
- keeping excavation surfaces moist;
- wetting down of placed fill material during spreading;
- sweeping of hardstand surfaces;
- minimising soil disturbance works during windy days; and
- retaining stabilised site access/egress points for vehicles.

Any remedial works associated with asbestos are to be carried out in accordance with SafeWork NSW (2016) *Code of Practice – How to Safety Remove Asbestos*.

10.6. Odour Control

Generation of significant odours during the remediation works is considered to be unlikely.

If odours are generated, odours will be monitored at the site boundary. Should unacceptable odours be detected at the site boundary, consideration will be given to implementing the following procedures:

- use of appropriate covering techniques such as plastic sheeting to cover excavation faces or stockpiles;
- use of fine mist sprays (which may incorporate deodorizing agents);
- use of hydrocarbon mitigating agents on impacted areas/materials; and
- adequate maintenance of equipment and machinery to minimise exhaust emissions.

A record of unacceptable odours and corrective/preventative action taken, will be maintained by the remediation contractor.

10.7. Traffic Management

Haulage routes for trucks transporting soil, materials, equipment or machinery to and from the site will be selected by the remediation contractor and will meet the following objectives:

- compliance with all traffic road rules;
- minimisation of noise, vibration and odour to adjacent premises; and
- utilisation of state roads and minimisation of use of local roads.

The remediation contractor will ensure that site vehicles:

- conduct deliveries of soil, materials, equipment or machinery during the hours of remediation work identified in **Section 10.13**;
- securely cover all loads to prevent dust or odour emissions during transportation;
- exit the site in a forward direction; and
- do not track soil, mud or sediment onto the road.

10.8. Vibration Management

Vibration emissions during remediation works will be controlled to mitigate risk of potential damage to assets on adjacent properties, and to mitigate unreasonable loss of amenity to nearby residents.

10.9. Fill Importation

Material proposed to be imported to site as engineered fill, will be limited to materials certified as:

- Virgin Excavated Natural Material (VENM); or
- Excavated Natural Material (ENM).

VENM certification will be undertaken with reference to NSW EPA (1995). ENM certification will be undertaken with reference to NSW EPA Excavated Natural Material Exemption.

The concentrations of potential contaminants in VENM and ENM proposed to be imported to site, will be less than the human health assessment criteria adopted for the site.

Imported fill will be compatible with existing soil characteristics for site drainage purposes.

The remediation contractor will maintain detailed records of all fill imported to the site, including details of the supplier, the source of the fill, the quantities of the fill, vehicle registration numbers and the dates/times the fill was received on site.

10.10. Work Health and Safety

10.10.1. Safe Work Method Statement

Each contractor and sub-contractor undertaking remediation works, or working within a remediation works zone, will prepare a project specific safe work method statement (SWMS), which will include, but not be limited to:

- the tasks to be undertaken;
- hazards identified for each of the tasks to be undertaken;
- an assessment of risk for each hazard, considering likelihood and consequence;
- control measures to eliminate or mitigate risks associated with each identified hazard.

10.10.2. Personal Protective Equipment

The following minimum personal protective equipment (PPE) should be worn by all persons working in or visiting the remediation works zone:

- long sleeves and long pants
- high visibility vests (or clothing);
- safety boots;
- hard hats
- gloves; and
- eye protection (e.g. safety glasses).

Additional PPE may be required in accordance with task specific control measures in SWMS (refer **Section 10.10.1**).

10.10.3. Decontamination of Personnel

Personnel undertaking remediation tasks, or entering the remediation works zone, be required to decontaminate upon exiting the remediation works zone. Decontamination procedures will include:

- cleaning down of protective footwear (including removal of soil from the soles); and
- washing of hands.

The following minimum personal protective equipment (PPE) should be worn by any persons the remediation works zone:

- gloves;
- safety boots;
- hard hats;
- high visibility vests or clothing; and
- safety glasses.

10.11. Site Signage

A sign will be posted on the boundary of the site, adjacent to the site access point, which will include 24-hour contact details of the remediation contractor. This sign will be maintained onsite until all remediation works are complete.

10.12. Site Security

Site security will be maintained throughout the duration of the remediation works, with appropriate boundary fencing and gate locks. Other security measures may be implemented, if the need arises.

10.13. Site Hours of Operation

Remediation works will be undertaken on Monday to Friday between the hours of 7:00am to 5:00pm, and Saturday between the hours of 8:00am and 1:00pm.

Remediation works will not be undertaken outside the hours stated above, or on Sundays or public holidays.

10.14. Community Relations and Complaints

Owners, occupants and tenants of properties adjoining the site and across the road from the site, will be provided with notification of remediation works, at least two days prior to those works commencing.

Personnel undertaking remediation works on the site, will direct all third-party communications and/or complaints to the Project Manager. The Project Manager will arrange for the communication/complaint to be assessed, a response prepared, corrective/preventative actions implemented (if necessary).

A register will be maintained on site for the recording of communications / complaints from third parties, including but not limited to, local residents and local businesses.

10.15. Emergency Preparedness

An emergency assembly point will be established at the site egress point. This point will be communicated to all site workers and visitors, during relevant site induction processes.

In the event of an emergency, site workers and visitors will assemble here and await further instructions from the site supervisor, project manager or emergency services.

Spill control kits and fire extinguishers will be located on site, as and where required.

Contact details to be used in the event of an emergency, are presented in **Section 10.16**.

10.16. Register of Contacts

A register of contacts for the project is presented in **Table 10.16**.

Table 10.16 Register of Contacts

Project Role	Person	Organisation	Contact
Emergency Services	-	Fire / Police / Ambulance	000
Site Owner	n/a	NSW Department of Education	n/a
Project Managers	Ian Downes	blueVisions	0401 991 796
Planning Consent Authority	TBA	City of Ryde	9952 8222
WHS Regulatory Authority	-	SafeWork NSW	131 050
Environmental Regulatory Authority	-	NSW EPA	131 500
Remediation Contractor	TBA	TBA	TBA
Environmental Consultant	Aidan Rooney	Alliance Geotechnical	0436 427 630

11. CONCLUSIONS

Based on the information presented in the historical contamination assessment reports, AG makes the following conclusions:

- Implementation of the strategies, methodologies and measures set out in this remedial action plan would facilitate management and/or remediation of potentially unacceptable land contamination risks in current proposed development areas onsite;
- Should newly identified unacceptable land contamination risks be identified during supplementary assessment works, an addendum to this RAP may be required. The addendum should be prepared by a suitably experienced environmental consultant;
- Prior to any removal of soils from site for offsite disposal during remedial works, a waste classification for those soils should be prepared by a suitably experienced environmental consultant;
- Future remedial works should be monitored and validated by a suitably experienced environmental consultant; and
- A long-term EMP that documents all areas where residual contamination is still present on the site and all capping and isolation measures will be required.

This report must be read in conjunction with the limitations set out in **Section 12**.

12. STATEMENT OF LIMITATIONS

The findings presented in this report are based on specific searches of relevant, government historical databases and anecdotal information that were made available during the course of this investigation. To the best of our knowledge, these observations represent a reasonable interpretation of the general condition of the site at the time of report completion.

This report has been prepared solely for the use of the client to whom it is addressed and no other party is entitled to rely on its findings.

No warranties are made as to the information provided in this report. All conclusions and recommendations made in this report are of the professional opinions of personnel involved with the project and while normal checking of the accuracy of data has been conducted, any circumstances outside the scope of this report or which are not made known to personnel and which may impact on those opinions is not the responsibility of Alliance Geotechnical Pty Ltd. Should information become available regarding conditions at the site including previously unknown sources of contamination, AG reserves the right to review the report in the context of the additional information.

This report must be reviewed in its entirety and in conjunction with the objectives, scope and terms applicable to AG's engagement. The report must not be used for any purpose other than the purpose specified at the time AG was engaged to prepare the report.

Logs, figures, and drawings are generated for this report based on individual AG consultant interpretations of nominated data, as well as observations made at the time site walkover/s were completed.

Data and/or information presented in this report must not be redrawn for its inclusion in other reports, plans or documents, nor should that data and/or information be separated from this report in any way.

Should additional information that may impact on the findings of this report be encountered or site conditions change, AG reserves the right to review and amend this report.

13. REFERENCES

AG 2018a, '*Stage 1 Preliminary Site Investigation, Portion of Lot 1 in DP837179 (Lot 10 in DP1232584, 2 Rhodes Street, Meadowbank, NSW*', dated June 2019, ref: 6179-ER-1-1 Rev 5;

AG 2018b, '*Stage 2 Detailed Site Investigation, Portion of Lot 1 in DP837179 (Lot 10 in DP1232584) 2 Rhodes Street, Meadowbank, NSW', dated June 2019*, ref: 6179-ER-1-2 Rev 6;

AG 2019a, '*Supplementary Contamination Assessment, Portion of Lot 1 in DP837179 (Lot 10 in DP1232584) 2 Rhodes Street, Meadowbank, NSW*', *dated July 2019*, ref: 9280-ER-1-1 Rev 1;

AG 2019b, '*Additional Supplementary Contamination Assessment, Portion of Lot 1 in DP837179 (Lot 10 in DP123258) 2 Rhodes Street, Meadowbank, NSW*', *dated Sept 2019*, ref: 9692-ER-1-1 Rev 1;

National Environment Protection Council (NEPC) 1999a, '*Schedule B(1) Guideline on Investigation Levels for Soil and Groundwater, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'*;

National Environment Protection Council (NEPC) 1999b, '*Schedule B(2) Guideline on Site Characterisation, National Environment Protection (Assessment of Site Contamination) Measure (NEPM) as amended in May 2013'*;

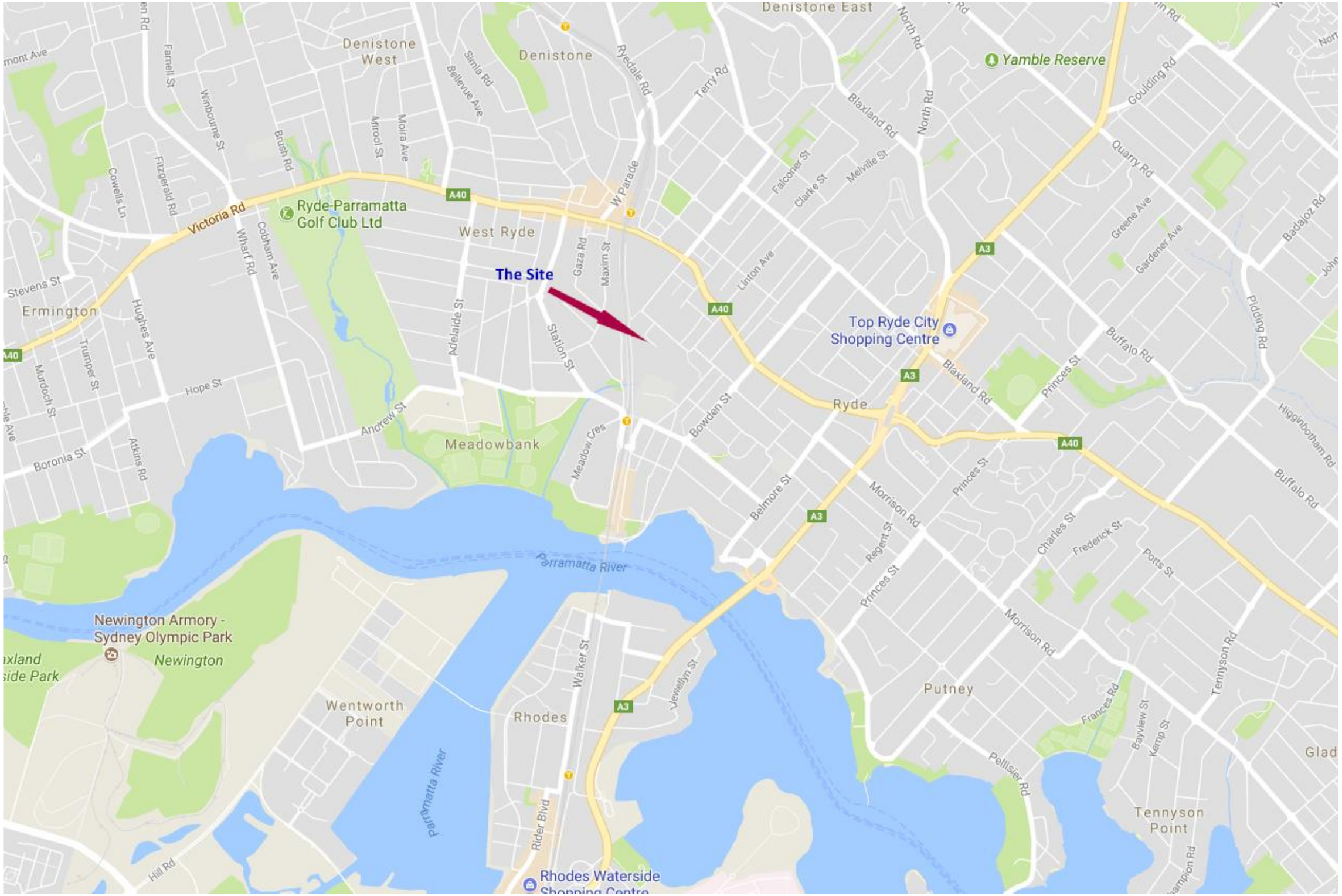
NSW EPA 1995, '*Contaminated Sites: Sampling Design Guidelines'*;

NSW EPA 2017, '*Contaminated Sites: Guidelines for the NSW Site Auditor Scheme (3rd edition)*';

NSW OEH 2011, '*Contaminated Sites: Guidelines for Consultants Reporting on Contaminated Sites'*;

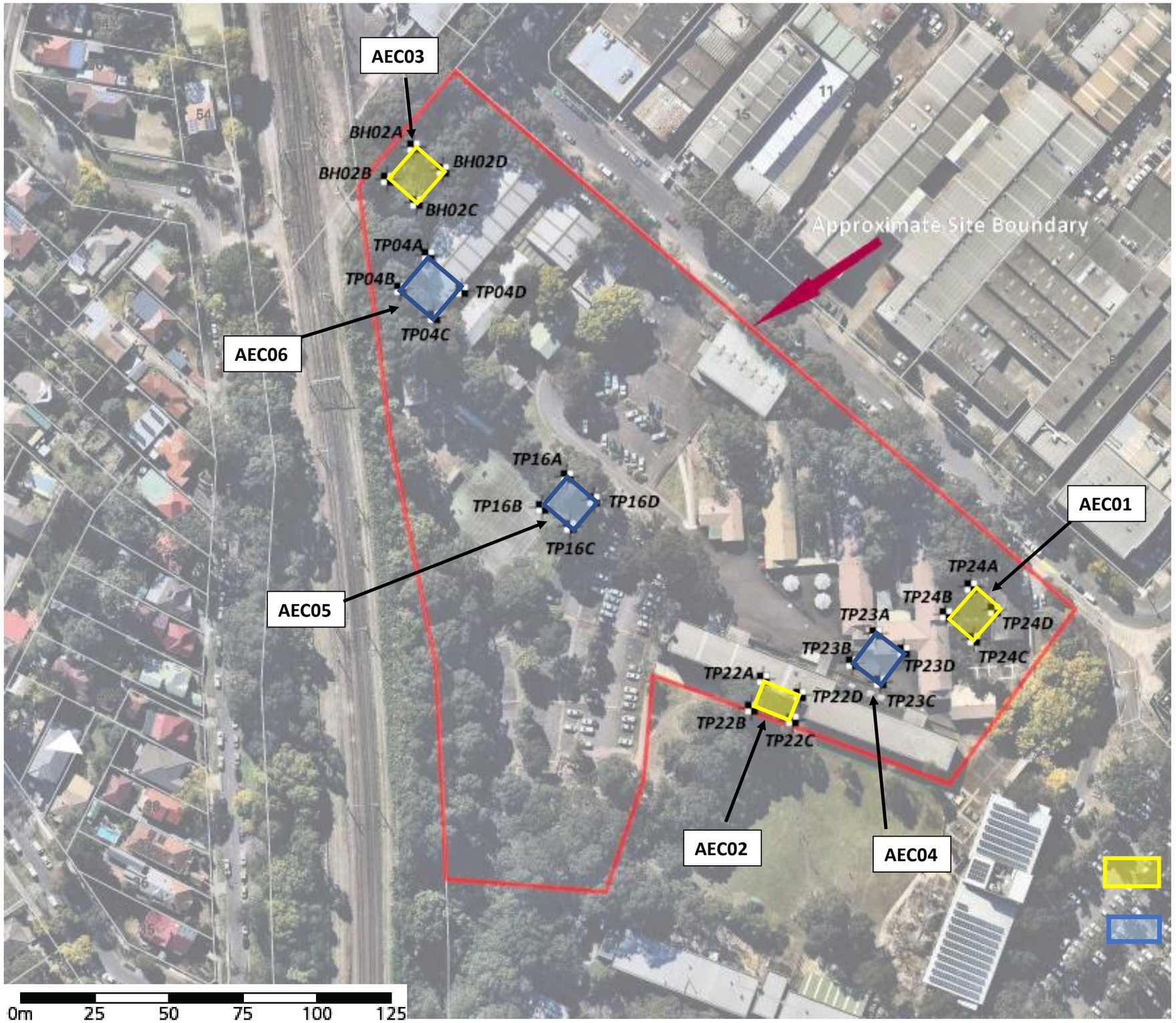
WA DOH 2009, *'Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia'* dated May 2009.

SITE FIGURES



Alliance Geotechnical Pty Ltd ENGINEERING | ENVIRONMENTAL | TESTING 10 Welder Road, Seven Hills, NSW T: 1800 288 188: enviro@allgeo.com.au	Project Address: Portion of Lot 1 in DP837179 (Lot 10 in DP1232584) See Street, Meadowbank, NSW	Client: Woods Bagot	Project Name: Remedial Action Plan	Report No: 9692-ER-1-2 Figure Date: 30 Sept 2019	N	Figure No: 1	Figure Title: Site Locality Plan

Alliance Geotechnical Pty Ltd ENGINEERING | ENVIRONMENTAL | TESTING 10 Welder Road, Seven Hills, NSW T: 1800 288 188: enviro@allgeo.com.au	Project Address: Portion of Lot 1 in DP837179 (Lot 10 in DP1232584) See Street, Meadowbank, NSW	Client: Woods Bagot	Project Name: Remedial Action Plan	Report No: 9692-ER-1-2 Figure Date: 30 Sept 2019	N	Figure No: 2	Figure Title: Site Layout Plan



Legend

Delineated Extent of Lead Contamination.

Delineated Extent of B(a)P Contamination.

Alliance Geotechnical Pty Ltd ENGINEERING | ENVIRONMENTAL | TESTING 10 Welder Road, Seven Hills, NSW T: 1800 288 188: enviro@allgeo.com.au	Project Address: Portion of Lot 1 in DP837179 (Lot 10 in DP1232584) See Street, Meadowbank, NSW	Client: Woods Bagot	Project Name: Remedial Action Plan	Report No: 9692-ER-1-2 Figure Date: 30 Sept 2019	N	Figure No: 3a	Figure Title: Areas of Environmental Concern and Approximate Extent of Chemical Contamination

Alliance Geotechnical Pty Ltd ENGINEERING | ENVIRONMENTAL | TESTING 10 Welder Road, Seven Hills, NSW T: 1800 288 188: enviro@allgeo.com.au	Project Address: Portion of Lot 1 in DP837179 (Lot 10 in DP1232584) See Street, Meadowbank, NSW	Client: Woods Bagot	Project Name: Remedial Action Plan	Report No: 9692-ER-1-2 Figure Date: 20 September 2019	N	Figure No: 3b	Figure Title: Known Extent of Asbestos Contamination

Date generated 26/09/2019 4:26:37 PM

Recent revision history

#	Status	Description	Date
1	Preliminary	Issued for Coordination	26/09/19

Notes & Legend

Contractor must verify all dimensions on site before commencing work or preparing shop drawings. Do not scale drawings.

LEGEND

- Existing tree to be removed
- Tree to be retained and protected
- Tree protection zone

The legend below is a summary of the types of remediation. Refer to Remedial Action plan, Civil Engineering Drawings and Arborist Report for details.

A
Remove by hand any visible rubble under tree canopy and do not disturb tree roots

A1
As 'A' but first remove hardstanding and confirm on site extent of contamination.

B
Retain existing soil levels. Add geotextile membrane, crushed rock. Area to have raised timber deck prior to future occupation.

C
Remove hardstanding, excavate to 500mm depth below existing level. Add geotextile membrane, fill to existing levels with clean fill.

D
As 'B'. Area to be built up with 500mm topsoil and native grasses. Area to be fenced off and made inaccessible prior to future occupation.

E
Excavate to 1m depth below existing levels, add geotextile membrane, fill to existing levels with clean fill.

F
Remove up to 300mm of soil. Area to be occupied by building in future.

G
Area of handstanding with expected low contamination. Hardstanding to be removed and confirm extent of contamination on site.

X
No works in this area

DRAFT ONLY

HDC & Architectural
WOODS BAGOT

Structural & Civil Engineering
ENSTRUCT

Mechanical Engineering & ESD/Energy Modelling
STEENSEN VARMING

Electrical Engineering
WSP

Hydraulic & Fire Engineering
WARREN SMITH & PARTNERS

Landscape & Heritage
URBIS

Project
MEADOWBANK EDUCATION PRECINCT SCHOOLS
2 Rhodes Street, Meadowbank

Client
NSW GOVERNMENT Education School Infrastructure

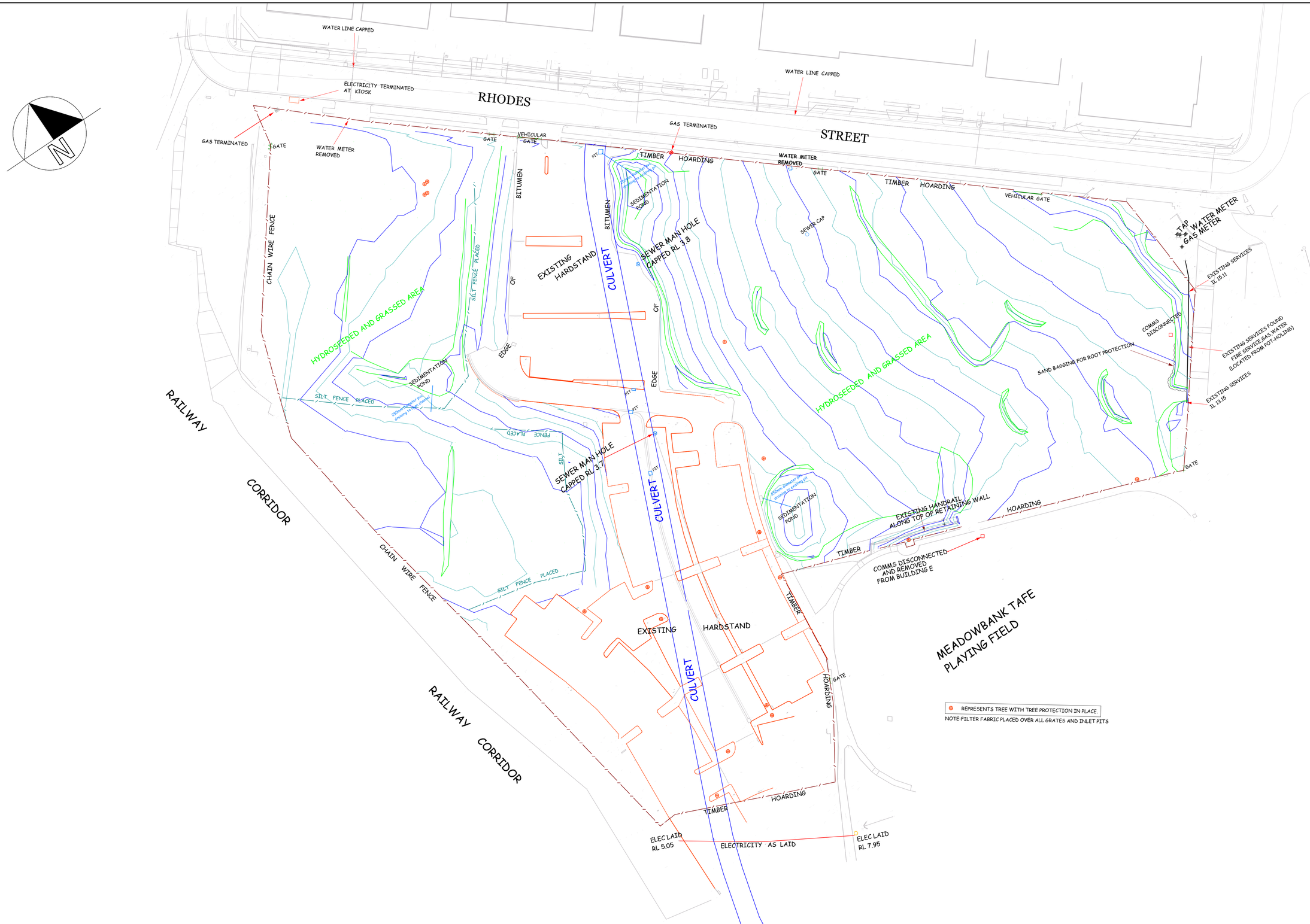
Project number 121172
Size check 25mm
Checked Checker
Approved Approver
Sheet size A1
Scale 1 : 500

Sheet title
SOIL CONTAMINATION REMEDIATION PLAN

Sheet number **MSP-WB-AR-DA108**
Revision 1
Status PRELIMINARY

APPENDIX A

SURVEY



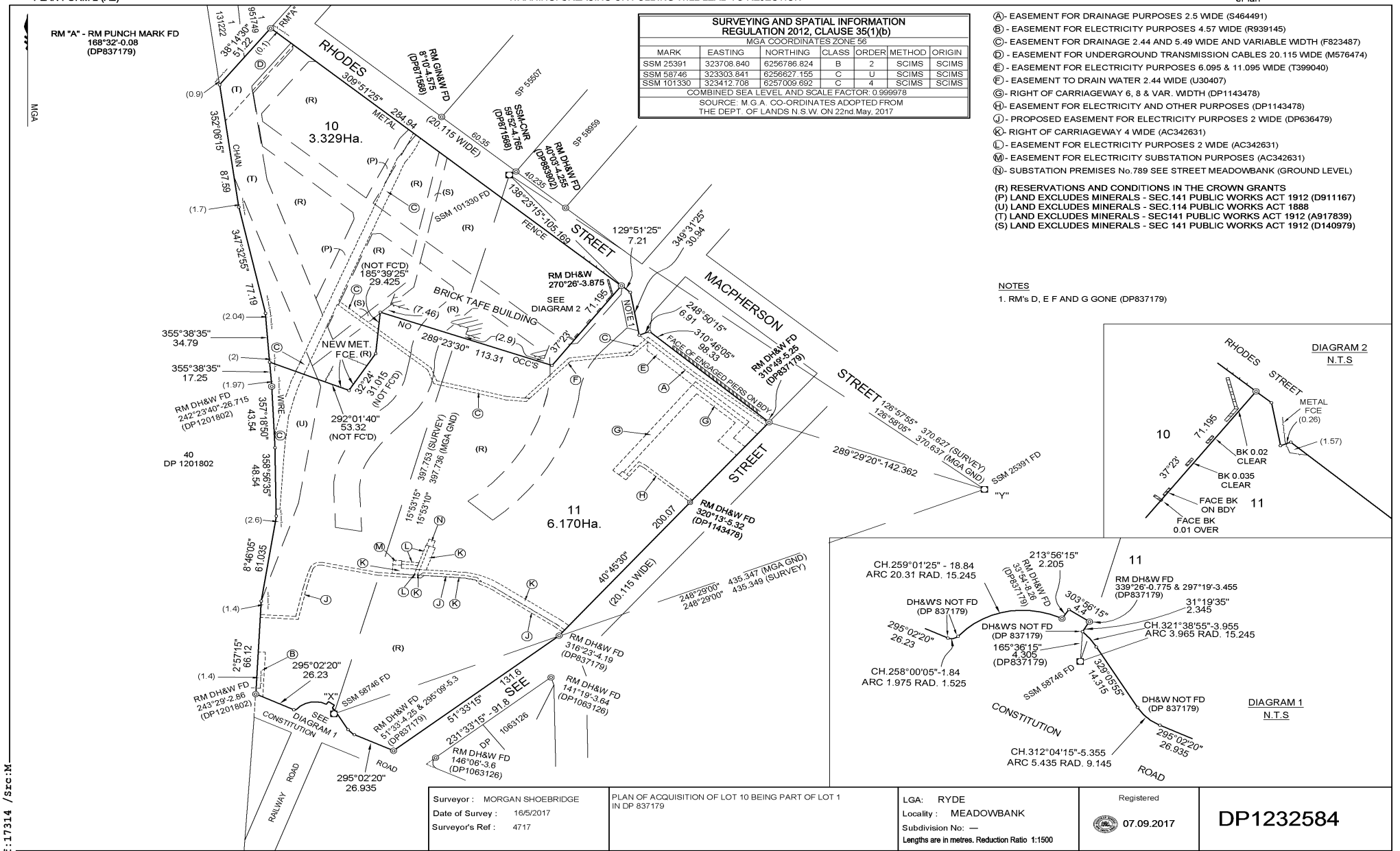
- PLAN SHOWING FEATURES AND LEVELS OF WORKS AS CARRIED OUT BY WARD CIVIL AND ENVIRONMENTAL.
- THIS PLAN IS NOT TO BE USED FOR DESIGN PURPOSES BUT IS ONLY A REPRESENTATION OF THE WORKS AS CARRIED OUT BY WARD CIVIL
- HARDSTAND AREA EXTRACTED FROM PREVIOUS SURVEY BY CMS SURVEYORS.
- EXTERNAL FEATURES EXTRACTED FROM PREVIOUS SURVEY BY CMS SURVEYORS.

- SURVEYED BY MICHAEL CANT (SURVEYOR) FOR WARD CIVIL

WARD

ACN 098942459 Email:www.wardcivil.com.au Suite 2, Level 4, 65 Epping Rd, Nth Ryde, NSW 2113 PO Box 1067,Nth Ryde BC NSW 1670 Ph:02 94383666 Fax:02 94397187

Project: MEADOWBANK EDUCATIONAL PRECINCT				Drawing Title: WORK AS EXECUTED FEATURES, LEVELS AND CONTOURS	
Datum: AHD	Date: 19/8/19	Scale: 1:500 @A1		Dwg No: 695004	Rev: C



APPENDIX B

LOGS

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Sample Point No: BH02A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Mechanical Pushtube
Hole Location: Refer to figure 4
Driller: Sam Scully
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
PT			0.5			FILL: SAND, brown, medium grained, loose, moist.	BH02A - 0.0-0.3m (PID = 2.3)	M		No potential ACM, odours or staining noted.
						Borehole BH02A terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: BH02B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Mechanical Pushtube
Hole Location: Refer to figure 4
Driller: Sam Scully
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
PT			0.5			FILL: SAND, brown, medium grained, loose, moist.	BH02B - 0.0-0.3m (PID = 1.8)	M		No potential ACM, odours or staining noted.
						Borehole BH02B terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: BH02C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Mechanical Pushtube
Hole Location: Refer to figure 4
Driller: Sam Scully
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
PT			0.5			FILL: SAND, brown, medium grained, loose, moist.	BH02C - 0.0-0.3m (PID = 2.1)	M		No potential ACM, odours or staining noted.
						Borehole BH02C terminated at 0.5m				
			1.0							
			1.5							
			2.0							

BOREHOLE / TEST PIT 9280-ER-1-1-LOGS.GPJ GINT STD AUSTRALIA.GDT 2/7/19

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Sample Point No: BH02D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Mechanical Pushtube
Hole Location: Refer to figure 4
Driller: Sam Scully
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
PT			0.5			FILL: SAND, brown, medium grained, loose, moist.	BH02D - 0.0-0.3m (PID = 2.0)	M		No potential ACM, odours or staining noted.
						Borehole BH02D terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: BH40A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 20/6/19
Finished: 20/6/19
Borehole Size:

Rig Type: Truck Mounted SFA
Hole Location: Refer to figure 4
Driller: AG
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA						ASPHALT				
			0.5			FILL: Gravelly CLAY, brown, soft, moist.	BH40A - 0.1-0.3m	M		No potential ACM, odours or staining noted.
			1.0			FILL: CLAY, pale grey, friable, dry with concrete boulders.	BH40A - 0.8-1.0m	D		
			1.5		CL	CLAY w/ trace gravels, brown, soft, moist.	BH40A - 1.2-1.4m	M		No potential ACM, odours or staining noted.
			2.0			Borehole BH40A terminated at 2m				

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Sample Point No: BH40B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 20/6/19
Finished: 20/6/19
Borehole Size:

Rig Type: Truck Mounted SFA
Hole Location: Refer to figure 4
Driller: AG
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA						ASPHALT				
						FILL: Gravelly CLAY, brown, soft, moist.	BH40B - 0.1-0.3m	M		No potential ACM, odours or staining noted.
			0.5							
							BH40B - 0.8-1.0m			
			1.0							
					CL	CLAY w/ trace gravels, brown, soft, moist.	BH40B - 1.4-1.6m	M		No potential ACM, odours or staining noted.
			1.5							
						Borehole BH40B terminated at 1.6m				
			2.0							

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Sample Point No: BH40C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Truck Mounted SFA
Hole Location: Refer to figure 4
Driller: AG
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA						ASPHALT / ROADBASE				
			0.5			FILL: Gravelly CLAY w/ some sand, red/grey, soft, moist with concrete and bitumen gravels, with further boulders and bricks at depth.	BH40C - 0.1-0.3m	M		Potential ACM observed. No odours or staining noted.
			1.0				BH40C - 0.9-1.1m			
			1.5				BH40C - 1.7-1.9m			
			2.0			Borehole BH40C terminated at 2m				

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Sample Point No: BH40D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Truck Mounted SFA
Hole Location: Refer to figure 4
Driller: AG
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA			0.5			FILL: Clayey SAND, brown, medium grained, loost, moist, with concrete and aggregate gravels to cobbles, sandstones gravels to boulders, wood and steel bar.	BH40D - 0.0-0.2m	M		No potential ACM, odours or staining noted.
			1.0			FILL: Sandy CLAY, brown, soft, moist, with concrete and aggregate gravels to cobbles, sandstones gravels to boulders, wood and steel bar.	BH40D - 0.9-1.1m	M		No potential ACM, odours or staining noted.
			1.5				BH40D - 1.7-1.9m			
			2.0			Borehole BH40D terminated at 2m				

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Sample Point No: BH41A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 20/6/19
Finished: 20/6/19
Borehole Size:

Rig Type: Truck Mounted SFA
Hole Location: Refer to figure 4
Driller: AG
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA						ASPHALT				
						FILL: CLAY w/ trace gravels, red/grey/brown, soft, moist.	BH41A - 0.1-0.3m	M		No potential ACM, odours or staining noted.
			0.5							
			1.0				BH41A - 0.9-1.1m			
			1.5							
			2.0				BH41A - 1.8-2.0m			
						Borehole BH41A terminated at 2m				

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Sample Point No: BH41B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 20/6/19
Finished: 20/6/19
Borehole Size:

Rig Type: Truck Mounted SFA
Hole Location: Refer to figure 4
Driller: AG
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA			0.5			FILL: Silty CLAY, brown, soft, dry with trace concrete and brick gravels.	BH41B - 0.0-0.2m	D		Refusal at 1.6m (unknown). No potential ACM, odours or staining noted.
			1.0				BH41B - 0.8-1.0m			
			1.5				BH41B - 1.4-1.6m			
			2.0			Borehole BH41B terminated at 1.6m				

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Sample Point No: BH41C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Started: 20/6/19
Finished: 20/6/19
Borehole Size:

Rig Type: Truck Mounted SFA | **Hole Location:** Refer to figure 4 | **Driller:** AG | **Logged:** SS
RL Surface: | **Contractor:** | **Bearing:** --- | **Checked:** AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA						ASPHALT				
						FILL: CLAY w/ trace gravels, red/grey, soft, dry.	BH41C - 0.1-0.3m	D		No potential ACM, odours or staining noted.
			0.5							
						FILL: Brown.	BH41C - 0.9-1.1m	D		
			1.0							
			1.5							
						FILL: Red/grey.	BH41C - 1.8-2.0m	D		
			2.0							
						Borehole BH41C terminated at 2m				

BOREHOLE / TEST PIT 9280-ER-1-1-LOGS.GPJ GINT STD AUSTRALIA.GDT 2/7/19

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Sample Point No: BH41D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 20/6/19
Finished: 20/6/19
Borehole Size:

Rig Type: Truck Mounted SFA
Hole Location: Refer to figure 4
Driller: AG
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
SFA			0.5			FILL: Silty CLAY, brown, soft, dry with trace concrete and brick gravels.	BH41D - 0.0-0.2m	D		No potential ACM, odours or staining noted.
			1.0		SS	Weathered SANDSTONE, red/grey, fine to medium grained, medium dense, dry.	BH41D - 0.9-1.1m	D		No potential ACM, odours or staining noted.
			1.5							
			2.0				BH41D - 1.8-2.0m			
						Borehole BH41D terminated at 2m				

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Sample Point No: SS02A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly SAND, dark brown/grey, medium grained, loose, moist with brick, concrete and sandstone gravels.	SS02A - 0.0-0.3m SS02A - 0.7-1.0m	M		No potential ACM, odours or staining noted.
			1.0			Borehole SS02A terminated at 1m				
			1.5							
			2.0							

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Sample Point No: SS02B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Started: 19/6/19
Project: Supplementary Contamination Assessment
Finished: 19/6/19
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Borehole Size:
Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, brown, fine to medium grained, loose, moist with sandstone gravels to boulders.	SS02B - 0.0-0.3m	M		Refusal at 0.7m (sandstone). No potential ACM, odours or staining noted.
			1.0			Borehole SS02B terminated at 0.7m				
			1.5							
			2.0							

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Sample Point No: SS02C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator | **Hole Location:** Refer to figure 4 | **Driller:** Ken Coles | **Logged:** SS
RL Surface: | **Contractor:** | **Bearing:** --- | **Checked:** AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, brown, fine to medium grained, loose, moist with concrete and sandstone gravels to boulders.	SS02C - 0.0-0.3m	M		Refusal at 0.6m (sandstone). No potential ACM, odours or staining noted.
			1.0			Borehole SS02C terminated at 0.6m				
			1.5							
			2.0							

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Alliance Geotechnical Pty Ltd
T: 1800 288 188
F: 02 9675 1888
E: office@allgeo.com.au
W: www.allgeo.com.au

Sample Point No: SS02D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly SAND, dark brown/grey, medium grained, loose, moist with brick, concrete and sandstone gravels.	SS02D - 0.0-0.3m SS02D - 0.7-1.0m	M		No potential ACM, odours or staining noted.
			1.0			Borehole SS02D terminated at 1m				
			1.5							
			2.0							

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Sample Point No: SS03A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator | **Hole Location:** Refer to figure 4 | **Driller:** Ken Coles | **Logged:** SS
RL Surface: | **Contractor:** | **Bearing:** --- | **Checked:** AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator						FILL: Clayey SAND, brown, medium grained, soft, moist with brick, concrete and sandstone gravels and boulders.	SS03A - 0.0-0.2m	M		No potential ACM, odours or staining noted.
			0.5			FILL: COALWASH / ASH gravels, black, moist with sandstone gravels and boulders.	SS03A - 0.5-0.7m	M		No potential ACM, odours or staining noted.
			1.0			Borehole SS03A terminated at 1m				
			1.5							
			2.0							

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Sample Point No: SS03B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, dark brown, soft, moist with aggregate and concrete gravels to boulders, ceramics, glass fragments and ash.	SS03B - 0.0-0.2m	M		No potential ACM, odours or staining noted.
			1.0				SS03B - 0.8-1.0m			
						Borehole SS03B terminated at 1m				
			1.5							
			2.0							

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Sample Point No: SS03C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator						FILL: Clayey SAND, brown, medium grained, soft, moist with brick, concrete and sandstone gravels and cobbles.	SS03C - 0.0-0.2m	M		No potential ACM, odours or staining noted.
			0.5			FILL: COALWASH / ASH gravels, black, moist.	SS03C - 0.5-0.7m	M		No potential ACM, odours or staining noted.
			1.0			Borehole SS03C terminated at 1.1m				
			1.5							
			2.0							

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Sample Point No: TP04A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, brown, soft, moist with sandstone and concrete gravels, to boulders, and brick.	TP04A - 0.0-0.2m (PID = 0.9)	M		No potential ACM, odours or staining noted.
			1.0		SW-SC	SAND w/ trace clay, grey/yellow, medium dense, medium grained, moist.	TP04A - 0.9-1.1m (PID = 1.1)	M		No potential ACM, odours or staining noted.
			1.5			Borehole TP04A terminated at 1.3m				
			2.0							

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Sample Point No: TP04B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, brown, soft, moist with sandstone and concrete gravels, to boulders, and brick.	TP04B - 0.0-0.2m (PID = 0.1)	M		Refusal at 0.7m (sandstone). Potential ACM observed in-situ. No odours or staining noted.
			1.0			Borehole TP04B terminated at 0.7m				
			1.5							
			2.0							

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Sample Point No: TP04C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Started: 19/6/19
Project: Supplementary Contamination Assessment
Finished: 19/6/19
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Borehole Size:
Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, brown, soft, moist with sandstone and concrete gravels, to boulders, and brick.	TP04C - 0.0-0.2m (PID = 0.5)	M		Refusal at 1.0m (sandstone). No potential ACM, odours or staining noted.
			1.0				TP04C - 0.8-1.0m (PID = 0.8)			
			1.5			Borehole TP04C terminated at 1m				
			2.0							

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Sample Point No: TP04D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY w/ some sand, brown/orange/grey, soft, moist with sandstone and concrete gravels to boulders.	TP04D - 0.0-0.2m (PID = 2.3)	M		No potential ACM, odours or staining noted.
			1.0				TP04D - 0.7-1.1m (PID = 1.8)			
			1.5				TP04D - 1.5-1.7m (PID = 1.9)			
			2.0			Borehole TP04D terminated at 1.7m				

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Sample Point No: TP07A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator | **Hole Location:** Refer to figure 4 | **Driller:** Ken Coles | **Logged:** SS
RL Surface: | **Contractor:** | **Bearing:** --- | **Checked:** AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, brown, soft, moist with concrete and sandstone gravels to boulders.	TP07A - 0.1-0.4m	M		Potential ACM observed on site surface. No odours or staining noted.
			1.0			Borehole TP07A terminated at 0.6m				
			1.5							
			2.0							

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Sample Point No: TP07B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, brown, soft, moist with concrete and sandstone gravels to boulders.	TP07B - 0.1-0.4m	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP07B terminated at 0.6m				
			1.5							
			2.0							

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Sample Point No: TP07C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, brown, soft, moist with concrete and sandstone gravels to boulders.	TP07C - 0.1-0.4m	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP07C terminated at 0.6m				
			1.5							
			2.0							

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Sample Point No: TP07D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY, brown, soft, moist with concrete and sandstone gravels to boulders.	TP07D - 0.1-0.4m	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP07D terminated at 0.6m				
			1.5							
			2.0							

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Sample Point No: TP16A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Silty SAND w/ clay, brown, medium grained, loose, dry with sandstone gravels, concrete and brick.	TP16A - 0.0-0.2m (PID = 1.6)	D		No potential ACM, odours or staining noted.
			1.0		SP	SAND, brown/orange, medium grained, medium density, moist.	TP16A - 0.7-0.9m (PID = 2.1)	M		No potential ACM, odours or staining noted.
			1.5				TP16A - 1.6-1.8m (PID = 1.5)			
			2.0			Borehole TP16A terminated at 2m				

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Sample Point No: TP16B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Started: 18/6/19
Project: Supplementary Contamination Assessment
Finished: 18/6/19
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Borehole Size:
Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5 1.0 1.5 2.0			FILL: Clayey SAND, brown, loose, soft, medium grained, with sandstone gravels to boulders, concrete boulders, tiles, glass and steel.	TP16B - 0.0-0.2m (PID = 0.9) TP16B - 0.9-1.1m (PID = 0.9) TP16B - 1.8-2.0m (PID = 1.3)	M		No potential ACM, odours or staining noted.
						Borehole TP16B terminated at 2m				

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Sample Point No: TP16C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Clayey SAND, brown, loose, soft, medium grained, with sandstone gravels to boulders, concrete boulders, tiles, glass and steel.	TP16B - 0.0-0.2m (PID = 2.5)	M		No potential ACM, odours or staining noted.
			1.0				TP16B - 0.9-1.1m (PID = 0.4)			
			1.5							
			2.0				TP16B - 1.8-2.0m (PID = 0.3)			
						Borehole TP16C terminated at 2m				

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Sample Point No: TP16D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator | **Hole Location:** Refer to figure 4 | **Driller:** Ken Coles | **Logged:** SS
RL Surface: | **Contractor:** | **Bearing:** --- | **Checked:** AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Silty SAND w/ clay, brown, medium grained, loose, dry with sandstone and bitumen gravels, concrete and brick.	TP16D - 0.0-0.2m (PID = 1.0)	D		No potential ACM, odours or staining noted.
			1.0		SP	SAND, orange, medium grained, medium density, moist.	TP16D - 0.7-0.9m (PID = 1.6)	M		No potential ACM, odours or staining noted.
			1.5			Borehole TP16D terminated at 1.2m				
			2.0							

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Sample Point No: TP22A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, brown, fine to medium grained, loose, moise with sandstone and concrete gravels to cobbles.	TP22A - 0.0-0.2m (PID = 0.8)	M		No potential ACM, odours or staining noted.
			1.0		SP	SAND w/ trace clay, red/grey, medium grained, medium dense, moist.	TP22A - 1.0-1.2m (PID = 0.5)	M		No potential ACM, odours or staining noted. Potentially reworked natural.
			1.5			Borehole TP22A terminated at 1.5m				
			2.0							

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Sample Point No: TP22B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, brown, fine to medium grained, loose, moise with sandstone and concrete gravels to cobbles.	TP22B - 0.0-0.2m (PID = 0.9)	M		No potential ACM, odours or staining noted.
			1.0		SP	SAND w/ trace clay, red/grey, medium grained, medium dense, moist with aggregate gravels.	TP22B - 0.9-1.1m (PID = 0.6)	M		No potential ACM, odours or staining noted.
			1.5			Borehole TP22B terminated at 1.5m				
			2.0							

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Sample Point No: TP22C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, brown, fine to medium grained, loose, moise with sandstone and concrete gravels to cobbles.	TP22C - 0.0-0.2m (PID = 0.2)	M		No potential ACM, odours or staining noted.
			1.0				TP22C - 1.1-1.3m (PID = 0.4)			
			1.5			Borehole TP22C terminated at 1.5m				
			2.0							

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Sample Point No: TP22D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, brown, fine to medium grained, loose, moise with sandstone and concrete gravels to cobbles.	TP22D - 0.0-0.2m (PID = 1.2)	M		No potential ACM, odours or staining noted.
			1.0				TP22D - 1.1-1.3m (PID = 0.9)			
			1.5			Borehole TP22D terminated at 1.5m				
			2.0							

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Sample Point No: TP23A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, dark brown, medium dense, medium grained, moist with brick, sandstone, concrete and aggregate gravels to cobbles.	TP23A - 0.1-0.4m (PID = 0.7)	M		No potential ACM, odours or staining noted.
						Borehole TP23A terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP23B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, dark brown, medium dense, medium grained, moist with brick, sandstone, concrete and aggregate gravels to cobbles.	TP23B - 0.1-0.4m (PID = 1.3)	M		No potential ACM, odours or staining noted.
						Borehole TP23B terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP23C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, dark brown, medium dense, medium grained, moist with brick, sandstone, concrete and aggregate gravels to cobbles.	TP23C - 0.1-0.4m (PID = 1.2)	M		No potential ACM, odours or staining noted.
						Borehole TP23C terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP23D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, dark brown, medium dense, medium grained, moist with brick, sandstone, concrete and aggregate gravels to cobbles.	TP23D - 0.1-0.4m (PID = 0.8) / DUP05 / DUP05A	M		No potential ACM, odours or staining noted.
						Borehole TP23D terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP24A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Started: 18/6/19
Project: Supplementary Contamination Assessment
Finished: 18/6/19
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Borehole Size:
Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Clayey SAND, orange/dark brown, medium grained, loose, soft, moist with aggregate gravels, brick and reworked red/grey clay, with ash/coalwash.	TP24A - 0.1-0.4m (PID = 2.1)	M		No potential ACM, odours or staining noted.
			1.0 1.5 2.0			Borehole TP24A terminated at 0.6m				

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Sample Point No: TP24B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator						FILL: Sandy CLAY, dark brown, loose, medium grained, soft, moist with lots of ash and some gravels.	TP24B - 0.1-0.4m (PID = 1.7)	M		No potential ACM, odours or staining noted.
			0.5		CL	CLAY, orange/grey, firm, moist.	TP24B - 0.3-0.5m (PID = 1.8)	M		No potential ACM, odours or staining noted.
						Borehole TP24B terminated at 0.6m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP24C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Clayey SAND, orange/dark brown, medium grained, loose, soft, moist with aggregate gravels, brick and reworked red/grey clay, with ash/coalwash.	TP24C - 0.1-0.4m (PID = 1.9)	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP24C terminated at 0.6m				
			1.5							
			2.0							

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Sample Point No: TP24D
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Clayey SAND, orange/dark brown, medium grained, loose, soft, moist with aggregate gravels, brick and reworked red/grey clay, with ash/coalwash.	TP24D - 0.1-0.4m (PID = 1.9)	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP24D terminated at 0.6m				
			1.5							
			2.0							

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Sample Point No: TP30A
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: CLAY w/ some sand, brown, soft, moist with plastic, wood and sandstone gravels to boulders.	TP30A - 0.0-0.2m / DUP03 / DUP03A	M		No potential ACM, odours or staining noted.
			1.0			FILL: Gravelly CLAY, red/brown, firm, moist with aggregate and concrete gravels.	TP30A - 0.7-0.9m	M		No potential ACM, odours or staining noted.
			1.5							
			2.0			FILL: SAND, yellow/grey, fine grained, very loose, moist.	TP30A - 1.7-1.9m	M		No potential ACM, odours or staining noted.
						Borehole TP30A terminated at 2m				

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Sample Point No: TP30B
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Clayey SAND, brown, fine to medium grained, very loose, moist with bricks, concrete gravels and boulders and steel bar.	TP30B - 0.0-0.2m	M		Potential ACM observed in-situ. No odours or staining noted.
			1.0				TP30B - 0.9-1.1m			
			1.5							
			2.0			FILL: SAND, yellow/grey, fine grained, very loose, moist.	TP30B - 1.6-1.8m	M		No potential ACM, odours or staining noted.
						Borehole TP30B terminated at 2m				

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Sample Point No: TP30C
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Sandy CLAY, brown, soft, moist with sandstone gravels to boulders, concrete and aggregate gravels, bitumen, bricks and fibrous cement sheeting fragments.	TP30C - 0.0-0.2m / DUP02 / DUP02A	M		Potential ACM observed in-situ. No odours or staining noted.
			1.0				TP30C - 0.9-1.1m			
			1.5							
			2.0			FILL: SAND, yellow/grey, fine grained, very loose, moist.	TP30C - 1.7-1.9m	M		No potential ACM, odours or staining noted.
						Borehole TP30C terminated at 2m				

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Sample Point No: TP42
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS

RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator						FILL: Sandy CLAY, red/grey, soft, moist with concrete gravels.	TP42 - 0.0-0.2m (PID = 0.4)	M		Potential ACM observed on surface. No odours or staining noted.
			0.5		SP-SC	SAND w/ trace clay, ref w/ grey mottle, medium grained, medium dense, moist.	TP42 - 0.4-0.6m (PID = 0.9)	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP42 terminated at 0.8m				
			1.5							
			2.0							

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Sample Point No: TP43
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator | **Hole Location:** Refer to figure 4 | **Driller:** Ken Coles | **Logged:** SS
RL Surface: | **Contractor:** | **Bearing:** --- | **Checked:** AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator						FILL: Sandy CLAY, red/grey, soft, moist with concrete gravels.	TP43 - 0.0-0.2m (PID = 1.2)	M		No potential ACM, odours or staining noted.
			0.5		SP-SC	SAND w/ trace clay, ref w/ grey mottle, medium grained, medium dense, moist.	TP43 - 0.5-0.7m (PID = 0.9)	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP43 terminated at 0.9m				
			1.5							
			2.0							

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Sample Point No: TP44
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Clayey SAND, red/grey, mefium grained, medium dense, moise with some sandstone gravels to cobbles.	TP44 - 0.0-0.2m (PID = 1.8)	M		No potential ACM, odours or staining noted. Potentially reworked natural material.
			1.0				TP44 - 0.8-1.0m (PID = 1.1)			
			1.5				TP44 - 1.5-1.7m (PID = 2.1)			
			2.0			Borehole TP44 terminated at 1.7m				

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Sample Point No: TP45
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY w/ some sand, brown, soft, moist with sandstone and concrete gravels to cobbles and brick.	TP45 - 0.1-0.4m (PID = 1.0)	M		No potential ACM, odours or staining noted.
						Borehole TP45 terminated at 0.5m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP46
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly SAND w/ trace clay, dark brown, medium grained, loose, moist with aggregate gravels and wood.	TP46 - 0.0-0.2m (PID = 0.4)	M		No potential ACM, odours or staining noted.
					SP-SC	SAND w/ trace clay, red/yellow, medium grained, loose, moist.	TP46 - 0.5-0.7m (PID = 0.9)	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP46 terminated at 0.9m				
			1.5							
			2.0							

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Sample Point No: TP47
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS

RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator						FILL: SAND w/ trace clay, brown, medium grained, loose, moist with gravels.	TP47 - 0.0-0.2m (PID = 1.6)	M		No potential ACM, odours or staining noted.
			0.5		SP-SC	SAND w/ trace clay, red/yellow, medium grained, loose, moist.	TP47 - 0.4-0.6m (PID = 2.1)	M		No potential ACM, odours or staining noted.
			1.0			Borehole TP47 terminated at 0.9m				
			1.5							
			2.0							

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Sample Point No: TP49
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator					SP-SC	SAND w/ trace clay, red/yellow, medium grained, loose, moist.	TP49 - 0.0-0.2m (PID = 0.8)	M		No potential ACM, odours or staining noted.
			0.5			Borehole TP49 terminated at 0.4m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP50
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator						FILL: Silty CLAY, brown, soft, moist with concrete gravels.	TP50 - 0.0-0.2m (PID = 1.5)	M		No potential ACM, odours or staining noted.
					SP-SC	SAND w/ trace clay, red/yellow, medium grained, loose, moist.	TP50 - 0.2-0.4m (PID = 1.8)	M		No potential ACM, odours or staining noted.
			0.5							
						Borehole TP50 terminated at 0.6m				
			1.0							
			1.5							
			2.0							

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Sample Point No: TP51
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly SAND w/ trace clay, brown/grey, medium grained, soft, moist with sandstone and concrete gravels to cobbles and brick.	TP51 - 0.0-0.2m (PID = 1.1)	M		No potential ACM, odours or staining noted.
			1.0				TP51 - 0.8-1.0m (PID = 1.3)			
			1.5		SW	SAND, yellow/pale brown, fine to medium grained, very loose, moist.	TP51 - 1.3-1.5m (PID = 0.8)	M		No potential ACM, odours or staining noted.
			2.0			Borehole TP51 terminated at 1.5m				

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Sample Point No: TP52
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Sandy CLAY, brown, soft, moist with glass, brick, concrete gravels and boulders and steel bar.	TP52 - 0.0-0.2m (PID = 0.5)	M		No potential ACM, odours or staining noted.
			1.0				TP52 - 0.9-1.1m (PID = 0.6)			
			1.5		CL	CLAY, red/grey, firm, moist.	TP52 - 1.2-1.4m (PID = 0.8)	M		No potential ACM, odours or staining noted.
			2.0			Borehole TP52 terminated at 1.5m				

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Sample Point No: TP53
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Gravelly CLAY w/ sand, brown/grey, soft, moist with sandstone gravels to cobbles and brick.	TP53 - 0.0-0.2m (PID = 0.5)	M		No potential ACM, odours or staining noted.
			1.0				TP53 - 0.9-1.1m (PID = 0.9)			
			1.5			FILL: CLAY w/ gravels, red/brown, firm, moist.	TP53 - 1.2-1.4m (PID = 0.1)	M		No potential ACM, odours or staining noted.
			2.0			Borehole TP53 terminated at 1.5m				

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Sample Point No: TP54
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 18/6/19
Finished: 18/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SILT, pale brown, very loose, soft, moist with sandstone cobbles and boulders and wood.	TP54 - 0.0-0.2m (PID = 0.7) / DUP01 / DUP01A	M		No potential ACM, odours or staining noted.
			1.0			FILL: Gravelly CLAY, grey/brown, soft, moist with concrete and aggregate gravel, bitumen cobbles to boulders and sandstone cobbles to boulders.	TP54 - 0.6-0.8m (PID = 0.4)	M		No potential ACM, odours or staining noted.
			1.5				TP54 - 1.3-1.5m (PID = 0.2)			
			2.0			Borehole TP54 terminated at 1.5m				

BOREHOLE / TEST PIT 9280-ER-1-1-LOGS.GPJ GINT STD AUSTRALIA.GDT 2/7/19

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Sample Point No: TP55
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator | **Hole Location:** Refer to figure 4 | **Driller:** Ken Coles | **Logged:** SS
RL Surface: | **Contractor:** | **Bearing:** --- | **Checked:** AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Clayey SAND, brown, medium grained, medium dense, moist with sandstone and concrete gravels to cobbles.	TP55 - 0.0-0.2m (PID = 0.3)	M		No potential ACM, odours or staining noted.
			1.0			FILL: SAND w/ trace clay, grey/orange, medium grained, medium dense, moist with trace aggregrate gravels and bricks.	TP55 - 0.8-1.0m (PID = 0.1)	M		No potential ACM, odours or staining noted.
			1.5			Borehole TP55 terminated at 1.5m				
			2.0							

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Sample Point No: TP56
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Project: Supplementary Contamination Assessment
Location: Meadowbank Schools Project, See Street, Meadowbank NSW

Started: 19/6/19
Finished: 19/6/19
Borehole Size:

Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: SAND w/ trace clay, dark brown, medium grained, medium dense, moist with brick, sandstone, concrete and aggregate gravels to cobbles.	TP56 - 0.1-0.4m (PID = 1.9)	M		No potential ACM, odours or staining noted.
						Borehole TP56 terminated at 0.5m				
			1.0							
			1.5							
			2.0							

BOREHOLE / TEST PIT 9280-ER-1-1-LOGS.GPJ GINT STD AUSTRALIA.GDT 2/7/19

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Sample Point No: TP57
Sheet: 1 of 1
Job No: 9280

Borehole Log

Client: Ward Civil
Started: 18/6/19
Project: Supplementary Contamination Assessment
Finished: 18/6/19
Location: Meadowbank Schools Project, See Street, Meadowbank NSW
Borehole Size:
Rig Type: Excavator
Hole Location: Refer to figure 4
Driller: Ken Coles
Logged: SS
RL Surface:
Contractor:
Bearing: ---
Checked: AR

Method	Water	RL (m)	Depth (m)	Graphic Log	Classification Symbol	Material Description	Samples Tests Remarks	Moisture Condition	Consistency/ Density Index	Additional Observations
Excavator			0.5			FILL: Sandy CLAY, orange/dark brown, medium grained, loose, soft, moist with brick, sandstone, concrete and aggregate gravels.	TP57 - 0.0-0.2m (PID = 1.1) / DUP01 / DUP01A	M		No potential ACM, odours or staining noted.
			1.0				TP57 - 0.8-1.0m (PID = 1.5)			
			1.5			Borehole TP57 terminated at 1m				
			2.0							