Douglas Partners
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Report on
Detailed Site Investigation for Contamination with Limited Sampling

Proposed Residential Subdivision
Menangle Park South, NSW

Prepared for
Dahua Group Sydney Project 3 Pty Ltd

Project 76744.04
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Geotechnics / Environment / Groundwater

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Executive Summary

Douglas Partners Pty Ltd (DP) was engaged by Dahua Group (Dahua), care of APP Corporation Pty Ltd (APP) to undertaken a Detailed Site Investigation for Contamination with limited sampling ('DSI') for the proposed residential development of a parcel of land referred to as Menangle Park South, Menangle Park, NSW ('the site'). The DSI is required to accompany Development Applications (DA) to Campbelltown City Council for the proposed residential development of the site.

The site has previously been subject to two contamination investigations including a Land Capability Study (LCS), the scope of which included soil sampling and laboratory analysis for potential contaminants of concern. The LCS concluded that contamination levels across the site were generally low and would not preclude the development of the site for the proposed residential use. The report recommended that a DSI (i.e. this investigation) be undertaken prior to redevelopment.

The scope of the DSI included a site walkover, review of site history information, review of previous investigations, soil sampling and laboratory analysis. A total of 13 test pits were completed as part of this investigation, of which three were completed in stockpiles and the remaining 10 across the balance of the site. A further 24 test pits were completed as part of the geotechnical and salinity investigation and to inform the current understanding of ground conditions at the site. A total of 13 test pits were completed as part of the LCS; analytical results from the LCS were considered as part of this investigation. A total of 23 test pits (excluding stockpiles) have therefore been completed at the site; which equates to approximately one test pit per 6 ha and is considered to be an appropriate sampling density for a site considered to have a low potential for significant contamination.

Concentrations of COC collected from test pit locations were within the LOR and / or adopted SAC for all samples with the exception of zinc in SP4 which exceeds the corresponding EIL. Asbestos was not reported above the reporting limit in any soil samples submitted for analysis and no suspected ACM was observed during test pitting. An ACM pipe was observed during the site walkover which will require remediation and validation prior to earthworks.

Based on the findings of the DSI, DP considers that site is considered to have a generally low potential for contamination and is considered suitable, from an environmental perspective, for the proposed residential land use. Notwithstanding the above, the potential remains for isolated pockets of contamination to be present in areas of the site. To appropriately manage unexpected potential contamination issues encountered during development works, DP recommends the development and implementation of an Unexpected Finds Protocol.

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1. Introduction

Douglas Partners Pty Ltd (DP) was engaged by Dahua Group (Dahua), care of APP Corporation Pty Ltd (APP) to undertaken a Detailed Site Investigation for Contamination with limited sampling ('DSI') for the proposed residential development of a parcel of land referred to as Menangle Park South, Menangle Park, NSW ('the site'). The works were carried out in accordance with DP's proposal MAC160099 dated 5 August 2016 and contract reference 13647/80172527. The DSI is required to accompany Development Applications (DA) to Campbelltown City Council ('Council') for the proposed residential development of the site.

Land to the north of the site (Menangle Park North) is subject to a separate DA for residential development purposes and is therefore the subject of a separate DSI (Project 76744.01).

The site has previously been subject to two contamination investigations including a Land Capability Study (LCS), the scope of which included soil sampling and laboratory analysis for potential contaminants of concern. The LCS concluded that contamination levels across the site were generally low and would not preclude the development of the site for the proposed residential use. The report recommended that a DSI (i.e. this investigation) be undertaken prior to redevelopment. The findings of previous contamination investigations completed at the site are further discussed in Section 3.6 of this report.

This DSI was conducted concurrently with a geotechnical and salinity investigation which have been reported separately under Projects 76744.05 and 76744.06 respectively. This DSI report has been completed with reference to NSW EPA guidelines under the Contaminated Land Management (CLM) Act 1997, NSW State Environmental Planning Policy No. 55 – *Remediation of Land* (SEPP 55) for a Preliminary Site Investigation and National Environment Protection Council *National Environment Protection (Assessment of Site Contamination) Measure*, 1999, as amended 2013 (NEPM, 2013). This report includes recommendations regarding the suitability of the site for the proposed development and the need for further work, as required.

1.1 Objectives

The objectives of the DSI are as follows:

- Identify potential data gaps relating to the contamination status of the site through review of previous environmental assessments and desktop investigations;
- Undertake intrusive works sampling and analysis to address the identified data gaps; and

- Provide advice and recommendations so that an informed decision can be made on the remediation works required to render the site suitable, from a contamination standpoint, for the proposed residential development .

2. Scope of Work

The following scope of work was carried out:

- Detailed review of:
  - Current and historical aerial photographs available from NSW Land and Property Information; and
  - EPA register.
- A review of previous assessment data against current NEPM (2013) criteria;
- A detailed site walkover and mapping of potential areas of environmental concern (PAEC)
- A data gap assessment;
- Excavation of 13 test pits to a maximum depth of 2.5 m or 0.5 m into natural and as follows:
  - eight test pits across the site (grid based sampling);
  - two test pits in areas of possible filling identified during the data gap assessment; and
  - three test pits in stockpiles at the site;
- Collection of representative soil samples from the test pits at regular depth intervals (i.e. 0 – 0.1 m and 0.4 – 0.5 m);
- Analysis of select soil samples for the following potential contaminants of concern (COC):
  - Heavy metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
  - Total recoverable hydrocarbons (TRH);
  - Benzene, toluene, ethyl benzene and xylene (BTEX);
  - Polycyclic aromatic hydrocarbons (PAH);
  - Phenols;
  - Organochlorine pesticides (OCP) and organophosphorus pesticides (OPP);
  - Polychlorinated biphenyls (PCB); and
  - Asbestos.
- Field sampling and laboratory analysis in compliance with standard environmental protocols, including a Quality Assurance / Quality Control (QA/QC) plan consisting of 10 % replicate sampling (intra-laboratory replicate samples); and
- Preparation of this report detailing the methodology and results of the investigation and assessment of the site's suitability for the proposed development.

3. Site Background

3.1 Site Identification

The site is irregular in shape with an approximate area of 134 ha and lies within the Local Government Area (LGA) of Campbelltown City Council. The site locality and boundary are shown on Drawing 1. The site is currently registered as 12 lots, as listed below:

- Lot 1 on Deposited Plan (D.P.) 708770;
- Lot 125 on D.P. 1097138;
- Lot 19 and Lot 22 on D.P. 260090;
- Lot 31 and Lot 33 on D.P. 1101983;
- Lot 35 on D.P. 230946
- Lot 1 on D.P. 707225;
- Lot 124 on D.P. 1097090;
- Lot 7 on D.P. 787284;
- Lot 1 on D.P. 249393;
- Lot 1 on D.P. 727098; and
- Lot 3 on D.P. 236059.

The site layout and lot boundaries are shown on Drawing 1, Appendix A.

3.2 Site Description

Menangle Park South is located approximately 7 km southwest of the Campbelltown CBD and comprises an irregular shaped area of approximately 140 hectares within the Campbelltown City Council Local Government Area. The site is general bound to the north and west by Menangle Road (not including the northern portion), whilst the eastern boundary is bound by the Hume Highway and the southern boundary by the Nepean River (Drawing 1, Appendix A).

The northern, central and north-eastern parts of the site comprise broad rolling hills with gentle to moderate slopes (5 – 15%). Some localised steeper slopes (up to 25%) were present along the south-east facing side of a prominent hill centrally located along the eastern boundary as well as in over steepened areas along the Nepean River banks. The above, northern, central and eastern portion of the site generally drain towards an unnamed tributary in the northern part of the site and south-eastern corner of the site, whilst the remainder of the site (the southern western portions) generally slopes towards the Nepean River in the south. The western and southern margin of the site comprises a gently sloping to alluvial terrace (0 – 5%) adjacent to the Nepean River. The unnamed tributary flows west (from approximate RL 108, relative to Australian height datum, AHD) through the central part of the site towards the Nepean River (at approximate RL 62). There is an overall relief of approximately

60 m from the highest part of the site (at the top of the hill near BH8, approximate RL 126) to the Nepean River, the lowest part of the site.

At the time of the investigation, the site was mainly rural land covered with grass with localised areas of scattered to moderately dense stands of trees. Much of the site is used for grazing land, primarily agistment of cattle and horses with numerous associated farm dams constructed across the site.

Historical land-use has been dominated by rural activities since European settlement, including cattle and sheep grazing, dairy farming and crop cultivation.

3.2.1 Current Zoning

The site is currently zoned under Campbelltown Local Environmental Plan (2015) as NU40 Non-Urban i.e. land that is in a rural or environmental zone and has an area of less than 40 hectares.

3.3 Regional Geology and Soil Landscapes

3.3.1 Geology

The site can be broadly divided into two broad geological units (Refer Figure 1 below, for additional detail):

The rolling hills, ridgelines and lower slopes in the northern, eastern and central portions of the site are underlain by the Bringelly Shale (mapping unit Rwb) and Ashfield Shale (mapping unit Rwa) of the Triassic age Wianamatta Group (refer to Geological Survey of New South Wales (1985), *Wollongong-Port Hacking Geological Map No. 137 Series Sheet, 1:100,000 Geological Sheet 9029-9129.* The site is predominantly underlain by Ashfield Shale typically comprises siltstone and laminite, all of which weather to form clays of high plasticity. The Bringelly Shale, which in the vicinity of the site includes an unnamed, fine to medium grained quartz-lithic sandstone member, typically comprises shale, carbonaceous claystone, laminite and some minor coaly bands which weather to form clays of high plasticity. The boundary between the Ashfield Shale and Bringelly Shale is commonly marked by a thin (between 1.5 m and 6 m, usually less than 3 m), fine to medium grained lithic sandstone unit, the Minchinbury Sandstone which, in the Sydney region may be of very high strength when fresh.

The lower lying western portion of the site (as well as the southern margin/central gully formation) is generally underlain by Quaternary alluvial deposits (mapping unit Qal) of the Nepean River are mainly derived from weathering of Permian and Triassic bedrock and comprise typically grey-brown, medium grained quartz sand with layers of silt and humic clay. Charcoal particles are abundant in some horizons.

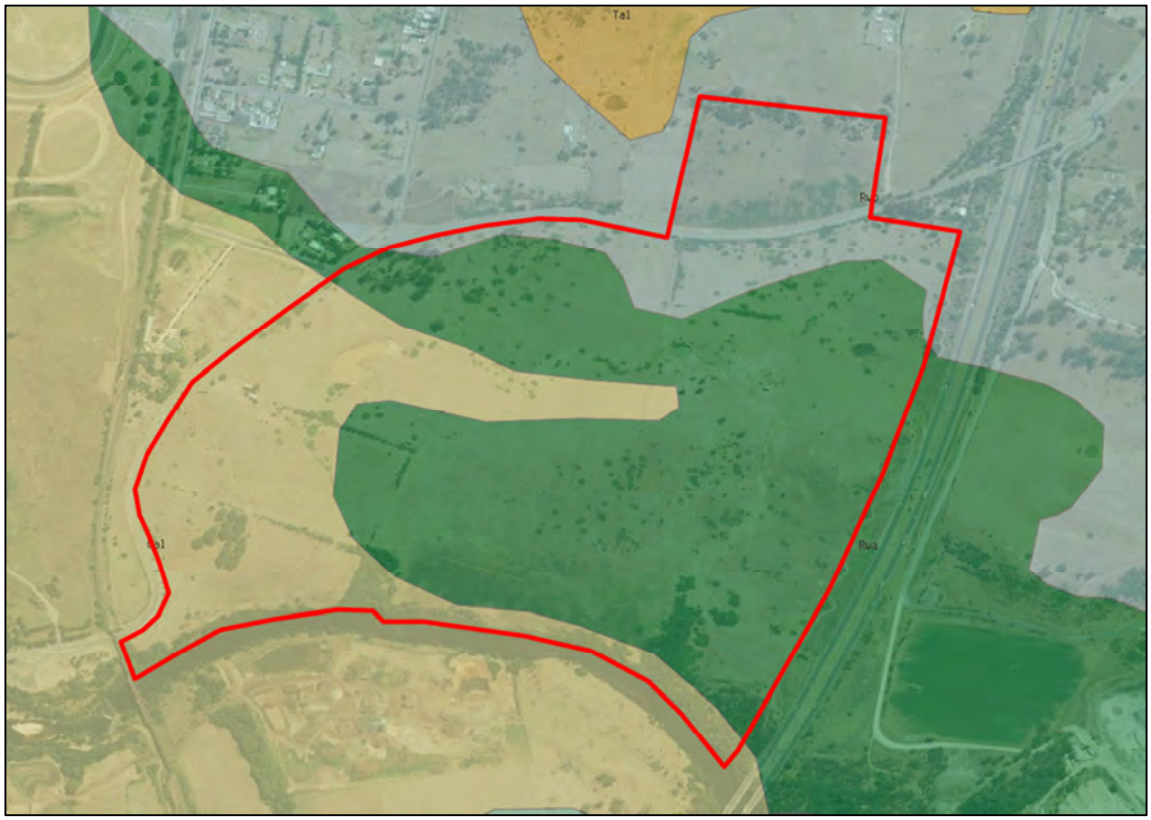


Figure 1: Geological Landscapes (Yellow – Alluvium, Green - Ashfield Shale and Blue – Bringelly Shale)

3.3.2 Soil Landscapes

Soil landscapes over the site generally reflect the underlying geology and topography. With reference to the Soil Conservation Service of NSW (1990) *Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet,* the site is broadly divided into three distinct soil landscapes, the Blacktown residual soils present over most of the central and eastern part of the site, the Theresa Park alluvial soils present in the western portion of the site and a smaller portion of Luddenham soils associated with the prominent hill located centrally along the eastern boundary. The Three soil landscapes are further described below (refer Figure 2 below for additional detail):

The Blacktown Soil Landscape (mapping unit bt) is a residual soil group associated with the gently undulating slopes and broad rounded crests and ridges on the Wianamatta Group in the eastern part of the site. The unit comprises up to four soil horizons that range from shallow red-brown hard-setting sandy clay soils on crests and upper slopes to deep brown to yellow sand and clay soils overlying grey plastic mottled clay on mid to lower slopes. These soils are typically of low fertility, are moderately reactive and have a generally low wet bearing strength.

The Theresa Park Soil Landscape (mapping unit tp) is an alluvial unit associated with the Quaternary flood plains and terraces of the Nepean River. Soil types include brown sandy loam, reddish-brown sandy clay, and light clay. Fluvial bedding is sometimes evident, and their sand-rich nature is reflected in typically higher permeability and low available water holding capacity.

Development limitations of these soils include seasonal and localised permanent waterlogging, erosion hazards, localised flood hazards, hard-setting surfaces and are generally of low fertility.

The Luddenham Soil Landscape (mapping unit lu) is an erosional soil group characterised by undulating to rolling low hills on Wianamatta Group shales, often associated with Minchinbury Sandstone. Local relief is between 50 – 80 m and slopes from 5 – 20%. Typical landscape features include narrow ridges, hillcrests and valleys. The unit comprises three soil horizons that range from shallow dark podzolic soils to massive earthy clays on crests and moderately deep red podzolic soils on upper slopes. These soils are typically moderately reactive, with a high soil erosion hazard, and localised impermeable highly plastic subsoil.

Figure 2: Soil Landscapes

3.4 Groundwater

A groundwater investigation was undertaken in the Camden South area adjacent to the Menangle Park site, which has a similar hydrogeological setting (AWT, 2001; as referenced in DP, 2004 and discussed in Section 3.6). The AWT study indicated that there were two distinct groundwater settings in that area:

1) Groundwater within Wianamatta Group shale; and

2) Groundwater within unconsolidated Quaternary deposits of the Nepean River flood plain.

Groundwater flow in unconsolidated Quaternary deposits is likely to be by porous flow in sandy horizons. Shales of the Wianamatta Group on the other hand have a very low intrinsic permeability, and groundwater flow is likely to be dominated by fracture flow.

A 2013 investigation and subsequent report completed by DLA Environmental Pty Ltd (DLA 2013; refer to Section 3.6) comprised the installation of six groundwater monitoring bores (MW1 – MW6). Five of these bores were located on site by DP and dipped to determine Standing Water Levels (SWL). In summary, the SWL for MW1 – MW5 were in the range 1.1 – 3.2 m bgl.

A search of groundwater bore data through the Department of Infrastructure Planning and natural Resources (DIPNR) shows 35 registered bores within a 5 km radius of Menangle Park, two of which lie in close proximity to the Menangle Park North Site. Bore GW101106 is located within the Glenlee Olive Grove property (not included in this investigation), and Bore GW109315 is located immediately west of Cummins Road (the south western boundary of the site). The intended / authorised purposes of the bores were for irrigation / domestic stock, with one of the bores located west of the site used for monitoring purposes. The drill logs for these bores are summarised below:

- GW101106 encountered a residual soil profile to a depth of 5 m overlying shale and sandstone bedrock to a termination depth of 280 m with a SWL of 14 – 17 m below ground level (bgl).
- GW109315 encountered alluvial silty sand and sand to the termination depth of 3 m with a standing water level of 0.6 m recorded.

Historical accounts of the farmland area south of Menangle Road formally occupied by Thomas Vardy (in the mid-1800s) refer to several springs in that area. The springs are likely due to shallow groundwater discharge from above a low permeability shale or sandstone unit towards the top of the Ashfield Shale.

3.5 Hydrology

Two unnamed streams traverse across the site and towards the south, i.e. towards the Nepean River. Three farm dams are located in the northern half of the site. The Nepean River is located parallel to the southern site boundary.

3.6 Previous Investigations

The site has been subject to two previous investigations of relevance to this investigation:

- DP *Report on Land Capability Study, The Menangle Park Urban Release Area, Menangle Park*, Project 36500, August 2004 (DP, 2004); and
- DP, Letter Report *Contamination Review, Proposed Residential Subdivision, Menangle Park*. Project 76744.00, dated 18 May 2016 (DP, 2016).

A summary of the above investigations are presented in Sections 3.6.1 and 3.6.2 below:

3.6.1 DP (2004) Land Capability Study

In 2004, DP undertook a Land Capability Study of a larger 920 ha area of land which incorporates the current site and additional surrounding land. The purpose of the Land Capability Study was to assess the suitability of the site for re-zoning and urban development with regards to the potential for contamination, the presence of potential or actual acid sulphate soils as well as salinity and soil erosion / instability risks.

The Land Capability Study (which comprised a review of past land uses, site inspection, intrusive investigation and sample analysis) indicated a number of potential sources of contamination that may be present within the vicinity of the site as listed below, with additional comment provided specific to this investigation:

- Areas of cut and fill associated with Sydney Gas extraction plants, pipes and gas flares adjacent to Nepean River.

  Based on a review of available maps[1] showing well heads and gas gathering lines in the general area, there are no known well heads on the site. A gas gathering line traverses the southern part of the site and it is understood this will be retained as part of the development;
- Uncontrolled landfilling and burial activities, past agricultural use of land with possible pesticides applications;
- Asbestos in filling material and buried waste; and
- Septic tank and potential chemical storage.

As part of the preliminary site contamination assessment, a total of 74 test pits were excavated across the 920-ha site, of which 13 test pits are located within the current site boundary (as shown on Drawing 2. The analytical results were assessed against the health based investigation levels (HILs) for residential land use and provisional phytotoxicity based investigation levels (PPILs) provided in the National Environmental Protection Measures (NEPM, 1999). Concentrations of contaminants of potential concern were below the adopted assessment criteria in all samples within the current site.

Since the completion of the Land Capability Study (DP, 2004), the NEPC updated key contamination guidelines (NEPM, 2013) which was adopted by all Australian states and endorsed by the NSW EPA on 11 June 2013. This document replaced the 1999 version which was applied to the Land Capability Study (DP, 2004). Based on a review in the context of the updated NEPM guidelines (NEPM, 2013) DP does not consider the revised document would significantly alter the findings of the Land Capability Study and therefore the conclusions remain unchanged.

Based on the evaluation of field and laboratory data, DP (2004) concluded that contamination levels across the site were generally low and would not preclude the development of the site for the proposed residential use. The report recommended that a DSI be undertaken prior to redevelopment.

The Land Capability Study indicated no known potential or actual acid sulphate soil at the site.

3.6.2 DP (2016) Contamination Review

A contamination review specific to the site was undertaken by DP for due diligence purposes (DP, 2016). The objective of the review was to provide comments on the potential for contamination to be present at the site. The review was based on results of the Land Capability Study, a review of readily

[1] https://www.agl.com.au/-/media/AGL/About-AGL/Documents/How-We-Source-Energy/Camden-Document-Repository/Maps/20131121_Camden-Project--Cambelltown-LGA-AGL-Well-Heads-and-Gas-Gathering-Line.pdf

available site history information and aerial photography for the site since the completion of the Land Capability Study.

Based on the information obtained, DP (2016) considered that overall there was a low potential for significant contamination at the site, however, further investigation targeting observed stockpiles and possible ground disturbances was warranted. In addition, low density confirmatory sampling of the balance of the site, was recommended to confirm the contamination status of the site.

A groundwater investigation was not considered necessary, unless further investigation identified areas of soil contamination.

4. Site History

A site history review was undertaken to identify PAEC and COPC which may arise from previous land uses, such as the presence of demolished or partly demolished buildings, soil stockpiles, land filling, waste disposal and / or other potentially contaminating activities. The findings of the site history investigation are summarised in Sections 4.1 and 4.2 below.

4.1 Historical Aerial Photographs

Historical aerial photographs available for selected years between1956 and 2016 are provided in Drawings 3 – 6, attached (in order). A summary of the key findings are presented below:

1956 - The aerial photograph for 1956 provided by NSW LPI only covers part of the northern portion of the site. The site consists largely of cleared rural land with scattered trees. There is an area of vegetation north of the site, adjacent to Menangle Road. The dominant land use for the balance of the site visible in the aerial photograph appears to be pastoral / agricultural. A stream / tributary can be seen traversing the northern portion of the site. There are three structures present, likely to be homesteads, one near the western boundary, one further east (south of the observed vegetation area) And the third structure is located within the north eastern quadrant of the site, south of the stream, however the aerial photograph does not cover the area in full.

1975 - The Hume Motorway can be seen running north – south parallel to the eastern site boundary. The portion of the site covered in the 1956 aerial appears much the same; however it is evident that some of the vegetation in the north has been cleared. Two additional structures are located in the east part of the site and a possible ground disturbance is evident south of the two structures. There appears to be a land clearing south of the tributary, towards the east. A house appears to be in construction just beyond the north-east corner of the site. Several tracks/paths (likely unpaved) are visible traversing the eastern half of the site.

1984 - The site appears much the same as in the previous aerial. The ground disturbance identified in the 1975 aerial is now clearly identified as small structures/shelters. There are patches of exposed ground / ground disturbances mainly within the central east of the site, in the vicinity of the structures.

1994 - The structures present within the western half of the 1984 aerial still remain, however most of the structures located towards the east appear to have been demolished.

2009 – 2016 - A review of recent aerial photographs available on Nearmap[2] indicates that the site has remained relatively unchanged since 2002. Minor ground disturbances were observed sporadically around the site. Some of these ground disturbances appear to be soil stockpiles and others are potentially from onsite operations (defined tracks and maintained grassed areas). Gas wells located in the surrounding area were generally installed between 2010 and 2011. Based on the absence of the gas gathering line in the historical aerial photograph for 1996 and its presence in Nearmap aerials in 2009, the gas gathering line located at the site was installed between 1996 and 2009.

4.2 Statutory Notices and Licenses

A search of the NSW EPA website on 2 December 2016 indicated that:

- The site and immediate surrounding area have not been included on the list of NSW contaminated sites notified to the Environment Protection Authority (EPA);
- No notices or orders made under the *Contaminated Land Management* (CLM) Act 1997 have been issued for the site or adjacent properties; and
- No licences have been issued under Schedule 1 of the *Protection of the Environment Operations* (POEO) Act, 1997 for the site. However, it is noted that a licence has been issued for Rosalind Park Quarry located on Medhurst Road, Menangle Park to the east of the site, beyond the Hume Motorway.

5. Site Walkover

A site walkover was completed by DP on 23 November 2016. Key observations made during the walkover are presented below. Photographs are provided in Appendix B.

- Several tracks traverse the site that appear to be access ways to animal grazing areas and residual structures at the site. The site was in use for livestock grazing at the time of the walkover.
- In the western part of the site a brick and corrugated steel house, separate garage and corrugated steel animal stall areas and associated grazing paddocks was observed (photograph 1). The house and adjacent structures were generally in a dilapidated condition. Suspected bonded asbestos containing materials (ACM) may possibly be present in the ceiling materials located inside the house (photograph 2).
- Two small stockpiles containing suspected reworked natural material were located to the west of the house. The stockpiles could not be closely inspected at the time of the walkover owing to the presence of dense grass covering both stockpiles. One small stockpile containing construction and demolition type materials was located approximately 100 m south east of the house and next to a fence line traversing a small creek here.
- Large concrete bricks were scattered on the ground surface in several locations near waterlogged areas associated with the Nepean River in the south east part of the site.

[2] http://www.nearmap.com.au/. Last accessed 2 December 2016.

- A suspected ACM pipe partially covered with concrete was located near to the Nepean River in the south east corner of the site (photograph 3).
- Minor fly tipping of materials including loose timber fencing, dilapidated steel shed, tyres, a lawnmower engine and exhaust pipe was observed next to the Nepean River in the south east part of the site. No staining or evidence of spill was observed on the underlying ground (photograph 4).
- A small stockpile covered in dense grass was observed next to the Nepean River in the south west part of the site. Owing to the dense grass cover, the stockpile could not be inspected with sufficient detail at the time of the walkover.
- With the exception of the above noted observations, no evidence of historical structures was visible during the walkover - including former building footprints observed in historical aerial photographs (refer to Section 4.1).
- The walkover included areas where localised ground disturbance were noted in the Contamination Review (DP, 2016). No evidence of suspected filling was observed during the walkover.

Key observations from the site walkover are presented in Drawing 7.

6. Potential Areas of Environmental Concern and Data Gaps

Based on a review of site background information, site history, previous investigations and the site walkover a total of 6 PAECs have been identified as requiring further consideration. These identified PAEC are presented in Table 1 below and presented on Drawing 8 (Appendix A).

Table 1: PAECs

PAEC #	Description / Data Gap	Identified From	Discussion and Recommended Works
1	Possible historical filling / burial near former structures. Any burial of material is more likely to occur in close proximity to historical structures and residential areas. Observed possible ground disturbance may indicate burial areas. Current and historical (demolished) structures may have contained ACM.	Previous investigation reports, historical aerial photographs.	A review of historical aerial photographs identified minimal potential land disturbance at the site. Some potential land disturbance was observed in the proximity of former structures; therefore test pits completed as part of these works will be carried out here to inform the current assessment.
2			
3			
4	Historical ground disturbance	Historical aerial photographs	Test pits completed as part of these works will be carried out here to inform the current assessment.
5			
6	Stockpiles containing soil, ripped rock and some building material	Site walkover	Soil stockpiles, particularly those containing building materials have the potential to contain contaminants, including asbestos. Some soil stockpiles will be subject to assessment as part of this DSI.
7	Stockpile containing general building material		
8	Soil stockpile		

PAEC #	Description / Data Gap	Identified From	Discussion and Recommended Works
9	Numerous small soil stockpiles		
10	Small soil stockpile		
11	Stockpile containing soil and some building material		
12	ACM pipe	Site walkover	Required to be removed and validated in future works, prior to earthworks.
13	Minor fly tipping near Nepean River	Site walkover	The contents of the stockpiles could not be observed during the walkover, therefore the stockpiles will be logged and sampled as part of the limited intrusive investigation.
14 (site wide)	Historical agricultural land use	Previous investigation reports, historical aerial photographs, site walkover.	Soil samples collected as part of this investigation shall be assessed for COPC associated with historical agricultural land use.

7. Preliminary Conceptual Site Model

A conceptual site model (CSM) is a representation of site-related information regarding contamination sources, receptors and exposure pathways between those sources and receptors (linkages). A preliminary CSM provides a framework to identify potential contamination sources and how potential receptors may be exposed to contamination either in the present or the future (i.e. it enables an assessment of the potential source – pathway – receptor linkages).

7.1 Potential Sources

Potential sources of contamination identified in the data gaps assessment are summarised in Table 2 below.

Table 2: Potential Contamination Sources and COC

Potential Source	Description of Potential Source	COC
Stockpiles and possible filling (S1)	Three stockpiles were observed at the site during the site walkover. Previous investigation reports and historical aerial photographs identified the potential for localised possible filling in the proximity of former structures at the site.	Metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols, and asbestos
Agricultural land use (S2)	Current and historical agricultural land use and associated pesticide use may potentially impact the surface soils.	Metals, OCP and OPP

Historical structures (S3)	Possible use of hazardous building materials	Lead, Asbestos, Pesticides
Gas gathering lines (S4)	Possible associated hydrocarbon impact from leaks and spills. NOTE: For safety reasons it is not possible to investigate in close proximity to gas gathering lines. DP understands that the gas gathering lines will be retained. Therefore, this potential contaminant source will not be further considered here.	Hydrocarbons, metals

Notes: *Metals: comprising arsenic (As), cadmium (Cd, chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni) and zinc (Zn);*
TRH - Total recoverable hydrocarbons;
BTEX - Benzene, toluene, ethylbenzene and xylene;
PAH - Polycyclic aromatic hydrocarbons;
OCP and OPP - Organochlorine and organophosphorous pesticides;
PCB - Polychlorinated biphenyls;
ACM – Asbestos Containing Material

7.2 Potential Receptors

The following potential human receptors (R) have been identified for the site:

- R1 – Construction and maintenance workers (during site redevelopment);
- R2 – Residential site users following development of the site; and
- R3 – Land users to the west, along Menangle Road (rural residentialal).

Owing to the likely high salinities and low yields of groundwater associated with the Wianamatta Group in the region (typically brackish to saline), groundwater beneath the site is unlikely to be suitable for irrigation purposes. Furthermore, no bores were registered within 1 km of the site for irrigation purposes. If soil investigation results indicate significant contamination is present at the site, the need for a groundwater investigation will be further considered.

The following potential ecological receptors (R) have been identified for the site:

- R4 – Local groundwater and receiving water bodies;
- R5 – Surface water bodies (creeks, farm dams and the Nepean River); and
- R6 – Ecology. DP notes that exposure to contaminants via plant uptake is usually associated with the upper 2 m (root zone and habitation zone for many species) of the soil profile.

7.3 Potential Pathways

Potential pathways for contamination include the following:

- P1 – Ingestion and dermal contact;
- P2 – Inhalation of fibres, dust and/or vapours;

- P3 – Leaching of contaminants and vertical migration into groundwater;
- P4 – Surface water run-off;
- P5 – Lateral migration of groundwater providing base flow to watercourses; and
- P6 – Plant uptake.

7.4 Summary of CSM

A 'source – pathway – receptor' approach has been used to assess the potential risks of harm caused to human or ecological receptors from contamination sources on or in the vicinity of the site, via exposure pathways. The possible exposure pathways between the above sources (S1 – S3) and receptors (R1 to R6) are provided in Table 2 below. Assessment of the preliminary CSM was used to identify appropriate sampling and analysis to investigate current data gaps and assess the suitability of the site for the proposed residential use.

Table 3: Preliminary Conceptual Site Model

Source	Exposure Pathway	Receptor	Requirement for Additional Data and / or Management
S1: Stockpiles and possible filling S2: Agricultural land use	P1 – Ingestion and dermal contact; P2 – Inhalation of fibres and/or dust and/or vapours	R1 – Construction and maintenance workers. R2 – Future site users following development of the site. R3 – Land users along Menangle Road.	An intrusive investigation is required to quantify and assess possible contamination including chemical testing of soil (and groundwater if deemed necessary).
	P3 – Leaching of contaminants and vertical migration into groundwater. P4 – Surface water run-off. P5 – Lateral migration of groundwater providing baseflow to watercourses.	R4 – Local groundwater and receiving water bodies. R5 – Surface water bodies.	
	P6 – Plant uptake.	R6 – Local ecology.	
S3: Historical structures	P1 – Ingestion and dermal contact; P2 – Inhalation of fibres and/or dust and/or vapours	R1 – Construction and maintenance workers. R2 – Future site users following development of the site. R3 – Land users along Menangle Road.	

8. Sampling and Analysis Plan

8.1 Sampling Rationale

Field investigations were undertaken on 16 and 17 January 2017 by a DP environmental engineer.

The field investigation was designed in accordance with the seven step data quality objective (DQO) process provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure 1999* as amended 2013 (NEPC, 2013). The DQO adopted for this DSI is provided in Appendix C.

The findings of the site history review and data gaps assessment were used to inform the sampling rationale which comprises a combination of targeted and grid sampling locations. A total of 13 test pits were completed as part of the current investigation; three in stockpiles and the remaining 10 across the balance of the site. A further 24 test pits were completed as part of the geotechnical and salinity investigation (refer to Section 1) and to inform the current understanding of ground conditions at the site. A total of 13 test pits were completed as part of the LCS (refer to Section 3.6.1.); analytical results from the LCS were considered as part of this investigation. A total of 23 test pits (excluding stockpiles) have therefore been completed at the site; which equates to approximately one test pit per 6 ha and is considered to be an appropriate sampling density for a site considered to have a low potential for significant contamination (refer to Section 3.6.2.).

Test pits were excavated to a targeted depth of 3 m (to inform the salinity investigation – reported separately) which equates to more than the required minimum 0.5 m into natural soils. All test pits were excavated to a minimum depth of 0.5 m into natural material, with the majority extending to approximately 3 m below ground level (bgl) in order to meet requirements of the salinity investigation (refer to Section 1). For stockpile locations, test pits were excavated only to the base of the stockpile. Test pit locations are shown in Drawing 2, Appendix A.

The selected rationale for the sampling locations investigated and analytes tested is provided in Table 4 below.

Table 4: Summary of Sampling and Analysis Rationale

Test Pit Location	Sample Depth	TP depth (m bgl)	Analytes	Location Target	Sample Target
MPS 1 ,	0 – 0.1	2.5 (refusal on bedrock)	Metals, TRH, BTEX, PAH, OCP, OPP, PCB, phenols, and asbestos	PAEC 2	Topsoil
MPS 2	0 – 0.1	2.5 (refusal on bedrock)		PAEC 3	Topsoil
MPS 3 – MPS 10	0 – 0.1	3 m or refusal on bedrock		General site coverage – agricultural land use	Topsoil
SP1	0 – 0.1 and 0.4 – 0.5	Base of stockpile		PAEC 6	Stockpile
SP2				PAEC 11	
SP4				PAEC 8	

8.2 Field Sampling Procedure

Sampling data was recorded to comply with routine Chain-of-Custody requirements and DP's standard operating procedures. The general sampling, handling, transport and tracking procedures are detailed below:

- Sample locations were pre-determined using GIS prior to field work and were located in the field using a handheld Garmin GPS;
- Disposable nitrile gloves were used to collect all samples. Gloves were replaced prior to the collection of each sample in order to prevent cross-contamination;
- A JCB 4X backhoe fitted with a 450 mm tooth bucket was used to excavate all test pits. Samples were collected from the freshly exposed walls of the test pit and placed into laboratory prepared glass jars. In addition, 50 g bag samples were collected for asbestos testing;
- Each sample was transferred into a new laboratory prepared glass jar, with minimal headspace, and sealed with a Teflon lined lid. Each jar was individually sealed to reduce the potential for cross contamination during transportation to the laboratory;
- Sample containers were labelled with individual and unique identification including project number, sample ID, depth and date of sampling; and
- Logs were completed for all test pits. Test pit logs included, where relevant, sample identification, coordinates, date of collection, a description of the substrate conditions encountered, visual or olfactory evidence of contamination, the depth of samples collected, QA / QC samples collected, the sampler and equipment used.

8.3 Sample Analysis

Laboratory analysis of primary and intra-laboratory samples was conducted by Envirolab Services Pty Ltd (Envirolab). Envirolab is accredited by the National Association of Testing Authorities (NATA) and are required to conduct in – house QA / QC procedures. These are normally incorporated into every analytical run and include assessment of reagent blanks, spike recovery, surrogate recovery and laboratory duplicates.

The analytical methods used are summarised in the laboratory certificates of analysis, included in Appendix D. Not all samples submitted to Envirolab were analysed. Samples that were not analysed were placed on hold should further testing be of benefit.

9. Site Assessment Criteria

The Site Assessment Criteria (SAC) applied in this DSI have been informed by the proposed land use (i.e. residential with accessible soils) and the preliminary CSM (refer to Section 7). Analytical results were assessed (as a Tier 1 assessment) against the investigation and screening levels as per Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013).

As the site is proposed to be redeveloped for residential land use, the investigation and screening levels adopted are consistent with a generic residential land use scenario. The adopted SAC are listed on the analytical results tables in Appendix E.

10. Results

10.1 Field Work Observations

The test pits indicate that subsurface conditions underlying the site typically comprise topsoil and filling overlying alluvial, colluvial and residual soils. Variably extremely low up to medium strength shale and sandstone on first contact below depths of 0.2 – 2.6 m in all boreholes and most test pits, with the exceptions of Pits MPS5, MPS-12, MPS-16 and MPS-20, stockpile Pits MPS-SP1, MPS-SP2 and MPS-SP4 and previous Pits 103 – 105 and 111. The general succession of strata is broadly summarised as follows:

- TOPSOIL – typically brown silty clay with rootlets to depths of 0.1 – 0.2 m in all excavated pits;
- ALLUVIUM / COLLUVIUM – silt and sand alluvium / colluvium was encountered in one test pit (MPS 5) from 0.1 m bgl to the base of the test pit (3 m);
- SILTY CLAY – medium dense to hard silty clay, mottled grey / brown and sandy in places was encountered in all test pits with the exception of MPS 5 at depths of between 0.2 and 2.5 m bgl;
- SHALE / SANDSTONE – extremely low to medium strength grey shale occasionally interbedded with orange / red / grey sandstone was encountered in in all boreholes and most test pits, with the exceptions of Pits MPS5, MPS-12, MPS-16 and MPS-20 and previous Pits 103 – 105 and 111 at depths of between 0.2 to 2.6 m+.

Copies of test pit logs are provided in Appendix F.

10.2 Soil Analytical Results

The analytical results for the soil samples collected during the investigation are summarised in Table E1 of Appendix E, together with the adopted SAC. Laboratory certificates of analysis are provided in Appendix D.

A summary of results is provided below:

- Concentrations of heavy metals were below the laboratory Limit of Reporting (LOR) and / or SAC for all samples submitted for analysis with the exception of zinc in stockpile sample SP4 (2,400 mg/kg) which exceeded the corresponding EIL (450 mg/kg);
- Concentrations of total phenols, BTEX, OPP, OCP, PCB, PAH and TRH were reported below their respective LOR in all samples submitted for analysis, with the exception of:
    - Total PAH in soils from MPS3 and SP2 which were reported marginally above the LOR but below the SAC;

- Benzo(a)pyrene in soils from SP2 recorded concentration of 0.2 mg/kg, which was below the corresponding SAC of 0.7 mg/kg; and
- TRH C_{16} – C_{34} (190 mg/kg) and TRH C_{34} – C_{40} (280 mg/kg) in soils from SP2, below the corresponding SAC of 1,300 and 5,600 mg/kg respectively.

- Asbestos was not detected at the limit of reporting in all soil samples submitted for analysis.

10.3 Quality Assurance and Quality Control

A review of the adopted QA / QC procedures and results (Appendix G) indicates that the DQIs have generally been met.

11. Areas of Environmental Concern

The findings of the DSI, including the finding of the preliminary soil and groundwater investigation works have been used to assess identified PAEC further and identified AECs requiring additional investigation, remediation and / or management works. Identified AECs are provided in Table 6 below.

Table 6: AECs

PAEC	Description	Outcome	AEC? (risk rating)
1	Possible historical landfilling / burial may have occurred. Any burial of material is more likely to occur in close proximity to historical structures and residential areas. Observed possible ground disturbance may indicate burial areas. Current and historical (demolished) structures may have contained ACM.	Test pits completed as part of this investigation included targeted test pits in the proximity of historical structures. No fill soil was observed and soil analytical results were below the SAC. No suspected ACM was observed associated with these areas. Current structures should be subject to a Hazardous Materials assessment prior to demolition as the potential for ACM and other potentially hazardous materials to be present in the building matrix exists.	No
2			
3			
4	Historical ground disturbance	No evidence of ground disturbance or filling was observed during the walkover.	No
5			
6	Stockpiles containing soil, ripped rock and some building material	Stockpile analytical results did not identify any any contaminants above SAC or any asbestos.	No
7	Stockpile containing general building material	No soil or potentially contaminating material was observed during the walkover.	No
8	Soil stockpile	Stockpile analytical results identified zinc above SAC.	Yes
9	Numerous small soil stockpiles	Soil stockpiles appear to comprise reworked natural soils.	No
10	Small soil stockpile	Soil stockpile appears to comprise reworked natural soils.	No

11	Stockpile containing soil and some building material	Stockpile analytical results did not identify any any contaminants above SAC or any asbestos.	No
12	ACM pipe	Identified ACM pipe will require remediation.	Yes
13	Minor fly tipping near Nepean River	No staining or evidence of spill was observed on the underlying ground.	No
14	Historical agricultural land use	Concentrations of COPC were below the LOR and / or the SAC.	No

12. Discussion

The scope of the DSI included a site walkover, review of site history information, review of previous investigations, soil sampling and laboratory analysis. The review of the Land Capability Study identified the site as having a generally low potential for contamination.

The site history review undertaken by DP indicated possible localised landfilling, current and historical agricultural land use and stockpiling of soils. Historical and current structures may contain ACM. If poorly managed, the demolition of structures containing ACM may adversely impact the surrounding ground and underlying soils, although none was observed on the surface during field work.

A total of 13 test pits were completed as part of this investigation, of which three were completed in stockpiles and the remaining 10 across the balance of the site. A further 24 test pits were completed as part of the geotechnical and salinity investigation and to inform the current understanding of ground conditions at the site. A total of 13 test pits were completed as part of the LCS; analytical results from the LCS were considered as part of this investigation. A total of 23 test pits (excluding stockpiles) have therefore been completed at the site; which equates to approximately one test pit per 6 ha and is considered to be an appropriate sampling density for a site considered to have a low potential for significant contamination.

With the exception of stockpiled soils, no filling was encountered in any of the test pits completed across the site. A total of 13 soil samples were analysed from the test pits. Concentrations of COC collected from test pit locations were within the LOR and / or adopted SAC for all samples with the exception of zinc in SP4 which exceeds the corresponding EIL. Asbestos was not reported above the reporting limit in any soil samples submitted for analysis and no suspected ACM was observed during test pitting. Based on the results of the investigation, DP considers that the potential for contamination at the site with respect to the proposed development is low. The investigation of the contamination status of groundwater below the site is therefore not considered to be warranted at this time.

An ACM pipe was observed during the site walkover which will require remediation and validation prior to earthworks.

13. Conclusions and Recommendations

Based on the findings of the DSI, DP considers that site is considered to have a generally low potential for contamination and is considered suitable, from an environmental perspective, for the proposed

residential land use. Notwithstanding the above, the potential remains for isolated pockets of contamination to be present in areas of the site. To appropriately manage unexpected potential contamination issues encountered during development works, DP recommends the development and implementation of an Unexpected Finds Protocol.

14. Limitations

Douglas Partners (DP) has prepared this report (or services) for this project at Menangle Park North, Menangle Park in accordance with DP's proposal dated 5 August 2016. The work was carried out under Contract reference 13647/80172527 dated 14 February 2017. This report is provided for the exclusive use of for this project only and for the purposes as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

Asbestos has not been detected by observation or by laboratory analysis, either on the surface of the site, or in filling materials at the test locations sampled and analysed. Building demolition materials, such as concrete, brick, tile [list as appropriate to the field work findings], were, however, located in previous below-ground filling and/or above-ground stockpiles [as appropriate], and these are considered as indicative of the possible presence of hazardous building materials (HBM), including asbestos.

Although the sampling plan adopted for this investigation is considered appropriate to achieve the stated project objectives, there are necessarily parts of the site that have not been sampled and analysed. This is either due to undetected variations in ground conditions or to budget constraints (as

discussed above), or to parts of the site being inaccessible and not available for inspection/sampling [where appropriate], or to vegetation preventing visual inspection and reasonable access [where appropriate]. It is therefore considered possible that HBM, including asbestos, may be present in unobserved or untested parts of the site, between and beyond sampling locations, and hence no warranty can be given that asbestos is not present.

This report has been produced with reference to the National Environmental Protection (Assessment of Site Contamination) Measure 1999 (ASC NEPM 1999) as originally issued and does not take into account the amendments made to ASC NEPM 1999 in 16 May 2013 and as approved by the NSW EPA on 11 June 2013 [or other state approvals as appropriate]. This is because this report was commenced and substantially completed prior to 16 May 2013; and significant additional works and/or cost would be necessary to meet the amended ASC NEPM; and the information available to DP to date indicates that any possible risks associated with applying the original ASC NEPM are likely to be relatively low.

Douglas Partners Pty Ltd

Appendix A

Drawings and About This Report

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Cone Penetration Tests

Douglas Partners

Introduction

The Cone Penetration Test (CPT) is a sophisticated soil profiling test carried out in-situ. A special cone shaped probe is used which is connected to a digital data acquisition system. The cone and adjoining sleeve section contain a series of strain gauges and other transducers which continuously monitor and record various soil parameters as the cone penetrates the soils.

The soil parameters measured depend on the type of cone being used, however they always include the following basic measurements

- Cone tip resistance q_c
- Sleeve friction f_s
- Inclination (from vertical) i
- Depth below ground z

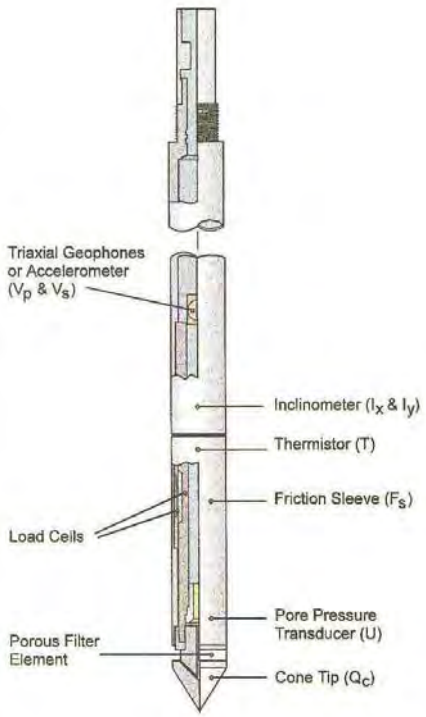


Figure 1: Cone Diagram

The inclinometer in the cone enables the verticality of the test to be confirmed and, if required, the vertical depth can be corrected.

The cone is thrust into the ground at a steady rate of about 20 mm/sec, usually using the hydraulic rams of a purpose built CPT rig, or a drilling rig. The testing is carried out in accordance with the Australian Standard AS1289 Test 6.5.1.

Figure 2: Purpose built CPT rig

The CPT can penetrate most soil types and is particularly suited to alluvial soils, being able to detect fine layering and strength variations. With sufficient thrust the cone can often penetrate a short distance into weathered rock. The cone will usually reach refusal in coarse filling, medium to coarse gravel and on very low strength or better rock. Tests have been successfully completed to more than 60 m.

Types of CPTs

Douglas Partners (and its subsidiary GroundTest) owns and operates the following types of CPT cones:

Type	Measures
Standard	Basic parameters (q_c, f_s, i & z)
Piezocone	Dynamic pore pressure (u) plus basic parameters. Dissipation tests estimate consolidation parameters
Conductivity	Bulk soil electrical conductivity (σ) plus basic parameters
Seismic	Shear wave velocity (V_s), compression wave velocity (V_p), plus basic parameters

Strata Interpretation

The CPT parameters can be used to infer the Soil Behaviour Type (SBT), based on normalised values of cone resistance (Qt) and friction ratio (Fr). These are used in conjunction with soil classification charts, such as the one below (after Robertson 1990)

Cone Penetration Tests

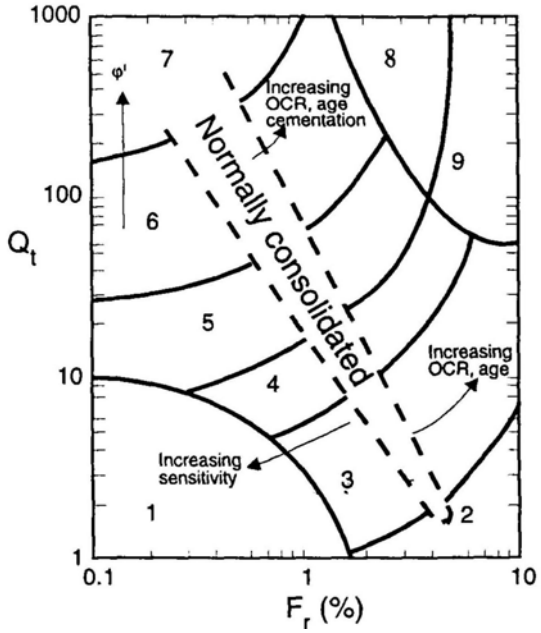


Figure 3: Soil Classification Chart

DP's in-house CPT software provides computer aided interpretation of soil strata, generating soil descriptions and strengths for each layer. The software can also produce plots of estimated soil parameters, including modulus, friction angle, relative density, shear strength and over consolidation ratio.

DP's CPT software helps our engineers quickly evaluate the critical soil layers and then focus on developing practical solutions for the client's project.

Engineering Applications

There are many uses for CPT data. The main applications are briefly introduced below:

Settlement

CPT provides a continuous profile of soil type and strength, providing an excellent basis for settlement analysis. Soil compressibility can be estimated from cone derived moduli, or known consolidation parameters for the critical layers (eg. from laboratory testing). Further, if pore pressure dissipation tests are undertaken using a piezocone, in-situ consolidation coefficients can be estimated to aid analysis.

Pile Capacity

The cone is, in effect, a small scale pile and, therefore, ideal for direct estimation of pile capacity. DP's in-house program ConePile can analyse most pile types and produces pile capacity versus depth plots. The analysis methods are based on proven static theory and empirical studies, taking account of scale effects, pile materials and method of installation. The results are expressed in limit state format, consistent with the Piling Code AS2159.

Dynamic or Earthquake Analysis

CPT and, in particular, Seismic CPT are suitable for dynamic foundation studies and earthquake response analyses, by profiling the low strain shear modulus G_0. Techniques have also been developed relating CPT results to the risk of soil liquefaction.

Other Applications

Other applications of CPT include ground improvement monitoring (testing before and after works), salinity and contaminant plume mapping (conductivity cone), preloading studies and verification of strength gain.

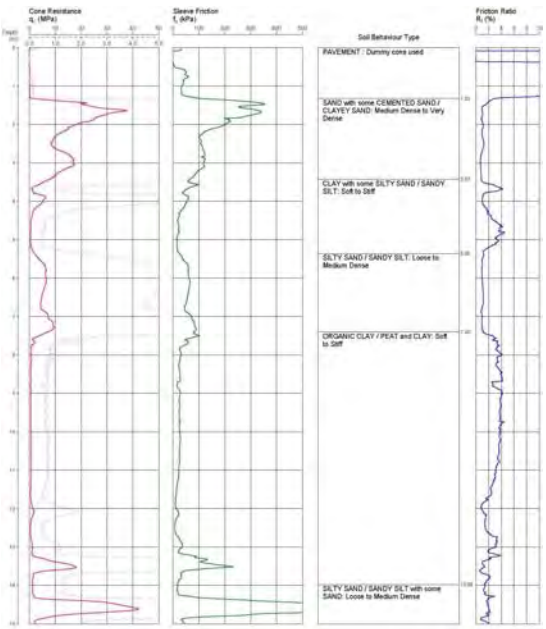


Figure 4: Sample Cone Plot

Rock Strength

Rock strength is defined by the Point Load Strength Index ($Is_{(50)}$) and refers to the strength of the rock substance and not the strength of the overall rock mass, which may be considerably weaker due to defects. The test procedure is described by Australian Standard 4133.4.1 - 1993. The terms used to describe rock strength are as follows:

Term	Abbreviation	Point Load Index $Is_{(50)}$ MPa	Approx Unconfined Compressive Strength MPa*
Extremely low	EL	<0.03	<0.6
Very low	VL	0.03 - 0.1	0.6 - 2
Low	L	0.1 - 0.3	2 - 6
Medium	M	0.3 - 1.0	6 - 20
High	H	1 - 3	20 - 60
Very high	VH	3 - 10	60 - 200
Extremely high	EH	>10	>200

* Assumes a ratio of 20:1 for UCS to $Is_{(50)}$

Degree of Weathering

The degree of weathering of rock is classified as follows:

Term	Abbreviation	Description
Extremely weathered	EW	Rock substance has soil properties, i.e. it can be remoulded and classified as a soil but the texture of the original rock is still evident.
Highly weathered	HW	Limonite staining or bleaching affects whole of rock substance and other signs of decomposition are evident. Porosity and strength may be altered as a result of iron leaching or deposition. Colour and strength of original fresh rock is not recognisable
Moderately weathered	MW	Staining and discolouration of rock substance has taken place
Slightly weathered	SW	Rock substance is slightly discoloured but shows little or no change of strength from fresh rock
Fresh stained	Fs	Rock substance unaffected by weathering but staining visible along defects
Fresh	Fr	No signs of decomposition or staining

Degree of Fracturing

The following classification applies to the spacing of natural fractures in diamond drill cores. It includes bedding plane partings, joints and other defects, but excludes drilling breaks.

Term	Description
Fragmented	Fragments of <20 mm
Highly Fractured	Core lengths of 20-40 mm with some fragments
Fractured	Core lengths of 40-200 mm with some shorter and longer sections
Slightly Fractured	Core lengths of 200-1000 mm with some shorter and loner sections
Unbroken	Core lengths mostly > 1000 mm

Rock Descriptions

Rock Quality Designation

The quality of the cored rock can be measured using the Rock Quality Designation (RQD) index, defined as:

$$\text{RQD \%} = \frac{\text{cumulative length of 'sound' core sections} \geq \text{100 mm long}}{\text{total drilled length of section being assessed}}$$

where 'sound' rock is assessed to be rock of low strength or better. The RQD applies only to natural fractures. If the core is broken by drilling or handling (i.e. drilling breaks) then the broken pieces are fitted back together and are not included in the calculation of RQD.

Stratification Spacing

For sedimentary rocks the following terms may be used to describe the spacing of bedding partings:

Term	Separation of Stratification Planes
Thinly laminated	< 6 mm
Laminated	6 mm to 20 mm
Very thinly bedded	20 mm to 60 mm
Thinly bedded	60 mm to 0.2 m
Medium bedded	0.2 m to 0.6 m
Thickly bedded	0.6 m to 2 m
Very thickly bedded	> 2 m

Sampling Methods

Douglas Partners

Sampling

Sampling is carried out during drilling or test pitting to allow engineering examination (and laboratory testing where required) of the soil or rock.

Disturbed samples taken during drilling provide information on colour, type, inclusions and, depending upon the degree of disturbance, some information on strength and structure.

Undisturbed samples are taken by pushing a thin-walled sample tube into the soil and withdrawing it to obtain a sample of the soil in a relatively undisturbed state. Such samples yield information on structure and strength, and are necessary for laboratory determination of shear strength and compressibility. Undisturbed sampling is generally effective only in cohesive soils.

Test Pits

Test pits are usually excavated with a backhoe or an excavator, allowing close examination of the in-situ soil if it is safe to enter into the pit. The depth of excavation is limited to about 3 m for a backhoe and up to 6 m for a large excavator. A potential disadvantage of this investigation method is the larger area of disturbance to the site.

Large Diameter Augers

Boreholes can be drilled using a rotating plate or short spiral auger, generally 300 mm or larger in diameter commonly mounted on a standard piling rig. The cuttings are returned to the surface at intervals (generally not more than 0.5 m) and are disturbed but usually unchanged in moisture content. Identification of soil strata is generally much more reliable than with continuous spiral flight augers, and is usually supplemented by occasional undisturbed tube samples.

Continuous Spiral Flight Augers

The borehole is advanced using 90-115 mm diameter continuous spiral flight augers which are withdrawn at intervals to allow sampling or in-situ testing. This is a relatively economical means of drilling in clays and sands above the water table. Samples are returned to the surface, or may be collected after withdrawal of the auger flights, but they are disturbed and may be mixed with soils from the sides of the hole. Information from the drilling (as distinct from specific sampling by SPTs or undisturbed samples) is of relatively low reliability, due to the remoulding, possible mixing or softening of samples by groundwater.

Non-core Rotary Drilling

The borehole is advanced using a rotary bit, with water or drilling mud being pumped down the drill rods and returned up the annulus, carrying the drill cuttings. Only major changes in stratification can be determined from the cuttings, together with some information from the rate of penetration. Where drilling mud is used this can mask the cuttings and reliable identification is only possible from separate sampling such as SPTs.

Continuous Core Drilling

A continuous core sample can be obtained using a diamond tipped core barrel, usually with a 50 mm internal diameter. Provided full core recovery is achieved (which is not always possible in weak rocks and granular soils), this technique provides a very reliable method of investigation.

Standard Penetration Tests

Standard penetration tests (SPT) are used as a means of estimating the density or strength of soils and also of obtaining a relatively undisturbed sample. The test procedure is described in Australian Standard 1289, Methods of Testing Soils for Engineering Purposes - Test 6.3.1.

The test is carried out in a borehole by driving a 50 mm diameter split sample tube under the impact of a 63 kg hammer with a free fall of 760 mm. It is normal for the tube to be driven in three successive 150 mm increments and the 'N' value is taken as the number of blows for the last 300 mm. In dense sands, very hard clays or weak rock, the full 450 mm penetration may not be practicable and the test is discontinued.

The test results are reported in the following form.

- In the case where full penetration is obtained with successive blow counts for each 150 mm of, say, 4, 6 and 7 as:

  4,6,7
  N=13

- In the case where the test is discontinued before the full penetration depth, say after 15 blows for the first 150 mm and 30 blows for the next 40 mm as:

  15, 30/40 mm

The results of the SPT tests can be related empirically to the engineering properties of the soils.

Dynamic Cone Penetrometer Tests / Perth Sand Penetrometer Tests

Dynamic penetrometer tests (DCP or PSP) are carried out by driving a steel rod into the ground using a standard weight of hammer falling a specified distance. As the rod penetrates the soil the number of blows required to penetrate each successive 150 mm depth are recorded. Normally there is a depth limitation of 1.2 m, but this may be extended in certain conditions by the use of extension rods. Two types of penetrometer are commonly used.

- Perth sand penetrometer - a 16 mm diameter flat ended rod is driven using a 9 kg hammer dropping 600 mm (AS 1289, Test 6.3.3). This test was developed for testing the density of sands and is mainly used in granular soils and filling.
- Cone penetrometer - a 16 mm diameter rod with a 20 mm diameter cone end is driven using a 9 kg hammer dropping 510 mm (AS 1289, Test 6.3.2). This test was developed initially for pavement subgrade investigations, and correlations of the test results with California Bearing Ratio have been published by various road authorities.

Soil Descriptions

Douglas Partners

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are based on Australian Standard AS 1726, Geotechnical Site Investigations Code. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	20 - 63
Medium gravel	6 - 20
Fine gravel	2.36 - 6
Coarse sand	0.6 - 2.36
Medium sand	0.2 - 0.6
Fine sand	0.075 - 0.2

The proportions of secondary constituents of soils are described as:

Term	Proportion	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	20 - 35%	Sandy Clay
Slightly	12 - 20%	Slightly Sandy Clay
With some	5 - 12%	Clay with some sand
With a trace of	0 - 5%	Clay with a trace of sand

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	vs	<12
Soft	s	12 - 25
Firm	f	25 - 50
Stiff	st	50 - 100
Very stiff	vst	100 - 200
Hard	h	>200

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	SPT N value	CPT qc value (MPa)
Very loose	vl	<4	<2
Loose	l	4 - 10	2 -5
Medium dense	md	10 - 30	5 - 15
Dense	d	30 - 50	15 - 25
Very dense	vd	>50	>25

Soil Descriptions

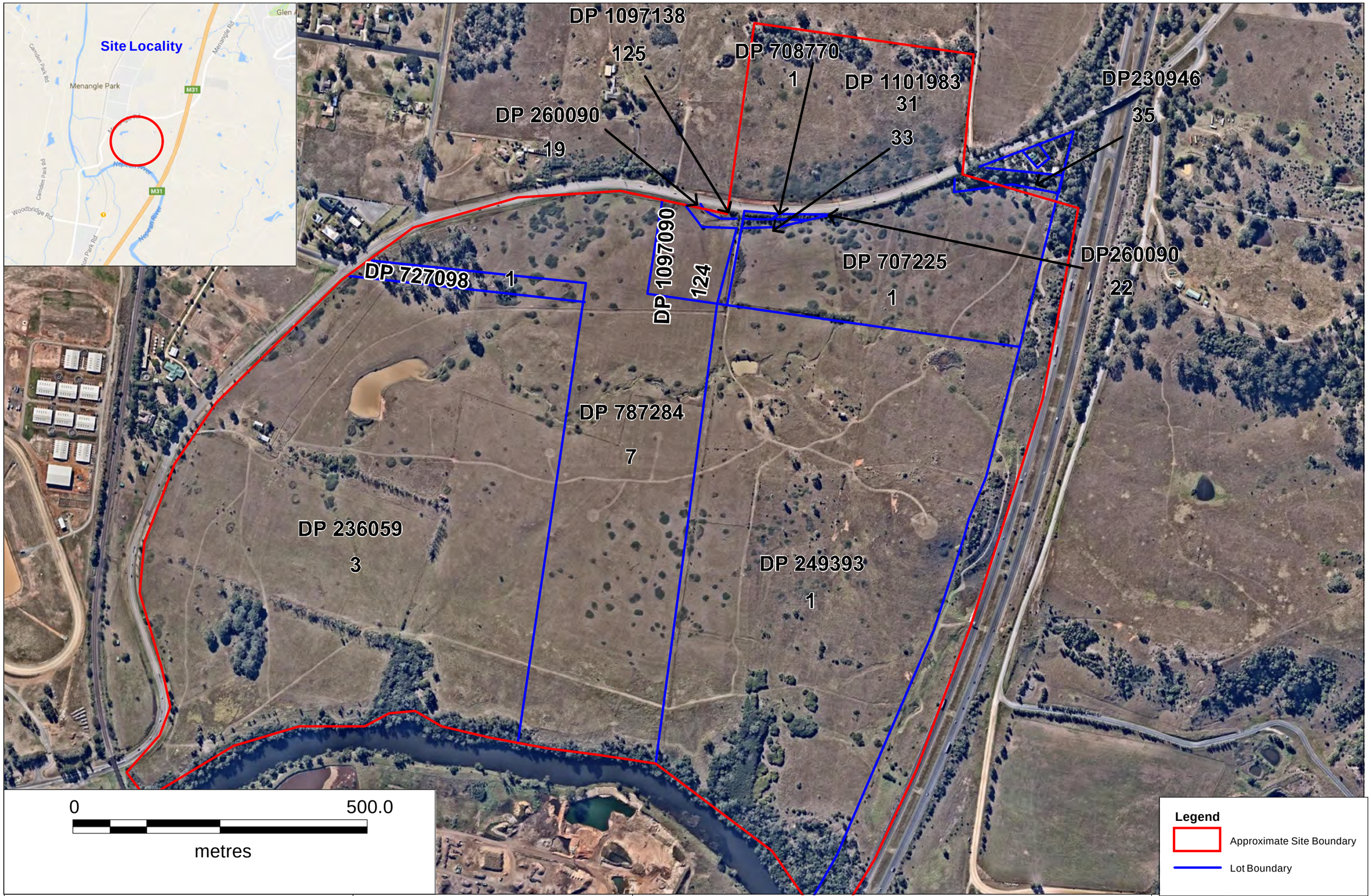
Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Transported soils - formed somewhere else and transported by nature to the site; or
- Filling - moved by man.

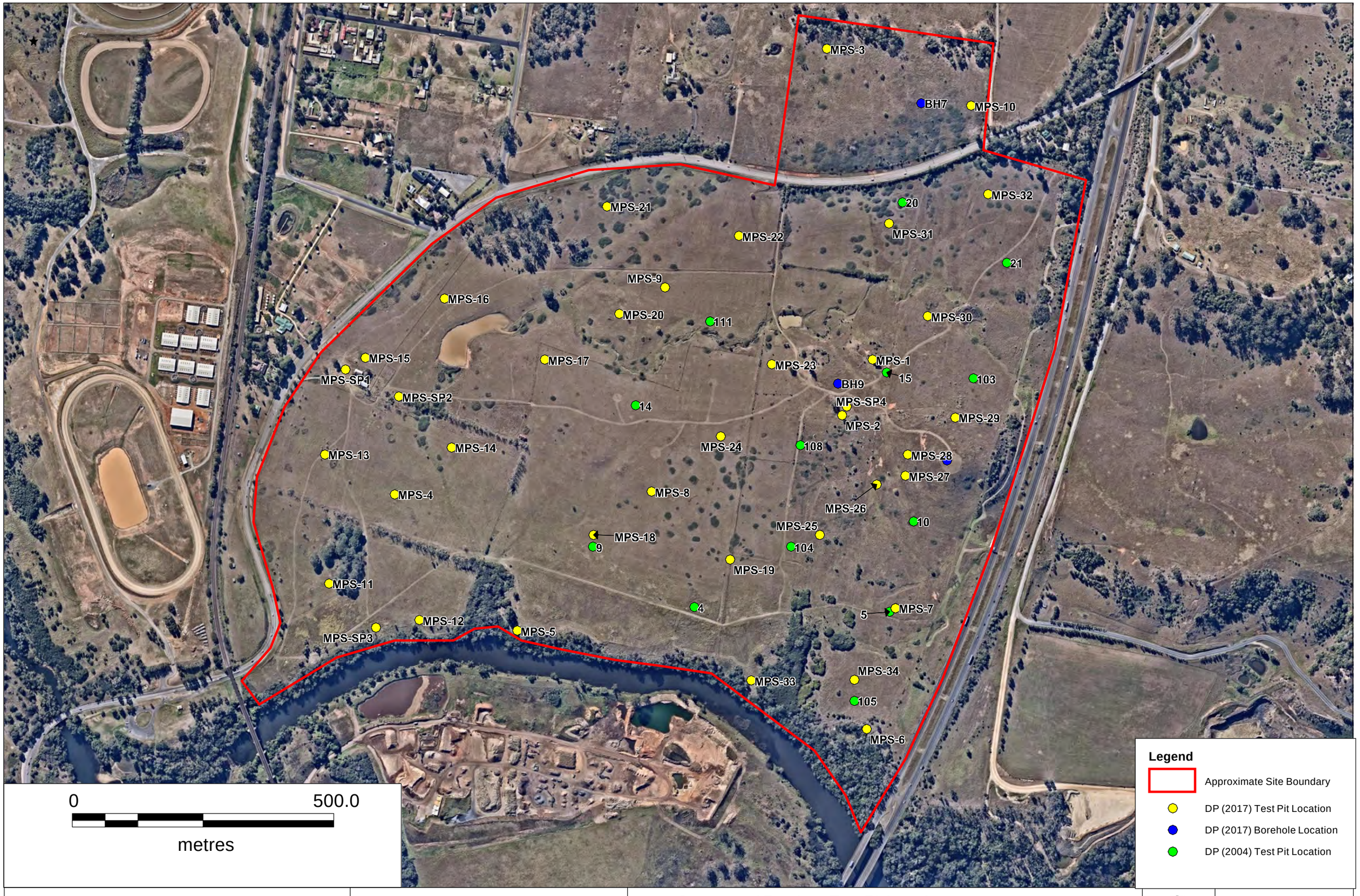
Transported soils may be further subdivided into:

- Alluvium - river deposits
- Lacustrine - lake deposits
- Aeolian - wind deposits
- Littoral - beach deposits
- Estuarine - tidal river deposits
- Talus - scree or coarse colluvium
- Slopewash or Colluvium - transported downslope by gravity assisted by water. Often includes angular rock fragments and boulders.



Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Dahua Group Sydney Project 3 Pty Ltd	TITLE: Site Locality and Boundaries Proposed Residential Subdivision Menangle Park South, NSW	PROJECT No: 76744.04
	OFFICE: Macarthur DRAWN BY: CLN		DRAWING No: 1
	SCALE: As shown DATE: 11.04.2017		REVISION: A

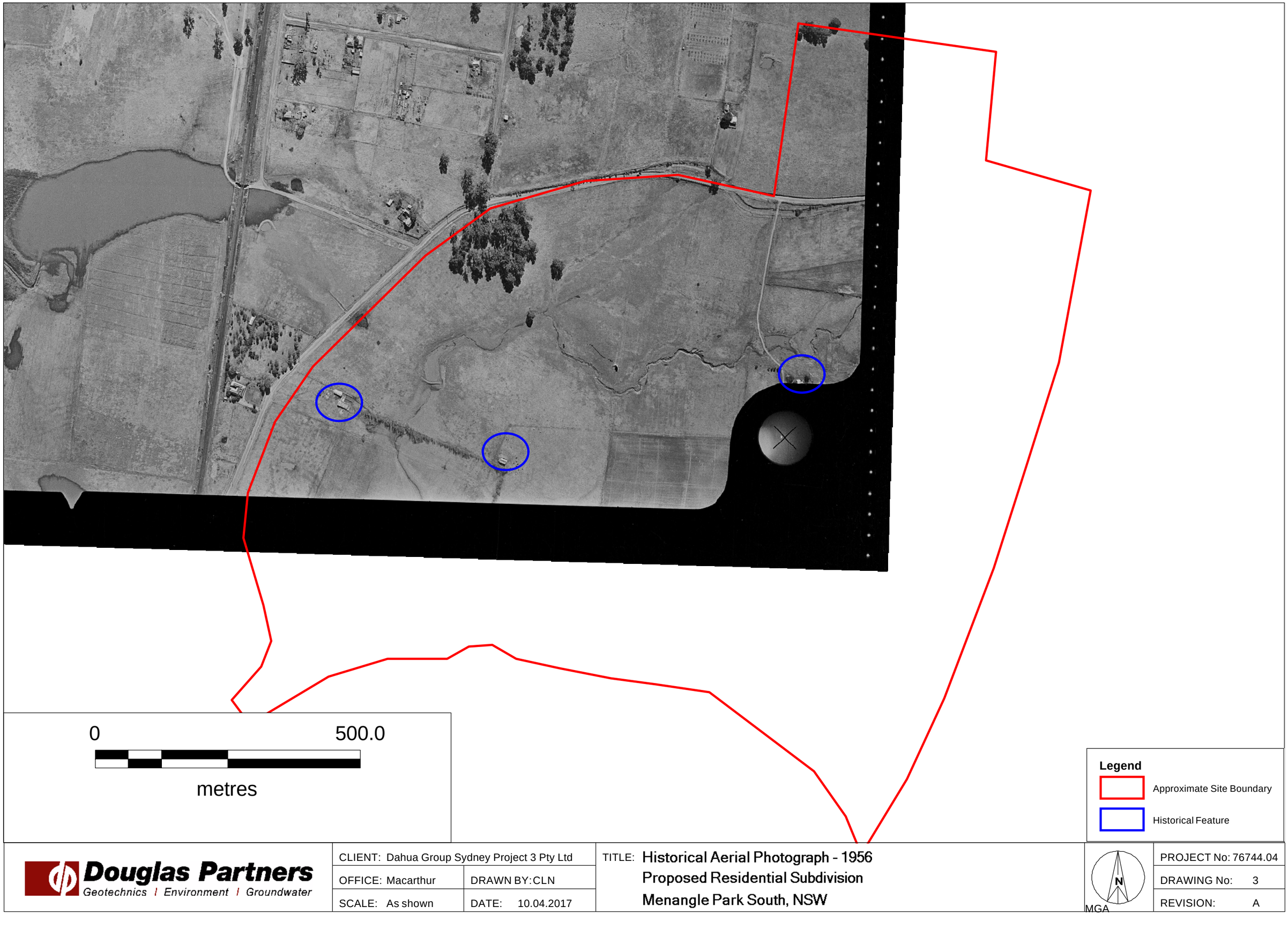
N
MGA



Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Dahua Group Sydney Project 3 Pty Ltd		TITLE: Current and Previous Test Pit Locations Proposed Residential Subdivision Menangle Park South, NSW
OFFICE: Macarthur	DRAWN BY: CLN	
SCALE: As shown	DATE: 11.04.2017	

PROJECT No:	76744.04
DRAWING No:	2
REVISION:	A



Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Dahua Group Sydney Project 3 Pty Ltd		TITLE: Historical Aerial Photograph - 1956 Proposed Residential Subdivision Menangle Park South, NSW	PROJECT No: 76744.04
OFFICE: Macarthur	DRAWN BY: CLN		DRAWING No: 3
SCALE: As shown	DATE: 10.04.2017		REVISION: A

0 500.0

metres

Legend

Approximate Site Boundary

Historical Feature

Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Dahua Group Sydney Project 3 Pty Ltd		TITLE: Historical Aerial Photograph - 1975 Proposed Residential Subdivision Menangle Park South NSW	PROJECT No: 76744.04
OFFICE: Macarthur	DRAWN BY: CLN		DRAWING No: 4
SCALE: As shown	DATE: 10.04.2017		REVISION: A

N

MGA

0 500.0

metres

Legend

Approximate Site Boundary

Historical Feature

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Dahua Group Sydney Project 3 Pty Ltd		TITLE: Historical Aerial Photograph - 1984 Proposed Residential Subdivision Menangle Park South, NSW
OFFICE: Macarthur	DRAWN BY: CLN	
SCALE: As shown	DATE: 10.04.2017	

N

MGA

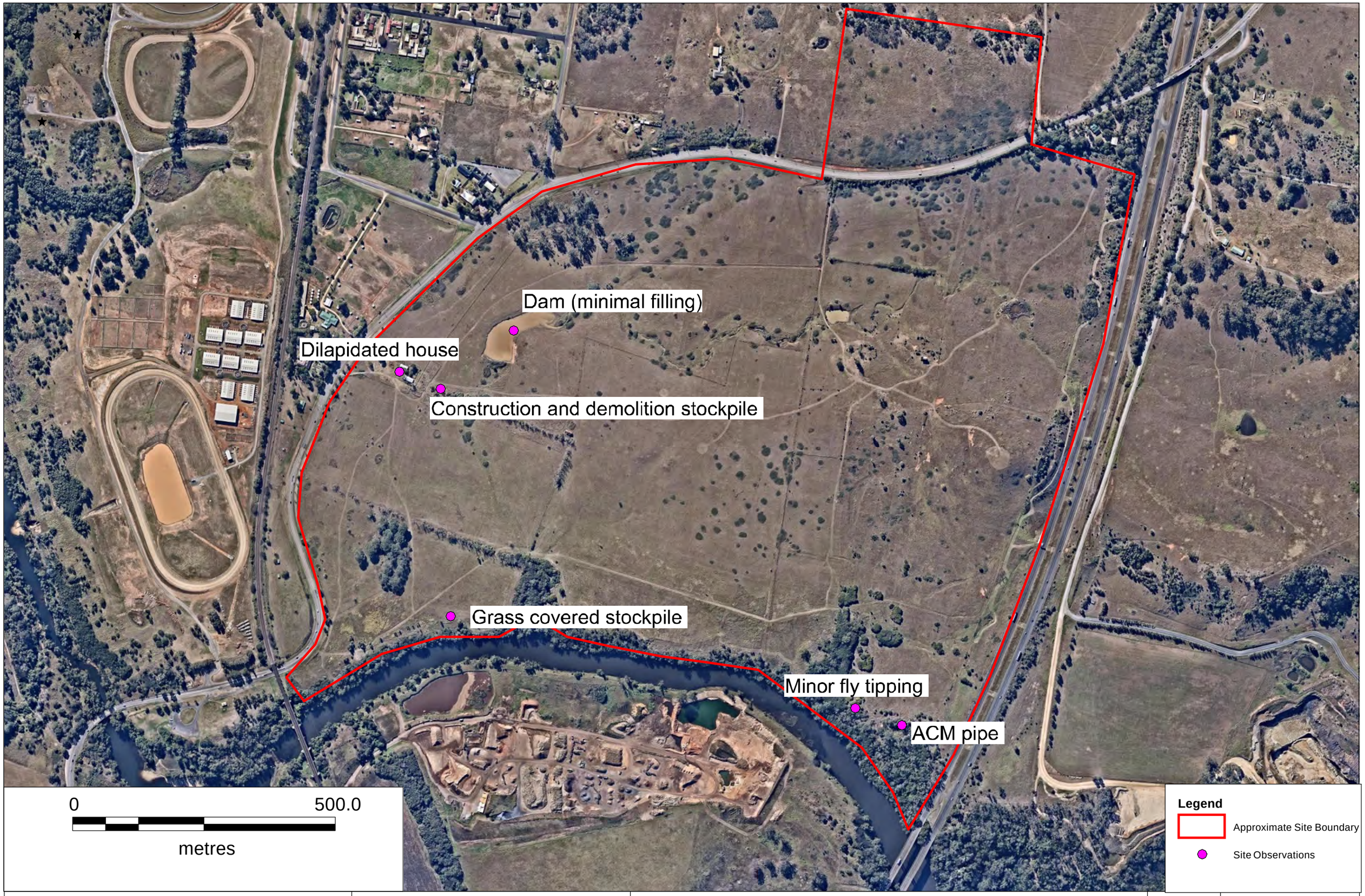
PROJECT No:	76744.04
DRAWING No:	5
REVISION:	A

Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Dahua Group Sydney Project 3 Pty Ltd		TITLE: Historical Aerial Photograph - 1994 Proposed Residential Subdivision Menangle Park South NSW
OFFICE: Macarthur	DRAWN BY: CLN	
SCALE: As shown	DATE: 10.04.2017	

N
MGA

PROJECT No:	76744.04
DRAWING No:	6
REVISION:	A

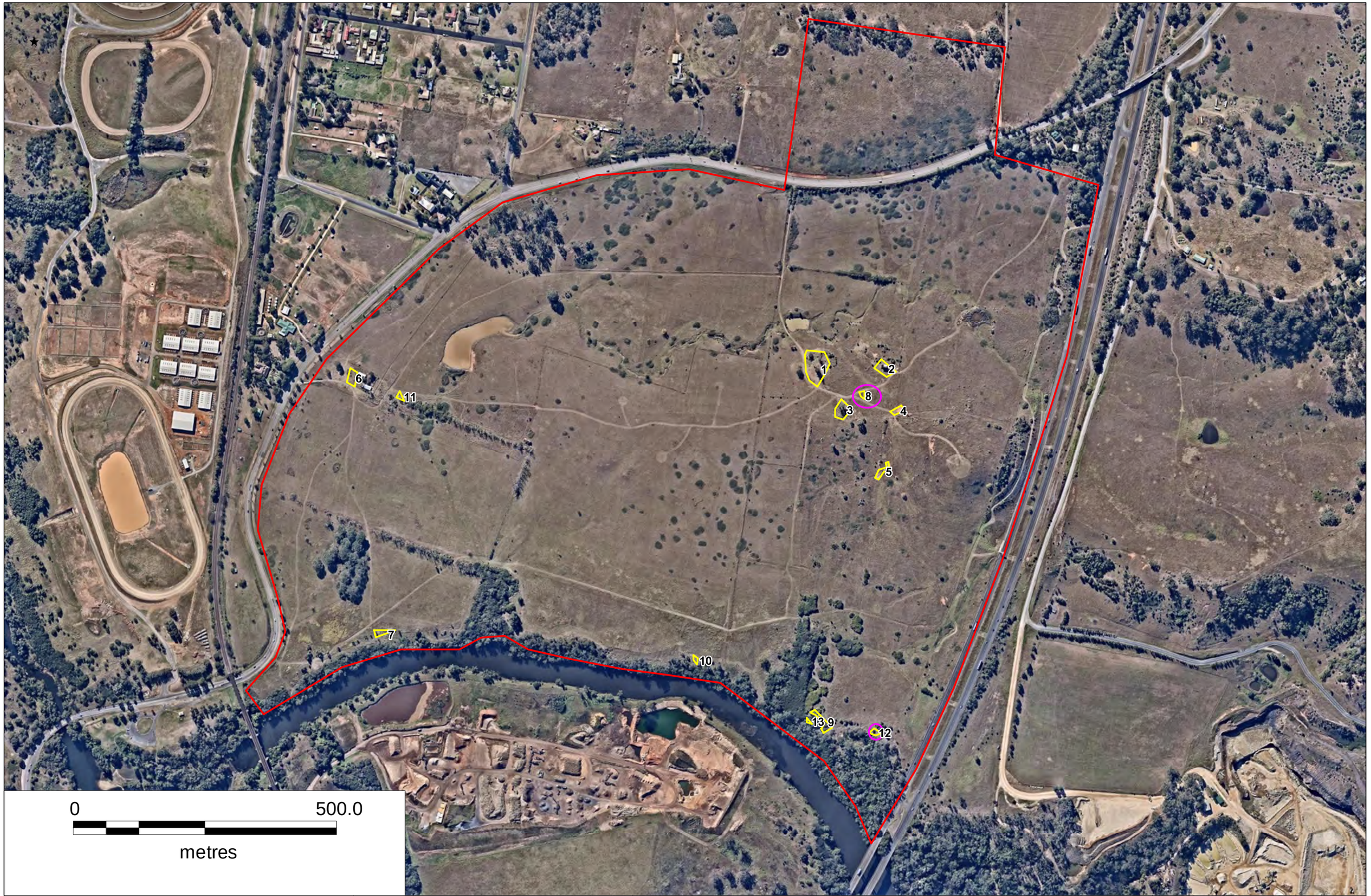


Douglas Partners
Geotechnics / Environment / Groundwater

CLIENT: Dahua Group Sydney Project 3 Pty Ltd		TITLE: Site Observations Proposed Residential Subdivision Menangle Park South, NSW
OFFICE: Macarthur	DRAWN BY: CLN	
SCALE: As shown	DATE: 11.04.2017	

N
MGA

PROJECT No:	76744.04
DRAWING No:	7
REVISION:	A



Douglas Partners
Geotechnics | Environment | Groundwater

CLIENT: Dahua Group Sydney Project 3 Pty Ltd		
OFFICE: Macarthur	DRAWN BY: CLN	
SCALE: As shown	DATE: 11.04.2017	

TITLE: **PAEC and AEC**
Proposed Residential Subdivision
Menangle Park South, NSW

N
MGA

PROJECT No:	76744.04
DRAWING No:	8
REVISION:	A

Appendix B

Site Photographs

Photograph 1 - Brick and corrugated steel house

Photograph 2 - Inside of house may contain ACM

Douglas Partners Geotechnics | Environment | Groundwater	Site Photographs	PROJ:	76744.04
	DSI with Limited Sampling	PLATE:	1
	Menangle Park South, NSW	REV:	A
	CLIENT: Dahua Group Sydney Project 3 Pty Ltd	DATE:	23.11.2016

Photograph 3 - ACM pipe

Photograph 4 - Stockpile of timber and metal fencing

Douglas Partners Geotechnics / Environment / Groundwater	Site Photographs	PROJ:	76744.04
	DSI with Limited Sampling	PLATE:	2
	Menangle Park South, NSW	REV:	A
	CLIENT: Dahua Group Sydney Project 3 Pty Ltd	DATE:	23.11.2016

Photograph 5 - Suspected ACM pipes

Photograph 6 - Minor fly tipping

Douglas Partners Geotechnics / Environment / Groundwater	Site Photographs	PROJ:	76744.04
	DSI with Limited Sampling	PLATE:	3
	Menangle Park South, NSW	REV:	A
	CLIENT: Dahua Group Sydney Project 3 Pty Ltd	DATE:	23.11.2016

Appendix C

DQO

Appendix C1: Data Quality Objectives

This Data Gaps DSI has been devised broadly in accordance with the seven step data quality objective (DQO) process which is provided in Appendix B, Schedule B2 of the *National Environment Protection (Assessment of Site Contamination) Measure* 1999 as amended 2013 (NEPC, 2013). The DQO process is outlined below:

C1.1 State the Problem

The site is proposed to be redeveloped for residential land use with accessible soils. Review of previous assessments, site history and a site inspection identified key potential areas of environmental concern (PAEC) associated with historical site use. In order to assess the contamination status of the site, targeted and grid sampling locations were carried out across the site.

The ñproblemò to be addressed is therefore to confirm the extent and nature of potential contamination at the site (which is currently not known), and to determine if the site is suitable for the proposed development.

C1.2 Identify the Decision/Goal of the Study

The suitability of the site for the proposed residential land use was assessed based on a comparison of the analytical results for all contaminants of potential concern (COPC) with the adopted site assessment criteria (SAC) as detailed in Appendix C2 and discussed below.

The main COPC are expected to be total recoverable hydrocarbons (TRH), benzene, toluene, ethyl benzene and xylenes (BTEX), polycyclic aromatic hydrocarbons (PAH), heavy metals and asbestos. Other commonly found contaminants which may be present include phenols, organochlorine pesticides (OCP), organophosphate pesticides (OPP) and polychlorinated biphenyls (PCB).

The following specific decisions were considered as part of the DSI:

- Did field observation and analytical results identify potential contamination sources which were not included in the preliminary CSM?
- Were COPC present in soil at concentrations that pose a potential risk to identified receptors?
- Were COPC present in background areas of the site at concentrations that are above expected background ranges?
- Does concentration of COPC in soil present a risk to groundwater beneath the site?
- Is the data sufficient to make a decision regarding the abovementioned risks, the suitability of the site for the proposed development, or are additional investigations required?
- Does contamination at the site, if encountered, trigger the Duty to Report requirements under the CLM Act 1997?
- Are there any off-site migration issues that need to be considered?
- Is the data sufficient to enable the preparation of a Remediation Action Plan (RAP) and / or Environmental Management Plan (EMP) should the data suggest these are required?

C1.3 Identify Information Inputs

Inputs into the decisions are as follows:

- Review of relevant previous investigations;
- Review of regional geology, topography and hydrogeology information;
- Review of site history information;
- Completion of a site inspection
- The lithology of the site as described in the test pit logs;
- Soil samples were collected in a general grid pattern across the Site. A total of 13 soil samples were collected;
- Field and laboratory QA / QC data to assess the suitability of the environmental data for the PSI (Appendix F);
- Analytical results for the COPC; and
- Laboratory reported concentrations of COPC were compared with the NEPC (2013) criteria as discussed in Section C2.

C1.4 Define the Study Boundaries

The site is irregular in shape with an approximate area of 134 ha and lies within the Local Government Area (LGA) of Campbelltown City Council. The site locality and boundary are shown on Drawing 1. The site is currently registered as 12 lots.

The investigation was undertaken to a maximum depth of 3.0 m below ground level (bgl) across the site. All test pits terminated in natural soils.

Field investigations were undertaken between 16 and 17 January 2017 by a DP environmental scientist.

C1.5 Develop the Analytical Approach (or decision rule)

The information obtained during the assessment was used to characterise the site in terms of contamination issues and risk to human health and the environment. The decision rules used in characterising the site were as follows:

- The adopted SAC was the NSW Environment Protection Authority (EPA) endorsed criteria; and
- The contaminant concentrations in soil were compared to the adopted SAC to determine whether further investigation or remedial action was required.

Field and laboratory test results were considered useable for the assessment after evaluation against the following data quality indicators (DQIs):

- Precision ï a measure of variability or reproducibility of data;

- Accuracy – a measure of closeness of the data to the 'true' value;
- Representativeness – the confidence (qualitative) of data representativeness of media present on site;
- Completeness – a measure of the amount of usable data from a data collection activity; and
- Comparability – the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event.

The specific limits are outlined in the data QA / QC procedures and results (Appendix F).

C1.6 Specify the Performance or Acceptable Criteria

Decision errors for the respective COPC for fill and natural soils are:

1. Deciding that fill and natural soil at the site exceeds the adopted SAC when they truly do not; and
2. Deciding that fill and natural soil at the site is within the adopted SAC when they truly do not.

Decision errors for the PSI were minimised and measured by the following:

- The sampling regime targeted each stratum identified to account for site variability;
- Sample collection and handling techniques were in accordance with DP's *Field Procedures Manual*;
- Samples were prepared and analysed by a NATA-accredited laboratory with the acceptance limits for laboratory QA / QC parameters based on the laboratory reported acceptance limits and those stated in NEPC (2013);
- The analyte selection is based on the available site history, past site activities, site features and the findings of previous investigations. The potential for contaminants other than those proposed to be analysed is considered to be low;
- The SAC were adopted from established and NSW EPA endorsed guidelines. The SAC have risk probabilities already incorporated; and
- A NATA accredited laboratory using NATA endorsed methods are used to perform laboratory analysis. Where NATA endorsed methods are not used, the reasons are stated. The effect of using non-NATA methods on the decision making process are explained.

C1.7 Optimise the design for obtaining data

Sampling design and procedures that were implemented to optimise data collection for achieving the DQOs included the following;

- NATA endorsed methods were used to perform laboratory analysis;
- To optimise the selection of soil samples for chemical analysis, all samples collected were screened using a calibrated photo-ionisation detector (PID) allowing for site assessment and sample selection. In addition, additional soil samples were collected but kept 'on hold' pending details of initial analysis so that they could be analysed if further delineation was required; and
- Adequately experienced environmental scientists/engineers were chosen to conduct field work and sample analysis interpretation.

Appendix C2: Site Assessment Criteria (Residential)

The Site Assessment Criteria (SAC) applied in the current investigation are informed by the proposed land use and the CSM which identified human and environmental receptors to potential contamination on the site (refer to Section 10). Analytical results are assessed (as a Tier 1 assessment) against the SAC comprising investigation and screening levels as per Schedule B1, *National Environment Protection (Assessment of Site Contamination) Measure* 1999, as amended 2013 (NEPC, 2013).

The investigation and screening levels applied in the current investigation comprise levels adopted for a generic residential land use scenario with accessible soils.

C2.1 Health Investigation and Screening Levels

The generic Health Investigation Levels (HILs) and Health Screening Levels (HSLs) are considered to be appropriate for the assessment of human health risk associated with contamination at the site. The adopted soil HILs and HSLs for the potential contaminants of concern are presented in Table C2, with inputs into their derivation shown in Table C1.

HILs are applicable to assessing health risk arising via all relevant pathways of exposure for a range of metals and organic substances. The HIL are generic to all soil types and apply generally to a depth of 3 m below the surface for residential use.

HSLs are applicable to selected petroleum compounds and fractions to assess the risk to human health via inhalation and direct contact pathways. It should be noted that although the CSM identifies a direct contact pathway as well as construction worker receptors, the corresponding HSLs are significantly higher than those for the vapour intrusion pathway and are therefore not drivers for further assessment and/or remediation. As such the direct contact and intrusive maintenance worker HSLs have not been listed.

Table C1: Inputs to the Derivation of HSLs

Variable	Input	Rationale
Potential exposure pathway	Inhalation of vapours	Potential exposure pathways
Soil Type	Silt	Dominant soil type in surface soils (see Test Pit and Borehole Logs ï Appendix F
Depth to contamination	0 m to <1 m	Potential contamination sources likely to impact surface soils

Table C2: HIL and HSL in mg/kg Unless Otherwise Indicated

Contaminants		HIL- A	HSL- AB
Metals	Arsenic	100	-
	Cadmium	20	-
	Chromium (VI)	100	-
	Copper	6000	-
	Lead	300	-
	Mercury (inorganic)	40	-
	Nickel	400	-
	Zinc	7400	-
PAH	Benzo(a)pyrene TEQ[1]	3	-
	Total PAH	300	
	Naphthalene	-	4
TRH	C6 ï C10 (less BTEX) [F1]	-	40
	>C10-C16 (less Naphthalene) [F2]	-	230
	>C16-C34 [F3]	-	-
	>C34-C40 [F4]	-	-
BTEX	Benzene	-	0.6
	Toluene	-	390
	Ethylbenzene	-	NL[3]
	Xylenes	-	95
Phenol	Pentachlorophenol (used as an initial screen)	100	-
OCP	Aldrin + Dieldrin	6	-
	Chlordane	50	-
	DDT+DDE+DDD	240	-
	Endosulfan	270	-
	Endrin	10	-
	Heptachlor	6	-
	HCB	10	-
	Methoxychlor	300	-
OPP	Chlorpyrifos	160	-
PCB[2]		1	

Notes:

1 Sum of carcinogenic PAH

2 Non dioxin-like PCBs only.

3 The soil saturation concentration (Csat) is defined as the soil concentration at which the porewater phase cannot dissolve any more of an individual chemical. The soil vapour that is in equilibrium with the porewater will be at its maximum. If the derived soil HSL exceeds Csat, a soil vapour source concentration for a petroleum mixture could not exceed a level that would results in the maximum allowable vapour risk for the given scenario. For these scenarios, no HSL is presented for these chemicals and the HSL is shown as ónot limitingôor ôNLô

C2.2 Ecological Investigation Levels

Ecological Investigation Levels (EILs) and Added Contaminant Limits (ACLs), where appropriate, have been derived in NEPC (2013) for only a short list of contaminants comprising As, Cu, Cr (III), DDT, naphthalene, Ni, Pb and Zn. The adopted EILs, derived using the *Interactive (Excel) Calculation Spreadsheet* (Standing Council on Environment and Water (SCEW) website (http://www.scew.gov.au/node/941)) are shown in the following Table C4, with inputs into their derivation shown on Table C3.

Table C3: Inputs to the Derivation of EILs

Variable	Input	Rationale
Age of contaminants	ñAgedò(>2 years)	Given the potential sources of soil contamination are from historic use, the contamination is considered as ñagedò(>2 years)
pH	6.1	Based on the average of 151 soil analytical results (ranging from 4.7 to 9.6 pH units)
CEC	9.1 cmolc/kg	Based on the average of 22 soil analytical results (range from 4.2 to 32 meq/100g)
Clay content	10 %	Conservative value for initial screen
Traffic volumes	low	The Site is considered to be located within a low traffic area
State / Territory	New South Wales	-

Table C4: EIL in mg/kg

Analyte		EIL
Metals	Arsenic	100
	Copper	190
	Nickel	140
	Chromium III	410
	Lead	1100
	Zinc	450
PAH	Naphthalene	170
OCP	DDT	180

C2.3 Ecological Screening Levels

Ecological Screening Levels (ESLs) are used to assess the risk of selected petroleum hydrocarbon compounds, BTEX and benzo(a)pyrene to terrestrial ecosystems. The adopted ESLs, based on a fine soil type are shown in the following Table C5.

Table C5: ESL in mg/kg

Analyte		ESL[1]	Comments
TRH	C6 ï C10 (less BTEX) [F1]	180*	All ESLs are low reliability apart from those marked with * which are moderate reliability
	>C10-C16 (less Naphthalene) [F2]	120*	
	>C16-C34 [F3]	1300	
	>C34-C40 [F4]	5600	
BTEX	Benzene	65	
	Toluene	105	
	Ethylbenzene	125	
	Xylenes	45	
PAH	Benzo(a)pyrene	0.7	

Asbestos in Soil

NEPC (2013) defines the various asbestos types as follows:

Bonded ACM: Asbestos containing material which is in sound condition, bound in a matrix of cement or resin, and cannot pass a 7 mm x 7 mm sieve.

FA: Fibrous asbestos material including severely weathered cement sheet, insulation products and woven asbestos material. This material is typically unbonded or was previously bonded and is now significantly degraded and crumbling.

AF: Asbestos fines including free fibres, small fibre bundles and also small fragments of bonded ACM that pass through a 7 mm x 7 mm sieve.

A detailed asbestos assessment was not undertaken as part of this investigation. A conservative approach was assumed as an initial screening measure. 50 g samples were collected and analysed at a LOR of 0.1 g / kg as a preliminary screen for the presence of asbestos at sampling locations across the Site. At these locations the preliminary screen was conducted to assess the potential extent of asbestos and to determine the requirement for (and / or to guide) further characterisation of asbestos with reference to NEPC (2013).

Appendix D

Laboratory Analytical Reports

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Emily McGinty

Sample Login Details	
Your Reference	76744.04, Menangle Park South
Envirolab Reference	**164791**
Date Sample Received	05/04/2017
Date Instructions Received	05/04/2017
Date Results Expected to be Reported	**07/04/2017**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	6 Soils
Turnaround Time Requested	2 days
Temperature on receipt (°C)	13.4
Cooling Method	Ice Pack
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

Sample Id	*vTRH(C6-C10)/BTEXN in Soil*	*svTRH (C10-C40) in Soil*	*PAHs in Soil*	*Acid Extractable metals in soil*	*Asbestos ID - soils*
MPS1A	✓	✓	✓	✓	✓
MPS2A	✓	✓	✓	✓	✓
MPS5A	✓	✓	✓	✓	✓
MPS8A	✓	✓	✓	✓	✓
MPS9A	✓	✓	✓	✓	✓
MPSAA	✓	✓	✓	✓	✓

The '✓' indicates the testing you have requested. ***THIS IS NOT A REPORT OF THE RESULTS****.*

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	~~Turner Rd~~ Menangle Park South.			**To:**	Envirolab Services
Project No:	76744.04	**Sampler:**	EMG		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	EMG	**Mob. Phone:**	0418 651 227	**Attn:**	Tania Notaras
Email:	emily.mcginty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	2 day turnaround			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combo 3a									Notes/preservation
MPS1A	1	05/04/17	S	G,P	x									
MPS2A	2	05/04/17	S	G,P	x									
MPS5A	3	05/04/17	S	G,P	x									
MPS8A	4	05/04/17	S	G,P	x									
MPS9A	5	05/04/17	S	G,P	x									
MPSAA	6	05/04/17	S	G,P	x									

ENVIROLAB

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 164791
Date Received: 05/04/17
Time Received: 16:00
Received by: D.F.
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	EMG		**Transported to laboratory by:**		
Signed:		**Date & Time:** 05.04.17	**Received by:**	Daniel Feed - ens	

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CERTIFICATE OF ANALYSIS 164791

Client:

Douglas Partners Pty Ltd Smeaton Grange
18 Waler Crescent
Smeaton Grange
NSW 2567

Attention: Emily McGinty

Sample log in details:

Your Reference:	**76744.04, Menangle Park South**
No. of samples:	6 Soils
Date samples received / completed instructions received	05/04/2017 / 05/04/2017

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	7/04/17 / 7/04/17
Date of Preliminary Report:	Not Issued

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Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	164791-1	164791-2	164791-3	164791-4	164791-5
Your Reference	---------- -	MPS1A	MPS2A	MPS5A	MPS8A	MPS9A
Date Sampled	----------	5/04/2017	5/04/2017	5/04/2017	5/04/2017	5/04/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
Date analysed	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	87	86	91	87	85

vTRH(C6-C10)/BTEXN in Soil		
Our Reference:	UNITS	164791-6
Your Reference	---------- -	MPSAA
Date Sampled	----------	5/04/2017
Type of sample		Soil
Date extracted	-	06/04/2017
Date analysed	-	06/04/2017
TRHC$_6$ - C$_9$	mg/kg	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25
Benzene	mg/kg	<0.2
Toluene	mg/kg	<0.5
Ethylbenzene	mg/kg	<1
m+p-xylene	mg/kg	<2
o-Xylene	mg/kg	<1
Total +ve Xylenes	mg/kg	<1
naphthalene	mg/kg	<1
Surrogate aaa-Trifluorotoluene	%	88

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	164791-1	164791-2	164791-3	164791-4	164791-5
Your Reference	----------	MPS1A	MPS2A	MPS5A	MPS8A	MPS9A
	-					
Date Sampled	----------	5/04/2017	5/04/2017	5/04/2017	5/04/2017	5/04/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
Date analysed	-	07/04/2017	07/04/2017	07/04/2017	07/04/2017	07/04/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	81	85	89	88	85

svTRH (C10-C40) in Soil		
Our Reference:	UNITS	164791-6
Your Reference	----------	MPSAA
	-	
Date Sampled	----------	5/04/2017
Type of sample		Soil
Date extracted	-	06/04/2017
Date analysed	-	07/04/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100
Total +ve TRH (>C10-C40)	mg/kg	<50
Surrogate o-Terphenyl	%	86

PAHs in Soil Our Reference: Your Reference	UNITS ----------	164791-1 MPS1A	164791-2 MPS2A	164791-3 MPS5A	164791-4 MPS8A	164791-5 MPS9A
Date Sampled	----------	5/04/2017	5/04/2017	5/04/2017	5/04/2017	5/04/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
Date analysed	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate p-Terphenyl-d14	%	111	112	111	112	113

PAHs in Soil Our Reference: Your Reference Date Sampled Type of sample	UNITS ---------- - ---------- 	164791-6 MPSAA 5/04/2017 Soil
Date extracted	-	06/04/2017
Date analysed	-	06/04/2017
Naphthalene	mg/kg	<0.1
Acenaphthylene	mg/kg	<0.1
Acenaphthene	mg/kg	<0.1
Fluorene	mg/kg	<0.1
Phenanthrene	mg/kg	<0.1
Anthracene	mg/kg	<0.1
Fluoranthene	mg/kg	<0.1
Pyrene	mg/kg	<0.1
Benzo(a)anthracene	mg/kg	<0.1
Chrysene	mg/kg	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2
Benzo(a)pyrene	mg/kg	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5
Total +ve PAH's	mg/kg	<0.05
Surrogate p-Terphenyl-d14	%	113

Acid Extractable metals in soil						
Our Reference:	UNITS	164791-1	164791-2	164791-3	164791-4	164791-5
Your Reference	----------	MPS1A	MPS2A	MPS5A	MPS8A	MPS9A
Date Sampled	- ----------	5/04/2017	5/04/2017	5/04/2017	5/04/2017	5/04/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
Date analysed	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
Arsenic	mg/kg	10	5	<4	7	6
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	16	14	10	15	14
Copper	mg/kg	22	21	12	27	13
Lead	mg/kg	32	37	16	29	20
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	9	10	8	17	6
Zinc	mg/kg	88	88	45	57	29

Acid Extractable metals in soil		
Our Reference:	UNITS	164791-6
Your Reference	----------	MPSAA
Date Sampled	- ----------	5/04/2017
Type of sample		Soil
Date prepared	-	06/04/2017
Date analysed	-	06/04/2017
Arsenic	mg/kg	9
Cadmium	mg/kg	<0.4
Chromium	mg/kg	15
Copper	mg/kg	22
Lead	mg/kg	32
Mercury	mg/kg	<0.1
Nickel	mg/kg	10
Zinc	mg/kg	170

Moisture						
Our Reference:	UNITS	164791-1	164791-2	164791-3	164791-4	164791-5
Your Reference	---------- -	MPS1A	MPS2A	MPS5A	MPS8A	MPS9A
Date Sampled	----------	5/04/2017	5/04/2017	5/04/2017	5/04/2017	5/04/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	06/04/2017	06/04/2017	06/04/2017	06/04/2017	06/04/2017
Date analysed	-	07/04/2017	07/04/2017	07/04/2017	07/04/2017	07/04/2017
Moisture	%	26	33	26	27	32

Moisture		
Our Reference:	UNITS	164791-6
Your Reference	---------- -	MPSAA
Date Sampled	----------	5/04/2017
Type of sample		Soil
Date prepared	-	06/04/2017
Date analysed	-	07/04/2017
Moisture	%	27

Asbestos ID - soils						
Our Reference:	UNITS	164791-1	164791-2	164791-3	164791-4	164791-5
Your Reference	---------- -	MPS1A	MPS2A	MPS5A	MPS8A	MPS9A
Date Sampled	----------	5/04/2017	5/04/2017	5/04/2017	5/04/2017	5/04/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	7/04/2017	7/04/2017	7/04/2017	7/04/2017	7/04/2017
Sample mass tested	g	Approx. 30g	Approx. 25g	Approx. 15g	Approx. 35g	Approx. 60g
Sample Description	-	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris	Brown soil & organic debris
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils		
Our Reference:	UNITS	164791-6
Your Reference	---------- -	MPSAA
Date Sampled	----------	5/04/2017
Type of sample		Soil
Date analysed	-	7/04/2017
Sample mass tested	g	Approx. 35g
Sample Description	-	Brown soil & organic debris
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore "Total +ve PAHs" is simply a sum of the positive individual PAHs.
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/04/2017	164791-1	06/04/2017 || 06/04/2017	LCS-10	06/04/2017
Date analysed	-			06/04/2017	164791-1	06/04/2017 || 06/04/2017	LCS-10	06/04/2017
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	164791-1	<25 || <25	LCS-10	101%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	164791-1	<25 || <25	LCS-10	101%
Benzene	mg/kg	0.2	Org-016	<0.2	164791-1	<0.2 || <0.2	LCS-10	93%
Toluene	mg/kg	0.5	Org-016	<0.5	164791-1	<0.5 || <0.5	LCS-10	94%
Ethylbenzene	mg/kg	1	Org-016	<1	164791-1	<1 || <1	LCS-10	105%
m+p-xylene	mg/kg	2	Org-016	<2	164791-1	<2 || <2	LCS-10	107%
o-Xylene	mg/kg	1	Org-016	<1	164791-1	<1 || <1	LCS-10	108%
naphthalene	mg/kg	1	Org-014	<1	164791-1	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	97	164791-1	87 || 90 || RPD: 3	LCS-10	99%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/04/2017	164791-1	06/04/2017 || 06/04/2017	LCS-10	06/04/2017
Date analysed	-			07/04/2017	164791-1	07/04/2017 || 07/04/2017	LCS-10	07/04/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	164791-1	<50 || <50	LCS-10	112%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	164791-1	<100 || <100	LCS-10	108%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	164791-1	<100 || <100	LCS-10	106%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	164791-1	<50 || <50	LCS-10	112%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	164791-1	<100 || <100	LCS-10	108%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	164791-1	<100 || <100	LCS-10	106%
Surrogate o-Terphenyl	%		Org-003	85	164791-1	81 || 83 || RPD: 2	LCS-10	95%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			06/04/2017	164791-1	06/04/2017 || 06/04/2017	LCS-10	06/04/2017
Date analysed	-			06/04/2017	164791-1	06/04/2017 || 06/04/2017	LCS-10	06/04/2017
Naphthalene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	LCS-10	92%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	LCS-10	84%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	LCS-10	105%
Anthracene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || 0.1	LCS-10	95%
Pyrene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || 0.1	LCS-10	94%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	LCS-10	89%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012	<0.2	164791-1	<0.2 || <0.2	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	164791-1	<0.05 || <0.05	LCS-10	87%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	164791-1	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	100	164791-1	111 || 109 || RPD: 2	LCS-10	128%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			06/04/2017	164791-1	06/04/2017 || 06/04/2017	LCS-10	06/04/2017
Date analysed	-			06/04/2017	164791-1	06/04/2017 || 06/04/2017	LCS-10	06/04/2017
Arsenic	mg/kg	4	Metals-020	<4	164791-1	10 || 7 || RPD: 35	LCS-10	115%
Cadmium	mg/kg	0.4	Metals-020	<0.4	164791-1	<0.4 || <0.4	LCS-10	103%
Chromium	mg/kg	1	Metals-020	<1	164791-1	16 || 16 || RPD: 0	LCS-10	108%
Copper	mg/kg	1	Metals-020	<1	164791-1	22 || 21 || RPD: 5	LCS-10	110%
Lead	mg/kg	1	Metals-020	<1	164791-1	32 || 32 || RPD: 0	LCS-10	107%
Mercury	mg/kg	0.1	Metals-021	<0.1	164791-1	<0.1 || <0.1	LCS-10	106%
Nickel	mg/kg	1	Metals-020	<1	164791-1	9 || 9 || RPD: 0	LCS-10	100%
Zinc	mg/kg	1	Metals-020	<1	164791-1	88 || 79 || RPD: 11	LCS-10	104%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	164791-2	06/04/2017
Date analysed	-	[NT]	[NT]	164791-2	06/04/2017
TRHC$_6$ - C$_9$	mg/kg	[NT]	[NT]	164791-2	90%
TRHC$_6$ - C$_{10}$	mg/kg	[NT]	[NT]	164791-2	90%
Benzene	mg/kg	[NT]	[NT]	164791-2	80%
Toluene	mg/kg	[NT]	[NT]	164791-2	80%
Ethylbenzene	mg/kg	[NT]	[NT]	164791-2	95%
m+p-xylene	mg/kg	[NT]	[NT]	164791-2	97%
o-Xylene	mg/kg	[NT]	[NT]	164791-2	97%
naphthalene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	[NT]	[NT]	164791-2	85%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	164791-2	06/04/2017
Date analysed	-	[NT]	[NT]	164791-2	07/04/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	[NT]	[NT]	164791-2	118%
TRHC$_{15}$ - C$_{28}$	mg/kg	[NT]	[NT]	164791-2	119%
TRHC$_{29}$ - C$_{36}$	mg/kg	[NT]	[NT]	164791-2	103%
TRH>C$_{10}$-C$_{16}$	mg/kg	[NT]	[NT]	164791-2	118%
TRH>C$_{16}$-C$_{34}$	mg/kg	[NT]	[NT]	164791-2	119%
TRH>C$_{34}$-C$_{40}$	mg/kg	[NT]	[NT]	164791-2	103%
Surrogate o-Terphenyl	%	[NT]	[NT]	164791-2	85%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	[NT]	[NT]	164791-2	06/04/2017
Date analysed	-	[NT]	[NT]	164791-2	06/04/2017
Naphthalene	mg/kg	[NT]	[NT]	164791-2	97%
Acenaphthylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	[NT]	[NT]	164791-2	88%
Phenanthrene	mg/kg	[NT]	[NT]	164791-2	99%
Anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	[NT]	[NT]	164791-2	92%
Pyrene	mg/kg	[NT]	[NT]	164791-2	96%
Benzo(a)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	[NT]	[NT]	164791-2	88%
Benzo(b,j+k)fluoranthene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(a)pyrene	mg/kg	[NT]	[NT]	164791-2	95%
Indeno(1,2,3-c,d)pyrene	mg/kg	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	[NT]	[NT]	164791-2	135%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	[NT]	[NT]	164791-2	06/04/2017
Date analysed	-	[NT]	[NT]	164791-2	06/04/2017
Arsenic	mg/kg	[NT]	[NT]	164791-2	98%
Cadmium	mg/kg	[NT]	[NT]	164791-2	97%
Chromium	mg/kg	[NT]	[NT]	164791-2	98%
Copper	mg/kg	[NT]	[NT]	164791-2	107%
Lead	mg/kg	[NT]	[NT]	164791-2	95%
Mercury	mg/kg	[NT]	[NT]	164791-2	104%
Nickel	mg/kg	[NT]	[NT]	164791-2	94%
Zinc	mg/kg	[NT]	[NT]	164791-2	101%

Report Comments:

Asbestos: Excessive sample volumes were provided for asbestos analysis.
A portion of the supplied samples were sub-sampled according to Envirolab procedures.
We cannot guarantee that these sub-samples are indicative of the entire sample.
Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.
Note: Samples 164791-1, 2, 3, 4, 5 & 6 were sub-sampled from bags provided by the client.

Asbestos ID was analysed by Approved Identifier:	Matt Tang
Asbestos ID was authorised by Approved Signatory:	Paul Ching

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	EMily McGinty

Sample Login Details	
Your Reference	76744.04, Menangle Park South - Part 2
Envirolab Reference	**161561**
Date Sample Received	08/02/2017
Date Instructions Received	10/02/2017
Date Results Expected to be Reported	**17/02/2017**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	12 soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	24.0
Cooling Method	None
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

Sample Id	*vTRH(C6-C10)/BTEXN in Soil*	*svTRH (C10-C40) in Soil*	*PAHs in Soil*	*Organochlorine Pesticides in soil*	*Organophosphorus Pesticides*	*PCBs in Soil*	*Acid Extractable metals in soil*	*Total Phenolics (as Phenol)*	*Asbestos ID - soils*	*On Hold*
MPS-3-0.5										✓
MPS-4-1.0										✓
MPS-5-1.5										✓
MPS-6-2.0										✓
MPS-10-0.5										✓
MPS-10-1.0										✓
MPS-10-1.5										✓
MPS-10-2.5										✓
MPS-3-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MPS-3-0.4-0.5										✓
MPS-10-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MPS-10-0.4-0.5										✓

Douglas Partners
Geotechnics | Environment | Groundwater

CHAIN OF CUSTODY

Project Name:	Menangle Park South - Part 2			**To:**	Envirolab Services
Project No:	76744.04	**Sampler:**	CLN		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	EMG	**Mob. Phone:**	0418 651 227	**Attn:**	Tania Notaras
Email:	emily.mcginty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type: S - soil W - water	Container Type: G - glass P - plastic	Analytes: Metals, OCP, OPP	Combo 8a	Combo 4L	Metals - Leachate	TRH - Leachate	HOLD	Asbestos ID	Metals and BTEX		Notes/preservation
MPS-3/0-0.1	9	01/02/17	S	G/P		X								
MPS-3/0.4-0.5	10	01/02/17	S	G/P						x				
MPS-10/0-0.1	11	01/02/17	S	G/P		X								
MPS-10/0.4-0.5	12	01/02/17	S	G/P						x				
MPS-3/0.5.	1													
MPS-3/1.0	2													
MPS-3/1.5.	3													
MPS-3/2.0	4													
MPS10/0.5.	5													
MPS-10/1.0	6													
MPS-10/1.5.	7													

ENVIROLAB GROUP

Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No: 161561
Date Received: 0802
Time Received: 1800
Received by: Ellen
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

(100217 10:05 COC)

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent, Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	CLN		**Transported to laboratory by:**		
Signed:		**Date & Time:** 6.2.17	**Received by:** Ellen WR 100217 ~~12pm~~ 10:05. COC Recd.		

MPS-10/2.5. 8

Simon Song

From: Chamali Nagodavithane <Chamali.Nagodavithane@douglaspartners.com.au>
Sent: Friday, 10 February 2017 10:05 AM
To: Simon Song
Subject: FW: 76744.01
Attachments: Contam - MPS COC.pdf

Hi Simon,

Sorry about that, I realised I forgot to include the COC for the "MPS samples" after I had sent them. Please find the COC attached.

Also, I don't think I included a COC for the "MPS'' salinity samples either. Can you please place all "MPS" salinity samples (0.5, 1. 1.5, 2. 2,5, 3.0) on hold.

Many thanks

Chamali Nagodavithane | Environmental Scientist
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
18 Waler Crescent Smeaton Grange NSW 2567
P: 02 4647 0075 | F: 02 4646 1886 | E: Chamali.Nagodavithane@douglaspartners.com.au

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FINANCIAL REVIEW
CLIENT CHOI(
FINALIST

#161561

This email is confidential. If you are not the intended recipient, please notify us immediately and be aware that any disclosure, copying, distribution or use of the contents of this information is prohibited. Please note that the company does not make any commitment through emails not confirmed by fax or letter.

From: Simon Song [mailto:SSong@envirolab.com.au]
Sent: Wednesday, 8 February 2017 1:36 PM
To: Emily McGinty
Subject: 76744.01

Hi Emily,
Have 4 soils 'MPS' of 76744.01 no COC here, can you please send a COC to us, thanks.
Photo attached.

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 161561

Client:

Douglas Partners Pty Ltd Smeaton Grange
18 Waler Crescent
Smeaton Grange
NSW 2567

Attention: EMily McGinty

Sample log in details:

Your Reference:	**76744.04, Menangle Park South - Part 2**		
No. of samples:	12 soils		
Date samples received / completed instructions received	08/02/17	/	10/02/17

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	17/02/17	/	15/02/17
Date of Preliminary Report:	Not Issued		

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Accredited for compliance with ISO/IEC 17025 - Testing **Tests not covered by NATA are denoted with *.**

Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	---------- -	MPS-3	MPS-10
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date extracted	-	13/02/2017	13/02/2017
Date analysed	-	14/02/2017	14/02/2017
TRH C_6 - C_9	mg/kg	<25	<25
TRH C_6 - C_{10}	mg/kg	<25	<25
vTPH C_6 - C_{10} less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	96	102

svTRH (C10-C40) in Soil			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date extracted	-	13/02/2017	13/02/2017
Date analysed	-	13/02/2017	13/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	102	102

PAHs in Soil			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date extracted	-	13/02/2017	13/02/2017
Date analysed	-	14/02/2017	14/02/2017
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	0.2	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Total +ve PAH's	mg/kg	0.2	<0.05
Surrogate p-Terphenyl-d14	%	109	105

Organochlorine Pesticides in soil			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date extracted	-	13/02/2017	13/02/2017
Date analysed	-	13/02/2017	13/02/2017
HCB	mg/kg	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1
Surrogate TCMX	%	109	107

Organophosphorus Pesticides			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
Depth	- ----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date extracted	-	13/02/2017	13/02/2017
Date analysed	-	13/02/2017	13/02/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1
Surrogate TCMX	%	109	107

PCBs in Soil			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date extracted	-	13/02/2017	13/02/2017
Date analysed	-	13/02/2017	13/02/2017
Aroclor 1016	mg/kg	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1
Surrogate TCLMX	%	109	107

Acid Extractable metals in soil			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date prepared	-	13/02/2017	13/02/2017
Date analysed	-	14/02/2017	14/02/2017
Arsenic	mg/kg	6	11
Cadmium	mg/kg	<0.4	<0.4
Chromium	mg/kg	12	8
Copper	mg/kg	11	17
Lead	mg/kg	12	16
Mercury	mg/kg	<0.1	<0.1
Nickel	mg/kg	5	9
Zinc	mg/kg	19	26

Misc Soil - Inorg			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date prepared	-	13/02/2017	13/02/2017
Date analysed	-	13/02/2017	13/02/2017
Total Phenolics (as Phenol)	mg/kg	<5	<5

Moisture			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date prepared	-	13/02/2017	13/02/2017
Date analysed	-	14/02/2017	14/02/2017
Moisture	%	6.5	8.4

Asbestos ID - soils			
Our Reference:	UNITS	161561-9	161561-11
Your Reference	----------	MPS-3	MPS-10
	-		
Depth	----------	0-0.1	0-0.1
Date Sampled		1/02/2017	1/02/2017
Type of sample		Soil	Soil
Date analysed	-	15/02/2017	15/02/2017
Sample mass tested	g	Approx. 30g	Approx. 15g
Sample Description	-	Brown clayey soil	Brown clayey soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Date analysed	-			14/02/2017	[NT]	[NT]	LCS-6	14/02/2017
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-6	101%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-6	101%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-6	86%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-6	91%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-6	108%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-6	109%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-6	120%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	100	[NT]	[NT]	LCS-6	87%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Date analysed	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-6	113%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	111%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	106%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-6	113%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	111%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-6	106%
Surrogate o-Terphenyl	%		Org-003	97	[NT]	[NT]	LCS-6	111%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Date analysed	-			14/02/2017	[NT]	[NT]	LCS-6	14/02/2017
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	105%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	111%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	123%
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	116%
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	115%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-6	103%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	LCS-6	108%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	116	[NT]	[NT]	LCS-6	123%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Date analysed	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
HCB	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	94%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	100%
Heptachlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	97%
delta-BHC	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	94%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	93%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	99%
Dieldrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	105%
Endrin	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	104%
pp-DDD	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	100%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	LCS-6	118%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCMX	%		Org-005	104	[NT]	[NT]	LCS-6	89%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Date analysed	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-6	112%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-6	111%
Dimethoate	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-6	87%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-6	93%
Malathion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-6	100%
Parathion	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-6	96%
Ronnel	mg/kg	0.1	Org-008	<0.1	[NT]	[NT]	LCS-6	86%
Surrogate TCMX	%		Org-008	104	[NT]	[NT]	LCS-6	102%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Date analysed	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	LCS-6	106%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate TCLMX	%		Org-006	104	[NT]	[NT]	LCS-6	102%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			13/02/2017	[NT]	[NT]	LCS-6	13/02/2017
Date analysed	-			14/02/2017	[NT]	[NT]	LCS-6	14/02/2017
Arsenic	mg/kg	4	Metals-020	<4	[NT]	[NT]	LCS-6	107%
Cadmium	mg/kg	0.4	Metals-020	<0.4	[NT]	[NT]	LCS-6	95%
Chromium	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	103%
Copper	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	104%
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	98%
Mercury	mg/kg	0.1	Metals-021	<0.1	[NT]	[NT]	LCS-6	85%
Nickel	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	93%
Zinc	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-6	95%
QUALITY CONTROL Misc Soil - Inorg	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			13/02/2017	[NT]	[NT]	LCS-1	13/02/2017
Date analysed	-			13/02/2017	[NT]	[NT]	LCS-1	13/02/2017
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	[NT]	[NT]	LCS-1	101%

Report Comments:

Asbestos: Excessive sample volume was provided for asbestos analysis. A portion of the supplied sample was sub-sampled according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g (50mL) of sample in its own container as per AS4964-2004.

Note: Samples 161561-3 & 11 were sub-sampled from bags provided by the client.

Asbestos ID was analysed by Approved Identifier:	Lucy Zhu
Asbestos ID was authorised by Approved Signatory:	Matt Mansfield

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Envirolab Services Pty Ltd
ABN 37 112 535 645
12 Ashley St Chatswood NSW 2067
ph 02 9910 6200 fax 02 9910 6201
enquiries@envirolabservices.com.au
www.envirolabservices.com.au

SAMPLE RECEIPT ADVICE

Client Details	
Client	Douglas Partners Pty Ltd Smeaton Grange
Attention	Emily McGinty

Sample Login Details	
Your Reference	76744.04, Menangle Park South
Envirolab Reference	**160671**
Date Sample Received	23/01/2017
Date Instructions Received	23/01/2017
Date Results Expected to be Reported	**31/01/2017**

Sample Condition	
Samples received in appropriate condition for analysis	YES
No. of Samples Provided	32 soils
Turnaround Time Requested	Standard
Temperature on receipt (°C)	19.1
Cooling Method	Ice
Sampling Date Provided	YES

Comments
Samples will be held for 1 month for water samples and 2 months for soil samples from date of receipt of samples

Please direct any queries to:

Aileen Hie	Jacinta Hurst
Phone: 02 9910 6200	Phone: 02 9910 6200
Fax: 02 9910 6201	Fax: 02 9910 6201
Email: ahie@envirolabservices.com.au	Email: jhurst@envirolabservices.com.au

Sample and Testing Details on following page

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Sample Id	vTRH(C6-C10)/BTEXN in Soil	svTRH (C10-C40) in Soil	PAHs in Soil	Organochlorine Pesticides in soil	Organophosphorus Pesticides	PCBs in Soil	Acid Extractable metals in soil	Total Phenolics (as Phenol)	Asbestos ID - soils	On Hold
MPS1-0-0.1										✓
MPS1-0.4-0.5				✓	✓		✓			
MPS2-0-0.1										✓
MPS2-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MPS4-0-0.1										✓
MPS4-0.4-0.5										✓
MPS5-0-0.1										✓
MPS5-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MPS6-0-0.1										✓
MPS6-0.4-0.5										✓
MPS7-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MPS7-0.4-0.5										✓
MPS8-0-0.1										✓
MPS8-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
MPS9-0-0.1										✓
MPS9-0.4-0.5	✓	✓	✓	✓	✓	✓	✓	✓	✓	
SP1-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
SP1-0.4-0.5										✓
SP2-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
SP2-0.4-0.5										✓
SP4-0-0.1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
SP4-0.4-0.5										✓
BD1	✓	✓	✓	✓	✓	✓	✓	✓	✓	
BD2	✓	✓	✓	✓	✓	✓	✓	✓	✓	
TB1	✓									
TS1	✓									
MPS9-0.9-1.0										✓
SP1-0.9-1.0										✓
SP2-0.9-1.0										✓
SP4-0.9-1.0										✓
MPS3-0-0.1										✓
MPS3-0.4-0.5										✓

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Menangle Park South			**To:**	Envirolab Services
Project No:	76744.04	**Sampler:**	CN		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	EMG	**Mob. Phone:**	0418 651 227	**Attn:**	Tania Notaras
Email:	emily.mcginty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard turnaround			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Combos	Metals	OCP OPP	Cl^-	SO_4	Hold.				Notes/preservation
MPS1/0-0.1	1	16/1	S	G						X				
MPS1/0.4-0.5	2					X	X							
MPS2/0-0.1	3									X				
MPS2/0.4-0.5	4				X									
MPS4/0-0.1	5									X				
MPS4/0.4-0.5	6									X				
MPS5/0-0.1	7									X				
MPS5/0.4-0.5	8				X									
MPS6/0-0.1	9									X				
MPS6/0.4-0.5	10									X				
MPS7/0-0.1	11				X									
MPS7/0.4-0.5	12									X				
MPS8/0-0.1	13	↓	↓	↓						X				

ENVIROLAB group
Envirolab Services
12 Ashley St
Chatswood NSW 2067
Ph: (02) 9910 6200

Job No. 166691
Date Received: 23/1
Time Received: 17:30
Received by: JAG
Temp: Cool/Ambient
Cooling: Ice/Icepack
Security: Intact/Broken/None

Lab Report No:			
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent Smeaton Grange 2567	**Phone:** (02) 4647 0075 **Fax:** (02) 4646 1886
Relinquished by:	EMG	**Transported to laboratory by:**	
Signed:		**Date & Time:** 23.01.17	**Received by:** James - ELS

Douglas Partners
Geotechnics / Environment / Groundwater

CHAIN OF CUSTODY

Project Name:	Menangle Park South			**To:**	Envirolab Services
Project No:	76744.04	**Sampler:**	CN		12 Ashley Street, Chatswood NSW 2067
Project Mgr:	EMG	**Mob. Phone:**	0418 651 227	**Attn:**	Tania Notaras
Email:	emily.mcginty@douglaspartners.com.au			**Phone:**	(02) 9910 6200 **Fax:** (02) 9910 6201
Date Required:	Standard turnaround			**Email:**	tnotaras@envirolabservices.com.au

Sample ID	Lab ID	Date Sampled	Sample Type (S - soil, W - water)	Container Type (G - glass, P - plastic)	Analytes: Lambda	8 metals	OCP OPP	Cl^-	SO_4	Metal.	Volatiles only			Notes/preservation
160691														
MPS 8/0.4-0.5	14	16/1	S	G	X									
MPS 9/0-0.1	15									X				
MPS 9/0.4-0.5	16				X									
SP1 /0-0.1	17				X									
SP1 /0.4-0.5	18									X				
SP2 /0-0.1	19				X									
SP2 / 0.4-0.5	20									X				
SP4/0-0.1	21				X									
SP4 /0.4-0.5	22													
BD1	23				X									
BD2	24				X									
TB1	25	↓	↓	↓							X			
TB1 Extra JAK	26													

Lab Report No:					
Send Results to:	Douglas Partners Pty Ltd	**Address** 18 Waler Crescent Smeaton Grange 2567		**Phone:** (02) 4647 0075	**Fax:** (02) 4646 1886
Relinquished by:	EMG		**Transported to laboratory by:**		
Signed:		**Date & Time:** 23.01.17	**Received by:** James-Els		

29. MPS9 0.9-1.0
26. SP1 0.9-1.0
29. SP2 0.9-1.0
30. SP4 0.9-1.0
Extra 32 JAK
31. MPS-3 0.0-0.1
MPS-3 0.4-0.5

12 Ashley Street, Chatswood, NSW 2067
tel: +61 2 9910 6200

email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 160671-A

Client:

Douglas Partners Pty Ltd Smeaton Grange
18 Waler Crescent
Smeaton Grange
NSW 2567

Attention: Emily McGinty

Sample log in details:

Your Reference:	**76744.04, Menangle Park South**
No. of samples:	Additional Testing on 2 Soils
Date samples received / completed instructions received	23/01/17 / 15/02/17

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	22/02/17 / 21/02/17
Date of Preliminary Report:	Not Issued

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Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil			
Our Reference:	UNITS	160671-A-18	160671-A-22
Your Reference	---------- -	SP1	SP4
Depth	----------	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017
Type of sample		Soil	Soil
Date extracted	-	16/02/2017	16/02/2017
Date analysed	-	20/02/2017	20/02/2017
TRHC$_6$ - C$_9$	mg/kg	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25
Benzene	mg/kg	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1
m+p-xylene	mg/kg	<2	<2
o-Xylene	mg/kg	<1	<1
Total +ve Xylenes	mg/kg	<1	<1
naphthalene	mg/kg	<1	<1
Surrogate aaa-Trifluorotoluene	%	93	87

svTRH (C10-C40) in Soil			
Our Reference:	UNITS	160671-A-18	160671-A-22
Your Reference	----------	SP1	SP4
	-		
Depth	----------	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017
Type of sample		Soil	Soil
Date extracted	-	16/02/2017	16/02/2017
Date analysed	-	16/02/2017	16/02/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50
Surrogate o-Terphenyl	%	83	99

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	160671-A-18 SP1 0.4-0.5 16/01/2017 Soil	160671-A-22 SP4 0.4-0.5 16/01/2017 Soil
Date extracted	-	16/02/2017	16/02/2017
Date analysed	-	16/02/2017	16/02/2017
Naphthalene	mg/kg	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5
Total +ve PAH's	mg/kg	<0.05	<0.05
Surrogate p-Terphenyl-d14	%	86	93

Acid Extractable metals in soil			
Our Reference:	UNITS	160671-A-18	160671-A-22
Your Reference	----------	SP1	SP4
	-		
Depth	----------	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017
Type of sample		Soil	Soil
Date prepared	-	16/02/2017	16/02/2017
Date analysed	-	17/02/2017	17/02/2017
Lead	mg/kg	18	81

Moisture			
Our Reference:	UNITS	160671-A-18	160671-A-22
Your Reference	----------	SP1	SP4
	-		
Depth	----------	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017
Type of sample		Soil	Soil
Date prepared	-	16/02/2017	16/02/2017
Date analysed	-	17/02/2017	17/02/2017
Moisture	%	5.2	10

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Metals-020	Determination of various metals by ICP-AES.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			16/02/2017	[NT]	[NT]	LCS-5	16/02/2017
Date analysed	-			20/02/2017	[NT]	[NT]	LCS-5	20/02/2017
$TRHC_6$ - C_9	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-5	104%
$TRHC_6$ - C_{10}	mg/kg	25	Org-016	<25	[NT]	[NT]	LCS-5	104%
Benzene	mg/kg	0.2	Org-016	<0.2	[NT]	[NT]	LCS-5	90%
Toluene	mg/kg	0.5	Org-016	<0.5	[NT]	[NT]	LCS-5	101%
Ethylbenzene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-5	107%
m+p-xylene	mg/kg	2	Org-016	<2	[NT]	[NT]	LCS-5	110%
o-Xylene	mg/kg	1	Org-016	<1	[NT]	[NT]	LCS-5	113%
naphthalene	mg/kg	1	Org-014	<1	[NT]	[NT]	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	97	[NT]	[NT]	LCS-5	97%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			16/02/2017	[NT]	[NT]	LCS-5	16/02/2017
Date analysed	-			16/02/2017	[NT]	[NT]	LCS-5	16/02/2017
$TRHC_{10}$ - C_{14}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-5	108%
$TRHC_{15}$ - C_{28}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	104%
$TRHC_{29}$ - C_{36}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	100%
$TRH>C_{10}$-C_{16}	mg/kg	50	Org-003	<50	[NT]	[NT]	LCS-5	108%
$TRH>C_{16}$-C_{34}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	104%
$TRH>C_{34}$-C_{40}	mg/kg	100	Org-003	<100	[NT]	[NT]	LCS-5	100%
Surrogate o-Terphenyl	%		Org-003	102	[NT]	[NT]	LCS-5	111%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			16/02/2017	[NT]	[NT]	LCS-5	16/02/2017
Date analysed	-			16/02/2017	[NT]	[NT]	LCS-5	16/02/2017
Naphthalene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	96%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	101%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	112%
Anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	112%
Pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	113%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	LCS-5	102%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012	<0.2	[NT]	[NT]	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	[NT]	[NT]	LCS-5	98%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	[NT]	[NT]	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	98	[NT]	[NT]	LCS-5	104%
QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			16/02/2017	[NT]	[NT]	LCS-5	16/02/2017
Date analysed	-			17/02/2017	[NT]	[NT]	LCS-5	17/02/2017
Lead	mg/kg	1	Metals-020	<1	[NT]	[NT]	LCS-5	103%

Report Comments:

Asbestos ID was analysed by Approved Identifier:	Not applicable for this job
Asbestos ID was authorised by Approved Signatory:	Not applicable for this job

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Simon Song

From: Emily McGinty <Emily.McGinty@douglaspartners.com.au>
Sent: Wednesday, 15 February 2017 11:36 AM
To: Simon Song
Subject: 160671 - additional analysis
Attachments: 160671-coc.pdf

160671 A
Due: 22/2/17
Std TAT.

Hi Simon

Please can I have the following analysis done on samples on the attached job:

- Sample 18 (SP1 0.4 – 0.5): Combination 2
- Sample 22 (SP4 0.4 – 0.5): Combination 2

Thanks,

Emily.

Emily McGinty | Environmental Scientist
Douglas Partners Pty Ltd | ABN 75 053 980 117 | www.douglaspartners.com.au
18 Waler Crescent Smeaton Grange NSW 2567
P: 02 4647 0075 | F: 02 4646 1886 | E: Emily.McGinty@douglaspartners.com.au

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email: sydney@envirolab.com.au
envirolab.com.au

Envirolab Services Pty Ltd - Sydney | ABN 37 112 535 645

CERTIFICATE OF ANALYSIS 160671

Client:

Douglas Partners Pty Ltd Smeaton Grange
18 Waler Crescent
Smeaton Grange
NSW 2567

Attention: Emily McGinty

Sample log in details:

Your Reference:	**76744.04, Menangle Park South**		
No. of samples:	32 soils		
Date samples received / completed instructions received	23/01/17	/	23/01/17

Analysis Details:

Please refer to the following pages for results, methodology summary and quality control data.
Samples were analysed as received from the client. Results relate specifically to the samples as received.
Results are reported on a dry weight basis for solids and on an as received basis for other matrices.
Please refer to the last page of this report for any comments relating to the results.

Report Details:

Date results requested by: / Issue Date:	31/01/17	/	31/01/17
Date of Preliminary Report:	Not Issued		

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Results Approved By:

David Springer
General Manager

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	160671-4	160671-8	160671-11	160671-14	160671-16
Your Reference	---------- -	MPS2	MPS5	MPS7	MPS8	MPS9
Depth	----------	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	94	104	95	95	130

vTRH(C6-C10)/BTEXN in Soil						
Our Reference:	UNITS	160671-17	160671-19	160671-21	160671-23	160671-24
Your Reference	---------- -	SP1	SP2	SP4	BD1	BD2
Depth	----------	0-0.1	0-0.1	0-0.1	-	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
TRHC$_6$ - C$_9$	mg/kg	<25	<25	<25	<25	<25
TRHC$_6$ - C$_{10}$	mg/kg	<25	<25	<25	<25	<25
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	<25	<25	<25	<25
Benzene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	mg/kg	<1	<1	<1	<1	<1
m+p-xylene	mg/kg	<2	<2	<2	<2	<2
o-Xylene	mg/kg	<1	<1	<1	<1	<1
Total +ve Xylenes	mg/kg	<1	<1	<1	<1	<1
naphthalene	mg/kg	<1	<1	<1	<1	<1
Surrogate aaa-Trifluorotoluene	%	114	118	106	112	111

vTRH(C6-C10)/BTEXN in Soil			
Our Reference:	UNITS	160671-25	160671-26
Your Reference	----------	TB1	TS1
	-		
Depth	----------	-	-
Date Sampled		16/01/2017	16/01/2017
Type of sample		Soil	Soil
Date extracted	-	25/01/2017	25/01/2017
Date analysed	-	30/01/2017	27/01/2017
TRHC$_6$ - C$_9$	mg/kg	<25	[NA]
TRHC$_6$ - C$_{10}$	mg/kg	<25	[NA]
vTPHC$_6$ - C$_{10}$ less BTEX (F1)	mg/kg	<25	[NA]
Benzene	mg/kg	<0.2	82%
Toluene	mg/kg	<0.5	81%
Ethylbenzene	mg/kg	<1	80%
m+p-xylene	mg/kg	<2	80%
o-Xylene	mg/kg	<1	80%
Total +ve Xylenes	mg/kg	<1	[NA]
naphthalene	mg/kg	<1	[NA]
Surrogate aaa-Trifluorotoluene	%	112	117

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	160671-4	160671-8	160671-11	160671-14	160671-16
Your Reference	---------- -	MPS2	MPS5	MPS7	MPS8	MPS9
Depth	----------	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	<100	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	<100	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	<50	<50	<50	<50
Surrogate o-Terphenyl	%	86	85	85	83	83

svTRH (C10-C40) in Soil						
Our Reference:	UNITS	160671-17	160671-19	160671-21	160671-23	160671-24
Your Reference	---------- -	SP1	SP2	SP4	BD1	BD2
Depth	----------	0-0.1	0-0.1	0-0.1	-	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	<50	<50	<50	<50	<50
TRHC$_{15}$ - C$_{28}$	mg/kg	<100	<100	<100	<100	<100
TRHC$_{29}$ - C$_{36}$	mg/kg	<100	250	<100	<100	<100
TRH>C$_{10}$-C$_{16}$	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{10}$ - C$_{16}$ less Naphthalene (F2)	mg/kg	<50	<50	<50	<50	<50
TRH>C$_{16}$-C$_{34}$	mg/kg	<100	190	<100	<100	<100
TRH>C$_{34}$-C$_{40}$	mg/kg	<100	280	<100	<100	<100
Total +ve TRH (>C10-C40)	mg/kg	<50	470	<50	<50	<50
Surrogate o-Terphenyl	%	84	84	85	86	85

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	160671-4 MPS2 0.4-0.5 16/01/2017 Soil	160671-8 MPS5 0.4-0.5 16/01/2017 Soil	160671-11 MPS7 0-0.1 16/01/2017 Soil	160671-14 MPS8 0.4-0.5 16/01/2017 Soil	160671-16 MPS9 0.4-0.5 16/01/2017 Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	<0.05	<0.05	<0.05	<0.05	<0.05
Surrogate p-Terphenyl-d14	%	88	87	90	86	86

PAHs in Soil Our Reference: Your Reference Depth Date Sampled Type of sample	UNITS ---------- - ---------- 	160671-17 SP1 0-0.1 16/01/2017 Soil	160671-19 SP2 0-0.1 16/01/2017 Soil	160671-21 SP4 0-0.1 16/01/2017 Soil	160671-23 BD1 - 16/01/2017 Soil	160671-24 BD2 - 16/01/2017 Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Naphthalene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthylene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Acenaphthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluorene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Phenanthrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fluoranthene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(a)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chrysene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(b,j+k)fluoranthene	mg/kg	<0.2	<0.2	<0.2	<0.2	<0.2
Benzo(a)pyrene	mg/kg	<0.05	0.07	<0.05	<0.05	<0.05
Indeno(1,2,3-c,d)pyrene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dibenzo(a,h)anthracene	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Benzo(g,h,i)perylene	mg/kg	<0.1	0.1	<0.1	<0.1	<0.1
Benzo(a)pyrene TEQ calc (zero)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(half)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene TEQ calc(PQL)	mg/kg	<0.5	<0.5	<0.5	<0.5	<0.5
Total +ve PAH's	mg/kg	<0.05	0.2	<0.05	<0.05	<0.05
Surrogate p-Terphenyl-d14	%	90	93	67	87	95

Organochlorine Pesticides in soil						
Our Reference:	UNITS	160671-2	160671-4	160671-8	160671-11	160671-14
Your Reference	----------	MPS1	MPS2	MPS5	MPS7	MPS8
Depth	- ----------	0.4-0.5	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	26/01/2017	26/01/2017	26/01/2017	26/01/2017	26/01/2017
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	112	113	110	112	107

Organochlorine Pesticides in soil						
Our Reference:	UNITS	160671-16	160671-17	160671-19	160671-21	160671-23
Your Reference	---------- -	MPS9	SP1	SP2	SP4	BD1
Depth	----------	0.4-0.5	0-0.1	0-0.1	0-0.1	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	26/01/2017	26/01/2017	26/01/2017	26/01/2017	26/01/2017
HCB	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
beta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
delta-BHC	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Heptachlor Epoxide	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
gamma-Chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
alpha-chlordane	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan I	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dieldrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDD	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan II	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
pp-DDT	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endrin Aldehyde	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Endosulfan Sulphate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Methoxychlor	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	112	114	113	111	111

Organochlorine Pesticides in soil		
Our Reference:	UNITS	160671-24
Your Reference	----------	BD2
	-	
Depth	----------	-
Date Sampled		16/01/2017
Type of sample		Soil
Date extracted	-	25/01/2017
Date analysed	-	26/01/2017
HCB	mg/kg	<0.1
alpha-BHC	mg/kg	<0.1
gamma-BHC	mg/kg	<0.1
beta-BHC	mg/kg	<0.1
Heptachlor	mg/kg	<0.1
delta-BHC	mg/kg	<0.1
Aldrin	mg/kg	<0.1
Heptachlor Epoxide	mg/kg	<0.1
gamma-Chlordane	mg/kg	<0.1
alpha-chlordane	mg/kg	<0.1
Endosulfan I	mg/kg	<0.1
pp-DDE	mg/kg	<0.1
Dieldrin	mg/kg	<0.1
Endrin	mg/kg	<0.1
pp-DDD	mg/kg	<0.1
Endosulfan II	mg/kg	<0.1
pp-DDT	mg/kg	<0.1
Endrin Aldehyde	mg/kg	<0.1
Endosulfan Sulphate	mg/kg	<0.1
Methoxychlor	mg/kg	<0.1
Total +ve DDT+DDD+DDE	mg/kg	<0.1
Surrogate TCMX	%	110

Organophosphorus Pesticides						
Our Reference:	UNITS	160671-2	160671-4	160671-8	160671-11	160671-14
Your Reference	---------- -	MPS1	MPS2	MPS5	MPS7	MPS8
Depth	----------	0.4-0.5	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	26/01/2017	26/01/2017	26/01/2017	26/01/2017	26/01/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	112	113	110	112	107

Organophosphorus Pesticides						
Our Reference:	UNITS	160671-16	160671-17	160671-19	160671-21	160671-23
Your Reference	---------- -	MPS9	SP1	SP2	SP4	BD1
Depth	----------	0.4-0.5	0-0.1	0-0.1	0-0.1	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	26/01/2017	26/01/2017	26/01/2017	26/01/2017	26/01/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Bromophos-ethyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Diazinon	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dichlorvos	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Dimethoate	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ethion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Fenitrothion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Malathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Parathion	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Ronnel	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCMX	%	112	114	113	111	111

Organophosphorus Pesticides		
Our Reference:	UNITS	160671-24
Your Reference	----------	BD2
	-	
Depth	----------	-
Date Sampled		16/01/2017
Type of sample		Soil
Date extracted	-	25/01/2017
Date analysed	-	26/01/2017
Azinphos-methyl (Guthion)	mg/kg	<0.1
Bromophos-ethyl	mg/kg	<0.1
Chlorpyriphos	mg/kg	<0.1
Chlorpyriphos-methyl	mg/kg	<0.1
Diazinon	mg/kg	<0.1
Dichlorvos	mg/kg	<0.1
Dimethoate	mg/kg	<0.1
Ethion	mg/kg	<0.1
Fenitrothion	mg/kg	<0.1
Malathion	mg/kg	<0.1
Parathion	mg/kg	<0.1
Ronnel	mg/kg	<0.1
Surrogate TCMX	%	110

PCBs in Soil						
Our Reference:	UNITS	160671-4	160671-8	160671-11	160671-14	160671-16
Your Reference	----------	MPS2	MPS5	MPS7	MPS8	MPS9
	-					
Depth	----------	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	26/01/2017	26/01/2017	26/01/2017	26/01/2017	26/01/2017
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	113	110	112	107	112

PCBs in Soil						
Our Reference:	UNITS	160671-17	160671-19	160671-21	160671-23	160671-24
Your Reference	----------	SP1	SP2	SP4	BD1	BD2
	-					
Depth	----------	0-0.1	0-0.1	0-0.1	-	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date extracted	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	26/01/2017	26/01/2017	26/01/2017	26/01/2017	26/01/2017
Aroclor 1016	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1221	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1232	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1242	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1248	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1254	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Aroclor 1260	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Total +ve PCBs (1016-1260)	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Surrogate TCLMX	%	114	113	111	111	110

Acid Extractable metals in soil						
Our Reference:	UNITS	160671-2	160671-4	160671-8	160671-11	160671-14
Your Reference	---------- -	MPS1	MPS2	MPS5	MPS7	MPS8
Depth	----------	0.4-0.5	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Arsenic	mg/kg	9	5	<4	8	7
Cadmium	mg/kg	<0.4	<0.4	<0.4	<0.4	<0.4
Chromium	mg/kg	19	10	10	14	13
Copper	mg/kg	25	48	7	18	34
Lead	mg/kg	18	23	10	19	21
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	7	12	7	10	10
Zinc	mg/kg	25	66	18	31	51

Acid Extractable metals in soil						
Our Reference:	UNITS	160671-16	160671-17	160671-19	160671-21	160671-23
Your Reference	---------- -	MPS9	SP1	SP2	SP4	BD1
Depth	----------	0.4-0.5	0-0.1	0-0.1	0-0.1	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Arsenic	mg/kg	7	9	61	8	<4
Cadmium	mg/kg	<0.4	<0.4	<0.4	5.1	<0.4
Chromium	mg/kg	18	20	29	7	8
Copper	mg/kg	21	20	140	26	6
Lead	mg/kg	19	70	9	41	9
Mercury	mg/kg	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	9	4	11	16	6
Zinc	mg/kg	22	99	120	2,400	18

Acid Extractable metals in soil		
Our Reference:	UNITS	160671-24
Your Reference	----------	BD2
	-	
Depth	----------	-
Date Sampled		16/01/2017
Type of sample		Soil
Date prepared	-	25/01/2017
Date analysed	-	27/01/2017
Arsenic	mg/kg	<4
Cadmium	mg/kg	<0.4
Chromium	mg/kg	8
Copper	mg/kg	5
Lead	mg/kg	8
Mercury	mg/kg	<0.1
Nickel	mg/kg	6
Zinc	mg/kg	16

Misc Soil - Inorg						
Our Reference:	UNITS	160671-4	160671-8	160671-11	160671-14	160671-16
Your Reference	----------	MPS2	MPS5	MPS7	MPS8	MPS9
	-					
Depth	----------	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Misc Soil - Inorg						
Our Reference:	UNITS	160671-17	160671-19	160671-21	160671-23	160671-24
Your Reference	----------	SP1	SP2	SP4	BD1	BD2
	-					
Depth	----------	0-0.1	0-0.1	0-0.1	-	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Total Phenolics (as Phenol)	mg/kg	<5	<5	<5	<5	<5

Moisture						
Our Reference:	UNITS	160671-2	160671-4	160671-8	160671-11	160671-14
Your Reference	---------- -	MPS1	MPS2	MPS5	MPS7	MPS8
Depth	----------	0.4-0.5	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Moisture	%	18	10	7.8	8.3	16

Moisture						
Our Reference:	UNITS	160671-16	160671-17	160671-19	160671-21	160671-23
Your Reference	---------- -	MPS9	SP1	SP2	SP4	BD1
Depth	----------	0.4-0.5	0-0.1	0-0.1	0-0.1	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date prepared	-	25/01/2017	25/01/2017	25/01/2017	25/01/2017	25/01/2017
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Moisture	%	13	10	3.1	7.8	5.1

Moisture		
Our Reference:	UNITS	160671-24
Your Reference	---------- -	BD2
Depth	----------	-
Date Sampled		16/01/2017
Type of sample		Soil
Date prepared	-	25/01/2017
Date analysed	-	27/01/2017
Moisture	%	5.2

Asbestos ID - soils						
Our Reference:	UNITS	160671-4	160671-8	160671-11	160671-14	160671-16
Your Reference	---------- -	MPS2	MPS5	MPS7	MPS8	MPS9
Depth	----------	0.4-0.5	0.4-0.5	0-0.1	0.4-0.5	0.4-0.5
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Sample mass tested	g	Approx. 50g	Approx. 50g	Approx. 40g	Approx. 50g	Approx. 55g
Sample Description	-	Brown clayey soil	Brown sandy soil	Brown clayey soil	Brown clayey soil	Brown clayey soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Asbestos ID - soils						
Our Reference:	UNITS	160671-17	160671-19	160671-21	160671-23	160671-24
Your Reference	---------- -	SP1	SP2	SP4	BD1	BD2
Depth	----------	0-0.1	0-0.1	0-0.1	-	-
Date Sampled		16/01/2017	16/01/2017	16/01/2017	16/01/2017	16/01/2017
Type of sample		Soil	Soil	Soil	Soil	Soil
Date analysed	-	27/01/2017	27/01/2017	27/01/2017	27/01/2017	27/01/2017
Sample mass tested	g	Approx. 55g	Approx. 70g	Approx. 40g	Approx. 55g	Approx. 50g
Sample Description	-	Brown clayey soil	Brown coarse-grained soil & rocks	Brown coarse-grained soil & rocks	Brown sandy soil	Brown sandy soil
Asbestos ID in soil	-	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected	No asbestos detected at reporting limit of 0.1g/kg Organic fibres detected
Trace Analysis	-	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected	No asbestos detected

Method ID	Methodology Summary
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater.
Org-016	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS. Water samples are analysed directly by purge and trap GC-MS. F1 = (C6-C10)-BTEX as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater. Note, the Total +ve Xylene PQL is reflective of the lowest individual PQL and is therefore "Total +ve Xylenes" is simply a sum of the positive individual Xylenes.
Org-014	Soil samples are extracted with methanol and spiked into water prior to analysing by purge and trap GC-MS.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis.
Org-003	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-FID. F2 = (>C10-C16)-Naphthalene as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater (HSLs Tables 1A (3, 4)). Note Naphthalene is determined from the VOC analysis. Note, the Total +ve TRH PQL is reflective of the lowest individual PQL and is therefore "Total +ve TRH" is simply a sum of the positive individual TRH fractions (>C10-C40).
Org-012	Soil samples are extracted with Dichloromethane/Acetone and waters with Dichloromethane and analysed by GC-MS. Benzo(a)pyrene TEQ as per NEPM B1 Guideline on Investigation Levels for Soil and Groundwater - 2013. For soil results:- 1. 'TEQ PQL' values are assuming all contributing PAHs reported as <PQL are actually at the PQL. This is the most conservative approach and can give false positive TEQs given that PAHs that contribute to the TEQ calculation may not be present. 2. 'TEQ zero' values are assuming all contributing PAHs reported as <PQL are zero. This is the least conservative approach and is more susceptible to false negative TEQs when PAHs that contribute to the TEQ calculation are present but below PQL. 3. 'TEQ half PQL' values are assuming all contributing PAHs reported as <PQL are half the stipulated PQL. Hence a mid-point between the most and least conservative approaches above. Note, the Total +ve PAHs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PAHs" is simply a sum of the positive individual PAHs.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-005	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's. Note, the Total +ve reported DDD+DDE+DDT PQL is reflective of the lowest individual PQL and is therefore simply a sum of the positive individually report DDD+DDE+DDT.
Org-008	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC with dual ECD's.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD.
Org-006	Soil samples are extracted with dichloromethane/acetone and waters with dichloromethane and analysed by GC-ECD. Note, the Total +ve PCBs PQL is reflective of the lowest individual PQL and is therefore" Total +ve PCBs" is simply a sum of the positive individual PCBs.

Method ID	Methodology Summary
Metals-020	Determination of various metals by ICP-AES.
Metals-021	Determination of Mercury by Cold Vapour AAS.
Inorg-031	Total Phenolics by segmented flow analyser (in line distillation with colourimetric finish). Solids are extracted in a caustic media prior to analysis.
Inorg-008	Moisture content determined by heating at 105+/-5 °C for a minimum of 12 hours.
ASB-001	Asbestos ID - Qualitative identification of asbestos in bulk samples using Polarised Light Microscopy and Dispersion Staining Techniques including Synthetic Mineral Fibre and Organic Fibre as per Australian Standard 4964-2004.

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
Date analysed	-			30/01/2017	160671-4	27/01/2017 || 27/01/2017	LCS-5	30/01/2017
TRHC$_6$ - C$_9$	mg/kg	25	Org-016	<25	160671-4	<25 || <25	LCS-5	108%
TRHC$_6$ - C$_{10}$	mg/kg	25	Org-016	<25	160671-4	<25 || <25	LCS-5	108%
Benzene	mg/kg	0.2	Org-016	<0.2	160671-4	<0.2 || <0.2	LCS-5	106%
Toluene	mg/kg	0.5	Org-016	<0.5	160671-4	<0.5 || <0.5	LCS-5	112%
Ethylbenzene	mg/kg	1	Org-016	<1	160671-4	<1 || <1	LCS-5	104%
m+p-xylene	mg/kg	2	Org-016	<2	160671-4	<2 || <2	LCS-5	108%
o-Xylene	mg/kg	1	Org-016	<1	160671-4	<1 || <1	LCS-5	107%
naphthalene	mg/kg	1	Org-014	<1	160671-4	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%		Org-016	106	160671-4	94 || 104 || RPD: 10	LCS-5	116%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
Date analysed	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	50	Org-003	<50	160671-4	<50 || <50	LCS-5	81%
TRHC$_{15}$ - C$_{28}$	mg/kg	100	Org-003	<100	160671-4	<100 || <100	LCS-5	80%
TRHC$_{29}$ - C$_{36}$	mg/kg	100	Org-003	<100	160671-4	<100 || <100	LCS-5	71%
TRH>C$_{10}$-C$_{16}$	mg/kg	50	Org-003	<50	160671-4	<50 || <50	LCS-5	81%
TRH>C$_{16}$-C$_{34}$	mg/kg	100	Org-003	<100	160671-4	<100 || <100	LCS-5	80%
TRH>C$_{34}$-C$_{40}$	mg/kg	100	Org-003	<100	160671-4	<100 || <100	LCS-5	71%
Surrogate o-Terphenyl	%		Org-003	103	160671-4	86 || 85 || RPD: 1	LCS-5	87%

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
Date analysed	-			27/01/2017	160671-4	27/01/2017 || 27/01/2017	LCS-5	27/01/2017
Naphthalene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	LCS-5	93%
Acenaphthylene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	LCS-5	96%
Phenanthrene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	LCS-5	99%
Anthracene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	LCS-5	94%
Pyrene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	LCS-5	93%
Benzo(a)anthracene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	LCS-5	95%
Benzo(b,j+k) fluoranthene	mg/kg	0.2	Org-012	<0.2	160671-4	<0.2 || <0.2	[NR]	[NR]

QUALITY CONTROL PAHs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Benzo(a)pyrene	mg/kg	0.05	Org-012	<0.05	160671-4	<0.05 || <0.05	LCS-5	82%
Indeno(1,2,3-c,d)pyrene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	0.1	Org-012	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%		Org-012	95	160671-4	88 || 97 || RPD: 10	LCS-5	118%
QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base ll Duplicate ll %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
Date analysed	-			26/01/2017	160671-4	26/01/2017 || 26/01/2017	LCS-5	26/01/2017
HCB	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	100%
gamma-BHC	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	109%
Heptachlor	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	98%
delta-BHC	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	100%
Heptachlor Epoxide	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	103%
gamma-Chlordane	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	103%
Dieldrin	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	108%
Endrin	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	107%
pp-DDD	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	106%
Endosulfan II	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	LCS-5	76%
Methoxychlor	mg/kg	0.1	Org-005	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%		Org-005	112	160671-4	113 || 114 || RPD: 1	LCS-5	100%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
Date analysed	-			26/01/2017	160671-4	26/01/2017 || 26/01/2017	LCS-5	26/01/2017
Azinphos-methyl (Guthion)	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	LCS-5	117%
Chlorpyriphos-methyl	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	LCS-5	74%
Dimethoate	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	LCS-5	97%
Fenitrothion	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	LCS-5	109%
Malathion	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	LCS-5	84%
Parathion	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	LCS-5	117%
Ronnel	mg/kg	0.1	Org-008	<0.1	160671-4	<0.1 || <0.1	LCS-5	112%
Surrogate TCMX	%		Org-008	112	160671-4	113 || 114 || RPD: 1	LCS-5	112%

QUALITY CONTROL PCBs in Soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date extracted	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
Date analysed	-			26/01/2017	160671-4	26/01/2017 || 26/01/2017	LCS-5	26/01/2017
Aroclor 1016	mg/kg	0.1	Org-006	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	0.1	Org-006	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	0.1	Org-006	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	0.1	Org-006	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	0.1	Org-006	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	0.1	Org-006	<0.1	160671-4	<0.1 || <0.1	LCS-5	114%
Aroclor 1260	mg/kg	0.1	Org-006	<0.1	160671-4	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%		Org-006	112	160671-4	113 || 114 || RPD: 1	LCS-5	112%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-5	25/01/2017
Date analysed	-			27/01/2017	160671-4	27/01/2017 || 27/01/2017	LCS-5	27/01/2017
Arsenic	mg/kg	4	Metals-020	<4	160671-4	5 || 5 || RPD: 0	LCS-5	115%
Cadmium	mg/kg	0.4	Metals-020	<0.4	160671-4	<0.4 || <0.4	LCS-5	101%
Chromium	mg/kg	1	Metals-020	<1	160671-4	10 || 9 || RPD: 11	LCS-5	110%
Copper	mg/kg	1	Metals-020	<1	160671-4	48 || 43 || RPD: 11	LCS-5	108%
Lead	mg/kg	1	Metals-020	<1	160671-4	23 || 22 || RPD: 4	LCS-5	102%
Mercury	mg/kg	0.1	Metals-021	<0.1	160671-4	<0.1 || <0.1	LCS-5	104%
Nickel	mg/kg	1	Metals-020	<1	160671-4	12 || 11 || RPD: 9	LCS-5	100%
Zinc	mg/kg	1	Metals-020	<1	160671-4	66 || 59 || RPD: 11	LCS-5	102%

QUALITY CONTROL Misc Soil - Inorg	UNITS	PQL	METHOD	Blank	Duplicate Sm#	Duplicate results Base II Duplicate II %RPD	Spike Sm#	Spike % Recovery
Date prepared	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-1	25/01/2017
Date analysed	-			25/01/2017	160671-4	25/01/2017 || 25/01/2017	LCS-1	25/01/2017
Total Phenolics (as Phenol)	mg/kg	5	Inorg-031	<5	160671-4	<5 || <5	LCS-1	100%

QUALITY CONTROL vTRH(C6-C10)/BTEXN in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
Date analysed	-	160671-24	27/01/2017 || 27/01/2017	160671-8	27/01/2017
$TRHC_6 - C_9$	mg/kg	160671-24	<25 || <25	160671-8	102%
$TRHC_6 - C_{10}$	mg/kg	160671-24	<25 || <25	160671-8	102%
Benzene	mg/kg	160671-24	<0.2 || <0.2	160671-8	101%
Toluene	mg/kg	160671-24	<0.5 || <0.5	160671-8	105%
Ethylbenzene	mg/kg	160671-24	<1 || <1	160671-8	101%
m+p-xylene	mg/kg	160671-24	<2 || <2	160671-8	102%
o-Xylene	mg/kg	160671-24	<1 || <1	160671-8	102%
naphthalene	mg/kg	160671-24	<1 || <1	[NR]	[NR]
Surrogate aaa-Trifluorotoluene	%	160671-24	111 || 117 || RPD: 5	160671-8	102%

QUALITY CONTROL svTRH (C10-C40) in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
Date analysed	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
TRHC$_{10}$ - C$_{14}$	mg/kg	160671-24	<50 || <50	160671-8	124%
TRHC$_{15}$ - C$_{28}$	mg/kg	160671-24	<100 || <100	160671-8	121%
TRHC$_{29}$ - C$_{36}$	mg/kg	160671-24	<100 || <100	160671-8	108%
TRH>C$_{10}$-C$_{16}$	mg/kg	160671-24	<50 || <50	160671-8	124%
TRH>C$_{16}$-C$_{34}$	mg/kg	160671-24	<100 || <100	160671-8	121%
TRH>C$_{34}$-C$_{40}$	mg/kg	160671-24	<100 || <100	160671-8	108%
Surrogate o-Terphenyl	%	160671-24	85 || 85 || RPD: 0	160671-8	85%
QUALITY CONTROL PAHs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
Date analysed	-	160671-24	27/01/2017 || 27/01/2017	160671-8	27/01/2017
Naphthalene	mg/kg	160671-24	<0.1 || <0.1	160671-8	94%
Acenaphthylene	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Acenaphthene	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Fluorene	mg/kg	160671-24	<0.1 || <0.1	160671-8	94%
Phenanthrene	mg/kg	160671-24	<0.1 || <0.1	160671-8	89%
Anthracene	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Fluoranthene	mg/kg	160671-24	<0.1 || <0.1	160671-8	83%
Pyrene	mg/kg	160671-24	<0.1 || <0.1	160671-8	85%
Benzo(a)anthracene	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Chrysene	mg/kg	160671-24	<0.1 || <0.1	160671-8	96%
Benzo(b,j+k)fluoranthene	mg/kg	160671-24	<0.2 || <0.2	[NR]	[NR]
Benzo(a)pyrene	mg/kg	160671-24	<0.05 || <0.05	160671-8	74%
Indeno(1,2,3-c,d)pyrene	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Dibenzo(a,h)anthracene	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Benzo(g,h,i)perylene	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Surrogate p-Terphenyl-d14	%	160671-24	95 || 99 || RPD: 4	160671-8	115%

QUALITY CONTROL Organochlorine Pesticides in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
Date analysed	-	160671-24	26/01/2017 || 26/01/2017	160671-8	26/01/2017
HCB	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
alpha-BHC	mg/kg	160671-24	<0.1 || <0.1	160671-8	98%
gamma-BHC	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
beta-BHC	mg/kg	160671-24	<0.1 || <0.1	160671-8	107%
Heptachlor	mg/kg	160671-24	<0.1 || <0.1	160671-8	95%
delta-BHC	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Aldrin	mg/kg	160671-24	<0.1 || <0.1	160671-8	96%
Heptachlor Epoxide	mg/kg	160671-24	<0.1 || <0.1	160671-8	99%
gamma-Chlordane	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
alpha-chlordane	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Endosulfan I	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
pp-DDE	mg/kg	160671-24	<0.1 || <0.1	160671-8	101%
Dieldrin	mg/kg	160671-24	<0.1 || <0.1	160671-8	106%
Endrin	mg/kg	160671-24	<0.1 || <0.1	160671-8	109%
pp-DDD	mg/kg	160671-24	<0.1 || <0.1	160671-8	105%
Endosulfan II	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
pp-DDT	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Endrin Aldehyde	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Endosulfan Sulphate	mg/kg	160671-24	<0.1 || <0.1	160671-8	79%
Methoxychlor	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Surrogate TCMX	%	160671-24	110 || 106 || RPD: 4	160671-8	99%

QUALITY CONTROL Organophosphorus Pesticides	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
Date analysed	-	160671-24	26/01/2017 || 26/01/2017	160671-8	26/01/2017
Azinphos-methyl (Guthion)	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Bromophos-ethyl	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Chlorpyriphos	mg/kg	160671-24	<0.1 || <0.1	160671-8	118%
Chlorpyriphos-methyl	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Diazinon	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Dichlorvos	mg/kg	160671-24	<0.1 || <0.1	160671-8	82%
Dimethoate	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Ethion	mg/kg	160671-24	<0.1 || <0.1	160671-8	107%
Fenitrothion	mg/kg	160671-24	<0.1 || <0.1	160671-8	103%
Malathion	mg/kg	160671-24	<0.1 || <0.1	160671-8	88%
Parathion	mg/kg	160671-24	<0.1 || <0.1	160671-8	113%
Ronnel	mg/kg	160671-24	<0.1 || <0.1	160671-8	85%
Surrogate TCMX	%	160671-24	110 || 106 || RPD: 4	160671-8	117%

QUALITY CONTROL PCBs in Soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date extracted	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
Date analysed	-	160671-24	26/01/2017 || 26/01/2017	160671-8	26/01/2017
Aroclor 1016	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Aroclor 1221	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Aroclor 1232	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Aroclor 1242	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Aroclor 1248	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Aroclor 1254	mg/kg	160671-24	<0.1 || <0.1	160671-8	117%
Aroclor 1260	mg/kg	160671-24	<0.1 || <0.1	[NR]	[NR]
Surrogate TCLMX	%	160671-24	110 || 106 || RPD: 4	160671-8	117%

QUALITY CONTROL Acid Extractable metals in soil	UNITS	Dup. Sm#	Duplicate Base + Duplicate + %RPD	Spike Sm#	Spike % Recovery
Date prepared	-	160671-24	25/01/2017 || 25/01/2017	160671-8	25/01/2017
Date analysed	-	160671-24	27/01/2017 || 27/01/2017	160671-8	27/01/2017
Arsenic	mg/kg	160671-24	<4 || <4	160671-8	100%
Cadmium	mg/kg	160671-24	<0.4 || <0.4	160671-8	103%
Chromium	mg/kg	160671-24	8 || 10 || RPD: 22	160671-8	106%
Copper	mg/kg	160671-24	5 || 7 || RPD: 33	160671-8	110%
Lead	mg/kg	160671-24	8 || 9 || RPD: 12	160671-8	100%
Mercury	mg/kg	160671-24	<0.1 || <0.1	160671-8	103%
Nickel	mg/kg	160671-24	6 || 7 || RPD: 15	160671-8	100%
Zinc	mg/kg	160671-24	16 || 17 || RPD: 6	160671-8	99%

Report Comments:

Asbestos: A portion of the supplied sample was sub-sampled for asbestos analysis according to Envirolab procedures. We cannot guarantee that this sub-sample is indicative of the entire sample. Envirolab recommends supplying 40-50g of sample in its own container.
Note: Samples requested for abestos testing were sub-sampled from jars provided by the client.

Asbestos ID was analysed by Approved Identifier:	Lucy Zhu
Asbestos ID was authorised by Approved Signatory:	Paul Ching

INS: Insufficient sample for this test	PQL: Practical Quantitation Limit	NT: Not tested
NR: Test not required	RPD: Relative Percent Difference	NA: Test not required
<: Less than	>: Greater than	LCS: Laboratory Control Sample

Quality Control Definitions

Blank: This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, can be determined by processing solvents and reagents in exactly the same manner as for samples.

Duplicate: This is the complete duplicate analysis of a sample from the process batch. If possible, the sample selected should be one where the analyte concentration is easily measurable.

Matrix Spike : A portion of the sample is spiked with a known concentration of target analyte. The purpose of the matrix spike is to monitor the performance of the analytical method used and to determine whether matrix interferences exist.

LCS (Laboratory Control Sample) : This comprises either a standard reference material or a control matrix (such as a blank sand or water) fortified with analytes representative of the analyte class. It is simply a check sample.

Surrogate Spike: Surrogates are known additions to each sample, blank, matrix spike and LCS in a batch, of compounds which are similar to the analyte of interest, however are not expected to be found in real samples.

Laboratory Acceptance Criteria

Duplicate sample and matrix spike recoveries may not be reported on smaller jobs, however, were analysed at a frequency to meet or exceed NEPM requirements. All samples are tested in batches of 20. The duplicate sample RPD and matrix spike recoveries for the batch were within the laboratory acceptance criteria.
Filters, swabs, wipes, tubes and badges will not have duplicate data as the whole sample is generally extracted during sample extraction.
Spikes for Physical and Aggregate Tests are not applicable.
For VOCs in water samples, three vials are required for duplicate or spike analysis.

Duplicates: <5xPQL - any RPD is acceptable; >5xPQL - 0-50% RPD is acceptable.
Matrix Spikes, LCS and Surrogate recoveries: Generally 70-130% for inorganics/metals; 60-140% for organics (+/-50% surrogates) and 10-140% for labile SVOCs (including labile surrogates), ultra trace organics and speciated phenols is acceptable.

In circumstances where no duplicate and/or sample spike has been reported at 1 in 10 and/or 1 in 20 samples respectively, the sample volume submitted was insufficient in order to satisfy laboratory QA/QC protocols.

When samples are received where certain analytes are outside of recommended technical holding times (THTs), the analysis has proceeded. Where analytes are on the verge of breaching THTs, every effort will be made to analyse within the THT or as soon as practicable.

Where sampling dates are not provided, Envirolab are not in a position to comment on the validity of the analysis where recommended technical holding times may have been breached.

Measurement Uncertainty estimates are available for most tests upon request.

Appendix E

Summary Tables

Douglas Partners
Geotechnics | Environment | Groundwater

Table E1 - Summary of Soil and PACM Laboratory Analysis (All results in mg/kg unless otherwise stated)

Test Pit/ Sample ID[a]	Depth	Sampling Date	Soil Type*	Metals									PAH				Phenols	Total Recoverable Hydrocarbons						BTEX				Organochlorine Pesticides (OCP)								OPP	PCB	Asbestos
				Arsenic	Cadmium	Chromium (VI)[b]	Copper	Lead	Mercury	Nickel	Zinc	Lead	Naphthalene	Benzo(a) Pyrene (BaP)	BaP TEQ	Total PAH	Phenol	TRH C6-C10	TRH >C10-C16	TRH C6-C10	TRH >C10-C16	TRH C16-C34	TRH >C34-C40	Benzene	Toluene	Ethylbenzene	Total xylenes	DDT + DDD + DDE	Aldrin and Dieldrin	Chlordane	Endosulfan	Endrin	Heptachlor	HCB	Methoxychlor	Chlorpyrifos	PCB	Asbestos
	Practical Quantitation Limit (PQL)			4	0.4	1	1	1	0.1	1	1		0.1	0.05	0.5	0.05	5	25	50	25	50	100	100	0.2	0.5	1	3	0.3	0.2	0.2	0.3	0.1	0.1	0.1	0.1	0.1	0.7	
Site Assessment Criteria (SAC)																																						
HIL A				100	20	100	6000	300	40	400	7400		-	-	3	300	3000	-	-	-	-	-	-	-	-	-	-	240	6	50	270	10	6	10	300	160	1	-
HSL A & B (0 m to <1m)				-	-	-	-	-	-	-	-		4	-	-	-	-	-	-	40	230	-	-	0.6	390	NL	95	-	-	-	-	-	-	-	-	-	-	-
EIL (urban residential and public open space)				100	-	410	190	1100	-	140	450		170	-	-	-	-	-	-	-	-	-	-	-	-	-	-	180	-	-	-	-	-	-	-	-	-	
ESL (Urban residential and public open space)				-	-	-	-	-	-	-	-		-	0.7	-	-	-	-	-	180	120	1300	5600	65	105	125	45	-	-	-	-	-	-	-	-	-	-	-
MPS1A	0-0.1	5/04/2017	Topsoil	**10**	<0.4	**16**	**22**	**32**	<0.1	**9**	**88**	-	<0.1	<0.05	<0.5	**0.2**	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	NAD
MPS1	0.4-0.5	16/01/2017	Silty clay	**9**	<0.4	**19**	**25**	**18**	<0.1	**7**	**25**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	-	-
MPS2A	0-0.1	5/04/2017	Topsoil	**5**	<0.4	**14**	**21**	**37**	<0.1	**10**	**88**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	NAD
MPS2	0.4-0.5	16/01/2017	Silty clay	**5**	<0.4	**10**	**48**	**23**	<0.1	**12**	**66**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
MPS3	0-0.1	1/02/2017	Topsoil	**6**	<0.4	**12**	**11**	**12**	<0.1	**5**	**19**	-	<0.1	<0.05	<0.5	**0.2**	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
MPS5A	0-0.1	5/04/2017	Topsoil	<4	<0.4	**10**	**12**	**16**	<0.1	**8**	**45**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	NAD
MPS5	0.4-0.5	16/01/2017	Alluvium	<4	<0.4	**10**	**7**	**10**	<0.1	**7**	**18**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
MPS7	0-0.1	16/01/2017	Topsoil	**8**	<0.4	**14**	**18**	**19**	<0.1	**10**	**31**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
MPS8A	0-0.1	5/04/2017	Topsoil	**7**	<0.4	**15**	**27**	**29**	<0.1	**17**	**57**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	NAD
MPS8	0.4-0.5	16/01/2017	Silty clay	**7**	<0.4	**13**	**34**	**21**	<0.1	**10**	**51**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
MPS9A	0-0.1	5/04/2017	Topsoil	**6**	<0.4	**14**	**13**	**20**	<0.1	**6**	**29**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	NAD
MPS9	0.4-0.5	16/01/2017	Silty clay	**7**	<0.4	**18**	**21**	**19**	<0.1	**9**	**22**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
MPS10	0-0.1	1/02/2017	Topsoil	**11**	<0.4	**8**	**17**	**16**	<0.1	**9**	**26**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
SP1	0-0.1	16/01/2017	Stockpile	**9**	<0.4	**20**	**20**	**70**	<0.1	**4**	**99**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
SP1	0.4-0.5	16/01/2017	Stockpile	-	-	-	-	-	-	-	-	**18**	<0.1	<0.05	<0.5	<0.05	-	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	-	-	-	-	-	-	-	-	-	-	-
SP2	0-0.1	16/01/2017	Stockpile	**61**	<0.4	**29**	**140**	**9**	<0.1	**11**	**120**	-	<0.1	**0.07**	<0.5	**0.2**	<5	<25	<50	<25	<50	**190**	**280**	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
SP4	0-0.1	16/01/2017	Stockpile	**8**	**5.1**	**7**	**26**	**41**	<0.1	**16**	**2400**	-	<0.1	<0.05	<0.5	<0.05	<5	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3	<0.3	<0.2	<0.2	<0.3	<0.1	<0.1	<0.1	<0.1	<0.1	<0.7	NAD
SP4	0.4-0.5	16/01/2017	Stockpile	-	-	-	-	-	-	-	-	**81**	<0.1	<0.05	<0.5	<0.05	-	-	-	-	-	-	-	<0.5	<1	<3	-	-	-	-	-	-	-	-			

Notes

<PQL	Concentration comprises of sum of a number of individual analytes. All individual analytes below reported PQL
a	QA/QC replicate of sample listed directly below the primary sample.
b	All Chromium are assumed to exist in the stable Cr(III) oxidation state, as Cr(VI) will be too reactive and unstable under the normal environment
HIL A / HSL A & B	HIL / HSL for soil contaminants - NEPC 2013, Schedule B1, (Residential)
EIL / ESL	EIL / ESL soil for soil contaminant - NEPC 2013, Schedule B1.
NAD	No asbestos detected
*	For purposes of assigning NEPM criteria
-	Not Analysed

Appendix F

Test Pit Logs

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 96.0 AHD
EASTING: 293070
NORTHING: 6223186

PIT No: MPS-1
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
96	0.0	TOPSOIL - brown silty clay with a trace of rootlets		E	0.0				
	0.2	SILTY CLAY - hard, brown silty clay with a trace of rootlets, MC<PL			0.1				
		- becoming red brown below 0.4m		E	0.4				
				D	0.5				
95	1.0	SHALE - very low to low strength, moderately weathered, grey and orange-brown shale		D	1.0				
		- with medium strength bands below 1.5m		D	1.5				
94	2			D	2.0				
		- becoming extremely low strength, with low to medium strength bands below 2.4m							
	2.5	Pit discontinued at 2.5m		D	2.5				
		- limit of investigation							
93	3								
92	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 99.0 AHD
EASTING: 293012
NORTHING: 6223080

PIT No: MPS-2
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
99	0.0	TOPSOIL - brown clayey silt with a trace of sand and rootlets		E	0.0				
					0.1				
	0.2	SILT AND CLAY - stiff, dark brown mottled brown silt and clay, friable, moist (Alluvial)							
				E	0.4				
				D	0.5				
		- becoming firm below 0.6m							
98	1			D	1.0				1
	1.4	SILTY CLAY - very stiff, red-orange mottled grey silty clay, MC<PL		D	1.5				
	1.9	SHALE - very low to low strength, highly weathered, orange and grey interbedded shale and sandstone with extremely low strength bands							
97	2			D	2.0				2
	2.5	Pit discontinued at 2.5m		D	2.5				
		- refusal on low to medium strength sandstone							
96	3								3
95	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 111.0 AHD
EASTING: 292983
NORTHING: 6223778

PIT No: MPS-3
PROJECT No: 76744.04
DATE: 1/2/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
111	0.0	TOPSOIL - brown clayey silt with a trace of rootlets		E	0.0				
					0.1				
	0.2	SILTY CLAY - hard, red mottled grey, slightly sandy, silty clay with a trace of rootlets, MC<PL							
				E	0.4				
				D	0.5				
110	1	- becoming yellow to orange, sandy below 1.0m		D	1.0				1
				D	1.5				
	1.9	SANDSTONE - low strength, moderately weathered, orange to red sandstone with very low strength sandstone and shale bands							
109	2	- becoming brown below 2.0m		D	2.0				2
		- with medium strength sandstone band below 2.5m		D	2.5				
	2.7	Pit discontinued at 2.7m - refusal on medium strength sandstone							
108	3								3
107	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 72.0 AHD
EASTING: 292160
NORTHING: 6222930

PIT No: MPS-4
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
72	0.0	TOPSOIL - brown silty clay with a trace of rootlets		E	0.0				
	0.2	SILTY CLAY - hard, brown silty clay, MC<PL			0.1				
				E	0.4				
	0.5	SHALE - very low strength, highly weathered, grey and brown shale		D	0.5				
71	1	- becoming low to medium strength, grey below 1.0m		D	1.0				1
		- becoming medium strength, moderately weathered, dark grey below 1.5m		D	1.5				
	1.7	Pit discontinued at 1.7m - limit of investigation							
70	2								2
69	3								3
68	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 73.0 AHD
EASTING: 292393
NORTHING: 6222670

PIT No: MPS-5
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
73	0.1	TOPSOIL - brown sandy silt with a trace of rootlets		E*	0.01				
		SILT AND SAND - very dense, brown silt and sand (Alluvial)		E	0.4				
				D	0.5				
72	1			D	1.0				1
				D	1.5				
71	2			D	2.0				2
				D	2.5				
70	3	3.0 Pit discontinued at 3.0m - limit of investigation		D	3.0				3
69	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD1/160117 collected

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 79.0 AHD
EASTING: 293059
NORTHING: 6222483

PIT No: MPS-6
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
79	0.0	TOPSOIL - brown slightly clayey silt with a trace of rootlets		E	0.0 0.1				
	0.2	SILTY CLAY - hard, orange-brown mottled red-orange silty clay, MC<PL			0.4				
				E D	0.5				
		- becoming light grey, slightly sandy with very low strength sandstone bands below 0.8m							
78	1.0	SANDSTONE - medium to high strength, moderately weathered, light grey medium to coarse grained quartz sandstone		D	1.0				1
	1.1	Pit discontinued at 1.1m - refusal on medium to high strength sandstone							
77	2								2
76	3								3
75	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 79.0 AHD
EASTING: 293114
NORTHING: 6222713

PIT No: MPS-7
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
79	0.2	TOPSOIL - brown silty clay with some rootlets		E	0.0 0.1				
		SILTY CLAY - hard, red brown silty clay with a trace of roots, MC<PL		E D U_{50}	0.4 0.5 0.9				
78	1	- becoming brown mottled grey below 1.0m		D	1.0				1
		- becoming friable below 1.5m		D	1.5				
77	2 2.0	SHALE - extremely low strength, extremely weathered, grey and orange-brown shale		D	2.0				2
		- becoming very low to low strength, highly weathered below 2.3m		D	2.5				
76	3 3.0	Pit discontinued at 3.0m - limit of investigation		D	3.0				3
75	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 81.0 AHD
EASTING: 292649
NORTHING: 6222935

PIT No: MPS-8
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
81	0.0	TOPSOIL - brown silty clay with a trace of sand and rootlets		E	0.0				
	0.2	SILTY CLAY - hard, red brown mottled brown silty clay, MC<PL			0.1				
				E	0.4				
				D	0.5				
80	1	- becoming grey mottled red brown below 1.0m		D	1.0				1
				D	1.5				
		- becoming very stiff, orange-brown, friable below 1.7m							
79	2	- with very low strength shale bands below 2.0m		D	2.0				2
	2.2	SHALE - medium strength, slightly weathered, grey shale							
	2.5	Pit discontinued at 2.5m - refusal on medium strength shale		D	2.5				
78	3								3
77	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 84.0 AHD
EASTING: 292675
NORTHING: 6223324

PIT No: MPS-9
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
84	0.0	TOPSOIL - brown clayey silt with a trace of rootlets		E	0.0				
	0.2	SILTY CLAY - hard, orange-brown silty clay with a trace of roots			0.1				
				E	0.4				
				D	0.5				
83	1			E	0.9				1
				D	1.0				
		- becoming very stiff below 1.3m		D	1.5		pp = 300-350		
82	2			D	2.0		pp = 200-250		2
	2.5	SHALE - extremely low strength, extremely weathered, brown and grey shale very low strength bands		D	2.5		pp = 300-320		
		- with low strength bands below 2.8m							
81	3			D	3.0				3
	3.0	Pit discontinued at 3.0m - limit of investigation							
80	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 118.0 AHD
EASTING: 293258
NORTHING: 6223670

PIT No: MPS-10
PROJECT No: 76744.04
DATE: 1/2/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
118	0.0	TOPSOIL - brown clayey silt with a trace of rootlets		E	0.0 0.1				
	0.2	SILTY CLAY - hard, red mottled grey silty clay with some gravel and a trace of rootlets, MC~PL		E D	0.4 0.5				
	0.8	SANDSTONE - low strength, moderately weathered, red and grey sandstone		D	1.0				
117	1								1
		- becoming medium strength, yellow and brown below 1.3m		D	1.5				
	1.9	Pit discontinued at 1.9m - refusal on medium strength sandstone							
116	2								2
115	3								3
114	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 73.0 AHD
EASTING: 292036
NORTHING: 6222761

PIT No: MPS-11
PROJECT No: 76744.04
DATE: 19/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
73	0.2	TOPSOIL - brown silty clay with a trace of rootlets and sand							
		SILTY SANDY CLAY - hard, dark brown silty sandy clay with a trace of rootlets, MC<PL		D	0.5				
72	1	- becoming light brown below 1.0m		D	1.0				
		- becoming orange mottled grey, with very low strength sandstone band below 1.5m							
71	2	- with extremely low strength bands, grey-orange shale and low strength shale bands below 2.0m		D	2.0				
	2.2	SHALE - low strength, moderately weathered, grey shale with medium strength bands		D	2.5				
70	3	- becoming medium strength below 3.0m		D	3.0				
	3.1	Pit discontinued at 3.1m - limit of investigation							
69	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 73.0 AHD
EASTING: 292207
NORTHING: 6222690

PIT No: MPS-12
PROJECT No: 76744.04
DATE: 19/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
73	0.3	TOPSOIL - brown sandy silt with a trace of rootlets							
		SAND AND CLAY - dense/hard, brown, sand and clay with a trace of rootlets, MC<PL		D	0.5				
72	1			D	1.0				1
	1.5	SANDY SILTY CLAY - hard, dark brown, sandy silty clay, MC~PL		D	1.5				
71	2	- becoming red brown below 2.0m		D	2.0				2
				D	2.5				
70	3	- becoming firm below 3.0m		D	3.0		pp = 60-70		3
	3.1	Pit discontinued at 3.1m - limit of investigation							
69	4								4

Dynamic Penetrometer Test (blows per 150mm) scale: 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 75.0 AHD
EASTING: 292027
NORTHING: 6223006

PIT No: MPS-13
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
75	0.2	TOPSOIL - dark brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, light brown, slightly sandy silty clay, MC<PL		D	0.5				
				B	0.6				
		- becoming dark brown mottled orange-brown below 0.8m							
74	1			D	1.0				1
	1.4	SHALE - medium strength, moderately weathered, dark grey and orange shale with low strength bands		D	1.5				
	1.6	Pit discontinued at 1.6m - refusal on medium strength shale							
73	2								2
72	3								3
71	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 73.0 AHD
EASTING: 292268
NORTHING: 6223019

PIT No: MPS-14
PROJECT No: 76744.04
DATE: 19/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
73	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, brown silty clay with a trace of rootlets, MC<PL		D	0.5				
72	1	- becoming orange mottled grey below 0.9m		D	1.0				1
	1.4	SANDSTONE - medium strength, moderately weathered,							
	1.51	orange-grey sandstone with slightly weathered bands		D	1.5				
71	2	Pit discontinued at 1.51m - refusal on medium strength sandstone							2
70	3								3
69	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 77.0 AHD
EASTING: 292104
NORTHING: 6223190

PIT No: MPS-15
PROJECT No: 76744.04
DATE: 19/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
77	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, orange-brown silty clay with a trace of rootlets, MC<PL		D	0.5				
76	1 1.0	SHALE - low strength, moderately weathered, grey and orange shale with medium strength bands		D	1.0				1
		- with extremely low strength bands below 1.5m		D	1.5				
75	2	- becoming red-grey below 2.0m		D	2.0				2
				D	2.5				
		- becoming medium strength below 2.8m							
74	3			D	3.0				3
	3.1	Pit discontinued at 3.1m - limit of investigation							
73	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 77.0 AHD
EASTING: 292255
NORTHING: 6223303

PIT No: MPS-16
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
77	0.2	TOPSOIL - brown silty clay with rootlets							
		SILTY CLAY - hard, orange-brown silty clay with a trace of rootlets, MC<PL		D	0.5				
76	1	- becoming red brown below 1.0m		D	1.0				1
		- becoming very stiff below 1.5m		D	1.5				
75	2			D	2.0				2
				D	2.5				
74	3			D	3.0				3
	3.1	Pit discontinued at 3.1m - limit of investigation							
73	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 82.0 AHD
EASTING: 292446
NORTHING: 6223186

PIT No: MPS-17
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
82	0.2	TOPSOIL - brown silty clay with rootlets							
		SILTY CLAY - hard, orange-grey silty clay, MC<PL		D	0.5				
81	1.0	SHALE - very low strength, highly weathered, grey-orange shale		D	1.0				1
		- with medium strength bands below 1.5m		D	1.5				
80	2.1	- becoming medium strength, moderately weathered below 2.0m		D	2.0				2
		Pit discontinued at 2.1m - refusal on medium strength shale							
79	3								3
78	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 73.0 AHD
EASTING: 292538
NORTHING: 6222853

PIT No: MPS-18
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
73	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
	0.9	SILTY CLAY - hard, orange and brown silty clay with a trace of shale and rootlets		D	0.5				
72	1	SHALE - low strength, highly weathered, grey (white) and orange shale with medium strength bands		D	1.0				1
				D	1.5				
71	2	- becoming medium strength with sandstone bands below 2.0m		D	2.0				2
	2.2	Pit discontinued at 2.2m - refusal on medium strength shale							
70	3								3
69	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 78.0 AHD
EASTING: 292799
NORTHING: 6222806

PIT No: MPS-19
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
78	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY GRAVELLY CLAY - hard, brown silty gravelly clay			0.4				
		- with low strength grey sandstone and shale bands and a trace of rootlets below 0.4m		B/D U_{50}	0.5				
					0.8				
77	1	- becoming orange and grey below 1.0m		D	1.0				1
	1.4	SHALE - low strength, highly weathered, grey shale with medium strength bands		D	1.5				
76	2			D	2.0				2
		- becoming medium strength below 2.5m		D	2.5				
	2.6	Pit discontinued at 2.6m - refusal on medium strength shale							
75	3								3
74	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 84.0 AHD
EASTING: 292587
NORTHING: 6223273

PIT No: MPS-20
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
84	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, orange-brown silty clay with a trace of rootlets		D	0.5				
83	1			D	1.0				1
				D	1.5				
82	2	- becoming stiff to very stiff below 2.0m		D	2.0				2
				D	2.5				
81	3			D	3.0				3
	3.1	Pit discontinued at 3.1m - limit of investigation							
80	4								4

Dynamic Penetrometer Test (blows per 150mm) scale: 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 88.0 AHD
EASTING: 292564
NORTHING: 6223478

PIT No: MPS-21
PROJECT No: 76744.04
DATE: 19/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
88	0.2	TOPSOIL - silty clay with a trace of rootlets							
		SILTY CLAY - hard, orange-brown silty clay with a trace of rootlets, MC<PL		D	0.5				
87	1	- with extremely low strength, extremely weathered, grey-orange shale bands below 1.0m		D	1.0				1
				D	1.5				
86	1.9	SHALE - extremely low strength, extremely weathered, grey-orange shale with very low strength bands		D	2.0				2
				D	2.5				
85	3	- becoming low strength, with extremely low strength bands below 3.0m		D	3.0				3
	3.1	Pit discontinued at 3.1m - limit of investigation							
84	4								4

5 10 15 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 96.0 AHD
EASTING: 292815
NORTHING: 6223422

PIT No: MPS-22
PROJECT No: 76744.04
DATE: 19/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
96	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, orange-brown mottled grey silty clay with a trace of rootlets, MC<PL		D	0.5				
95	1	- with low strength grey shale band below 1.0m		D	1.0				
	1.4	SHALE - low strength, slightly weathered, grey and orange shale with extremely low strength, extremely weathered and medium strength, moderately weathered bands below 1.5m		D	1.5				
94	2	- becoming medium strength below 2.2m		D	2.0				
	2.4	Pit discontinued at 2.4m - refusal on medium strength shale							
93	3								
92	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 89.0 AHD
EASTING: 292878
NORTHING: 6223177

PIT No: MPS-23
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
89	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, red brown mottled grey silty clay with a trace of rootlets		D	0.5				
	0.8	SHALE - medium strength, moderately weathered, grey shale							
88	1			D	1.0				1
		- becoming low strength, highly weathered below 1.2m							
				D	1.5				
87	2	- with extremely low strength shale band below 2.0m		D	2.0				2
				D	2.5				
86	3			D	3.0				3
	3.1	Pit discontinued at 3.1m - limit of investigation							
85	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 91.0 AHD
EASTING: 292781
NORTHING: 6223040

PIT No: MPS-24
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
91	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, red brown mottled grey silty clay with a trace of rootlets and shale		D	0.5				
	0.7	SHALE - very low strength, highly weathered, grey-orange shale with extremely low strength shale bands							
90	1			D	1.0				1
		- becoming low strength, with medium strength bands below 1.5m		D	1.5				
89	2	- becoming extremely low strength below 2.0m		D	2.0				2
				D	2.5				
		- becoming medium strength below 2.8m							
88	3			D	3.0				3
	3.2	Pit discontinued at 3.2m - limit of investigation							
87	4								4

5 10 15 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 78.0 AHD
EASTING: 292969
NORTHING: 6222852

PIT No: MPS-25
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
78	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
	0.5	SILTY CLAY - hard, brown silty clay, MC<PL							
		SHALE - low strength, highly weathered, grey and red shale with very low strength bands		D	0.5				
77	1	- becoming medium strength below 1.0m		D	1.0				1
		- becoming slightly weathered, dark grey below 1.5m		D	1.5				
	1.8	Pit discontinued at 1.8m - refusal on medium strength shale							
76	2								2
75	3								3
74	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 92.0 AHD
EASTING: 293078
NORTHING: 6222949

PIT No: MPS-26
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
92	0.1	TOPSOIL - brown silty clay with a trace of rootlets							
	0.3	GRAVELLY SILTY CLAY - hard, brown silty clay with a trace of shale gravel and rootlets (Colluvium)							
	0.7	CLAYEY GRAVEL - brown clayey gravel with a sandstone boulder at 0.5m (300x300x100mm) (Colluvium)		D	0.5				
91	1	SHALE - low strength, highly weathered, grey and brown shale		D	1.0				1
				D	1.5				
	1.9	Pit discontinued at 1.9m - refusal on medium strength shale							
90	2								2
89	3								3
88	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 101.0 AHD
EASTING: 293133
NORTHING: 6222965

PIT No: MPS-27
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
101	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, brown silty clay with a trace of shale gravel (Colluvium), MC<PL		D	0.5				
100	1	- becoming orange mottled grey below 0.9m (possible Colluvium)		D	1.0				
				D	1.5				
	1.7	SHALE - extremely low strength, extremely weathered, grey and orange shale with low strength bands							
99	2	- becoming low strength below 2.0m		D	2.0				
		- becoming medium strength below 2.5m		D	2.5				
	2.8	Pit discontinued at 2.8m - refusal on medium strength shale							
98	3								
97	4								

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 108.0 AHD
EASTING: 293137
NORTHING: 6223005

PIT No: MPS-28
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
108	0	TOPSOIL - brown silty clay with a trace of rootlets							
	0.3	SILTY CLAY - hard, brown and grey silty clay with a trace of angular sandstone and shale gravel (Colluvium), MC<PL		D	0.5				
	0.7	SHALE - low strength, highly weathered, grey shale with extremely low and medium strength bands							
107	1			D	1.0				1
		- becoming moderately weathered below 1.5m		D	1.5				
106	2			D	2.0				2
	2.2	Pit discontinued at 2.2m - refusal on medium strength shale							
105	3								3
104	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 112.0 AHD
EASTING: 293227
NORTHING: 6223076

PIT No: MPS-29
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
112	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, brown silty clay with a trace of rootlets, MC<PL		D	0.5				
		- becoming red brown below 0.5m							
111	1 1.0	SHALE - low strength, highly weathered, grey and orange shale with medium strength shale bands		D	1.0				1
				D	1.5				
110	2	- becoming medium strength below 2.0m		D	2.0				2
	2.1	Pit discontinued at 2.1m - refusal on medium strength shale							
109	3								3
108	4								4

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 95.0 AHD
EASTING: 293175
NORTHING: 6223269

PIT No: MPS-30
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
95	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, orange-brown silty clay with a trace of rootlets		D	0.5				
94	1	- becoming mottled grey below 1.0m		D	1.0				1
93	2			D	2.0				2
		- with low strength shale band below 2.5m		D	2.5				
	2.6	SHALE - low strength, highly weathered, brown-grey shale with very low and medium strength bands							
92	3			D	3.0				3
	3.2	Pit discontinued at 3.2m - limit of investigation							
91	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 98.0 AHD
EASTING: 293101
NORTHING: 6223446

PIT No: MPS-31
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
98	0.2	TOPSOIL - silty clay with a trace of rootlets							
		SILTY CLAY - hard, red brown silty clay with a trace of rootlets, MC<PL		D	0.5				
97	0.9	SHALE - low strength, highly weathered, grey-orange shale with medium strength bands		D	1.0				
		- with extremely low strength bands below 1.5m		D	1.5				
96	2			D	2.0				
		- becoming medium strength, dark grey below 2.5m		D	2.5				
	2.8	Pit discontinued at 2.8m - refusal on medium strength shale							
95	3								
94	4								

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 102.0 AHD
EASTING: 293290
NORTHING: 6223501

PIT No: MPS-32
PROJECT No: 76744.04
DATE: 18/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
102	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
		SILTY CLAY - hard, red brown silty clay with a trace of rootlets		D	0.5				
101	1			D	1.0				1
		- becoming mottled grey below 1.5m		D	1.5				
	1.8	SHALE - extremely low strength, extremely weathered, grey and orange shale with low strength bands							
100	2			D	2.0				2
		- with medium strength bands below 2.5m		D	2.5				
99	3			D	3.0				3
	3.1	Pit discontinued at 3.1m - limit of investigation							
98	4								4

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 72.0 AHD
EASTING: 292844
NORTHING: 6222561

PIT No: MPS-33
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm) 5 10 15 20
72	0.2	TOPSOIL - silty sandy clay with a trace of rootlets							>>
		SANDY SILT - hard, brown sandy silt - with medium strength, orange sandstone bands below 0.4m		D	0.5				
	0.6	Pit discontinued at 0.6m - refusal on medium strength sandstone							
71	1								1
70	2								2
69	3								3
68	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 75.0 AHD
EASTING: 293035
NORTHING: 6222576

PIT No: MPS-34
PROJECT No: 76744.04
DATE: 17/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 150mm)
75	0.2	TOPSOIL - brown silty clay with a trace of rootlets							
	0.5	SILTY CLAY - hard, orange-brown silty clay, MC<PL		D	0.5				
	0.8	SANDSTONE - low strength, highly weathered, orange-grey sandstone with medium strength bands		U_{50}	0.8				
74	1	Pit discontinued at 0.8m - refusal on medium strength sandstone							
73	2								
72	3								
71	4								

Dynamic Penetrometer Test (blows per 150mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: CLN

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 78.0 AHD
EASTING: 292067
NORTHING: 6223167

PIT No: MPS- SP1
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
78	0.0	FILLING - brown to orange brown silty clay with some sand and gravel with a trace of cobbles		E	0.0				
					0.1				
				E	0.4				
	0.5	FILLING - light grey sandy gravel (shale roadbase) with some cobbles			0.5				
				E	0.9				
77	1.0	SILTY CLAY - hard, red and orange mottled brown silty clay with a trace of rootlets			1.0				
	1.7	Pit discontinued at 1.7m - limit of investigation							
76	2								
75	3								
74	4								

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 75.0 AHD
EASTING: 292169
NORTHING: 6223117

PIT No: MPS-SP2
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
75	0.0	FILLING - brown sandy silt		E*	0.0				
					0.1				
				E	0.4				
	0.5	FILLING - brown sand			0.5				
74	1.0	CLAYEY SANDY SILT - dark brown clayey sandy silt, moist							
	1.5	Pit discontinued at 1.5m - limit of investigation							
73	2								
72	3								
71	4								

Dynamic Penetrometer Test (blows per mm): 5, 10, 15, 20

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS: * Replicate sample BD2/160117 collected

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 73.0 AHD
EASTING: 292125
NORTHING: 6222676

PIT No: MPS-SP3
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm) 5 10 15 20
73	0.0	FILLING - grey and brown sandy gravel (concrete) with some silt, cobbles and concrete boulders (up to 500x900x100mm) with some anthropgenics comprising aluminium tubing		E	0.0–0.1				
				E	0.4–0.5				
	0.6	CLAYEY SILT - brown clayey silt with a trace of rootlets, friable							
	0.9	SHALE - very low strength, highly weathered, brown and grey shale with extremely low to low strength bands		E	0.9–1.0				
72	1								1
71	2								2
	2.0	Pit discontinued at 2.0m - limit of investigation							
70	3								3
69	4								4

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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TEST PIT LOG

CLIENT: Dahua Group Sydney Project 3 Pty Ltd
PROJECT: Proposed Residential Subdivision
LOCATION: Menangle Park South, Menangle Park, NSW

SURFACE LEVEL: 99.0 AHD
EASTING: 293021
NORTHING: 6223097

PIT No: MPS-SP4
PROJECT No: 76744.04
DATE: 16/1/2017
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per mm)
99	0.1	FILLING - sandy gravel (coalwash) with brick fragments and plastic		E	0.0				
		SILTY CLAY - hard, brown silty clay, MC<PL			0.1				
				E	0.4				
		- becoming red to brown below 0.5m			0.5				
				E	0.9				
98	1.0	Pit discontinued at 1.0m - limit of investigation			1.0				
97	2								
96	3								
95	4								

RIG: JCB 4X Backhoe with 450mm bucket

LOGGED: ECR

SURVEY DATUM: MGA94 Zone 56

WATER OBSERVATIONS: No free groundwater observed

REMARKS:

☐ Sand Penetrometer AS1289.6.3.3
☐ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Appendix G

QAQC

Appendix G - DATA QUALITY ASSESSMENT

Q1. Data Quality Indicators

The reliability of field procedures and analytical results were assessed against the following data quality indicators (DQIs):

- Completeness ï a measure of the amount of usable data from a data collection activity;
- Comparability ï the confidence (qualitative) that data may be considered to be equivalent for each sampling and analytical event;
- Representativeness ï the confidence (qualitative) of data representativeness of media present on-site;
- Precision ï a measure of variability or reproducibility of data; and
- Accuracy ï a measure of closeness of the data to the ótrueô value.

The DQIs were assessed as outlined in the following table.

Table Q1: DQIs

DQI	Considerations with reference to NEPC (2013) Schedule B2	Comment
Completeness		
Field Considerations	Critical locations sampled	Samples were collected from target areas identified in the DP proposal and the CSM, and from grid based locations for general site coverage .
	Samples collected (from grid and at depth)	A limited sampling plan was followed as discussed in Appendix C ï Data Quality Objectives; potentially impacted media (topsoil, fill) was sampled at all locations.
	Standard operating procedures (SOPs) appropriate and complied with	Field staff followed SOPs, and discussed further in Report Section 9
	Experienced sampler	Experienced DP environmental scientists led the field team and were given guidance from the project manager.
	Documentation correct	The DP environmental scientist completed a safe work method statement (SWMS), chain of custody, and test pit logs. The project manager reviewed the documentation.
Laboratory Considerations	Critical samples analysed according to the proposal	The DP Proposal MAC160099 dated 5 August 2016 (the proposal) was followed in the selection of samples for analysis. Samples of media initially considered to be potentially impacted by COPC were analysed. Any variation to the proposal was recorded in the report.

DQI	Considerations with reference to NEPC (2013) Schedule B2	Comment
	Analytes analysed according to the proposal	The analytes were selected on the basis of the COPC as outlined in the proposal. Any variation has been recorded in the report.
	Appropriate methods and PQLs/LOR	NATA approved methods were adopted by the selected analytical laboratory. Limits of reporting (LORs) and practical quantitation limits (PQLs) in accordance with the method have been used by the contract laboratory.
	Sample documentation complete	Chain-of-custody (CoC) maintained and appended to the Certificates of Analysis(s). Certificates of Analysis complete and appended to the report.
	Sample holding times complied with	All samples were analysed within the holding times, as discussed in Section Q3.3
Comparability		
Field Considerations	Same SOPs used on each occasion	Field staff followed the same SOPs for each day of sampling as defined in the proposal.
	Same types of samples collected	At all test pit locations, soil samples were collected from the test pit wall. Samples were placed in laboratory supplied jars.
Laboratory Considerations	Sample analytical methods used	The laboratory used is accredited by NATA for the analyses undertaken. Laboratory analytical methods were the same for each sample, for the same analyte, in the same laboratory, and are as stated on the Certificates of Analysis.
	Sample PQLs / LORs	PQL or LOR set by the laboratory are generally below the adopted SAC.
	Same laboratories	Envirolab Services Pty Ltd (ELS) was used for sample analysis. The reliability of the data provided by the laboratory is discussed in Section Q3.
	Same units	Laboratory results are expressed in consistent units for each media / analyte.
Representativeness		
Field Considerations	Appropriate media sampled according to the proposal	Appropriate media were sampled with reference to the proposal. This included media considered to be potentially impacted by the COPC such as topsoil and fill.
	Media identified in the proposal sampled	Media identified as requiring investigation in the proposal were sampled.
Laboratory Considerations	Samples analysed according to the proposal	Samples were analysed according to the proposal, and as stipulated in the COC.
Precision		
Field Considerations	SOPs appropriate and complied with	Field staff followed SOPs as defined in the proposal. SOPs specific for contamination investigation purposes.

DQI	Considerations with reference to NEPC (2013) Schedule B2	Comment
Laboratory Considerations	Analysis of laboratory duplicates	Refer to Section Q3.5. The majority of duplicate results were within the laboratory acceptance standards. The relevance of those outside the standards are discussed in the same section.
	Field duplicates	The analysis included 10% intra- replicates prepared in the field. The majority of RPDs were within acceptable limits, as discussed in Section Q2.5. The relevance of those outside the limits are discussed in the same section.
Accuracy (bias)		
Field Considerations	SOPs appropriate and complied with	Field staff followed SOPs as defined in the proposal. SOPs specific for contamination investigation purposes.
	Analysis of reagent blanks	Refer to Section Q3.6. The reagent blank samples were generally within laboratory acceptance standards. The implications of those outside the standards are discussed in Section Q3.10
	Analysis of matrix spikes	Refer to Section Q3.7. The matrix spike samples were generally within laboratory acceptance standards. The implications of those outside the standards are discussed in Section Q3.10.
	Analysis of surrogate spikes	Refer to Section Q3.8. The surrogate spike samples were generally within laboratory acceptance standards. The implications of those outside the standards are discussed in Section Q3.10.
	Analysis of laboratory control samples	Refer to Section Q3.9. The LCS were generally within laboratory acceptance standards. The implications of those outside the standards are discussed in Section Q3.10.

Q2. FIELD QUALITY ASSURANCE AND QUALITY CONTROL

The field QC procedures for sampling as prescribed in the DP *Field Procedures Manual* were followed at all times during the investigation.

Q2.1 Sampling Team and Weather Conditions

Field sampling was undertaken by a DP Environmental Scientist/Geologist. Fieldwork was undertaken on 16 ï 17 January and 5 April 2017. The DP environmental scientist was instructed by the Project Manager regarding the sampling methods to be adopted. The same approach to the sampling was applied by each team member, minimising the potential for field sampling related variations in test outcomes.

Climatic or weather conditions are not considered to have impeded or significantly impacted the investigation.

Q2.2 Sample Collection

Soil

At test pit locations, samples were collected from the test pit walls, at regular intervals or where a change in soil stratification was observed. Further details of the excavation and sampling methodology are presented in Report Section 9. The QA / QC samples collected during the course of soil sampling comprised the following:

- 10 % intra-laboratory replicates (10 % of soil samples analysed).

Q2.3 Logs and Field Sheets

Logs for each soil sampling location were recorded in the field. The individual samples were recorded on the field logs along with the sample identity, depth, replicate sample locations, and observations. Logs are presented in Appendix F.

Q2.4 Chain of Custody

Chain of custody information was recorded on the Chain-of-Custody (COC) sheets which accompanied samples to the analytical laboratory. Signed copies of COCs are presented in Appendix D.

The COC documented, *inter alia*, the analytical laboratory, dispatch courier, DP dispatcher, date, sample identifications, sample type and analysis to be performed on each sample.

Q2.5 Field Replicates

Replicate samples were collected in the field as a measure of accuracy, precision and repeatability of the results.

Field replicate samples for soil were collected from the same location and an identical depth to the primary sample. Equal portions of the subject material were placed into the primary and replicate sampling jars and sealed. The sample was not homogenised so as to minimise the possible loss of volatiles. Replicate samples were labelled with a DP identification number, recorded on DP's field logs, so as to conceal their relationship to their primary sample from the analytical laboratory.

A measure of the consistency of results is derived by the calculation of relative percentage differences (RPDs) for replicate samples. A RPD of +/- 30% is generally considered acceptable for inorganic analytes by the industry, although in general a wider RPD range (50%) may be acceptable for organic analytes. RPDs above the generally acceptable limits (if applicable) are shown in **bold** on the relevant tables below.

Q2.5.1 Intra-Laboratory Analysis

Intra-laboratory replicates were analysed as an internal check of the reproducibility within the primary laboratory ELS and as a measure of consistency of sampling techniques. The comparative results of analysis between original and intra-laboratory replicate samples are summarised in Table H1.

It should be noted that a duplicate sample of MPS-5 was collected, however has not been tabulated as the primary sample was not scheduled for analysis.

Note that, where both samples are < LOR/PQL the difference and RPD has been given as zero. Where one sample is reported < LOR/PQL, but a concentration is reported for the other, the LOR/PQL value has been used for calculation of the RPD for the < LOR/PQL sample.

Table H1: Relative Percentage Difference Results – Intra-laboratory Replicates

Test Pit/ Sample IDa	Sampling Date	Units	Metals								Total Recoverable Hydrocarbons						BTEX			
			Arsenic	Cadmium	Chromium (VI)[b]	Copper	Lead	Mercury	Nickel	Zinc	TRH C6-C10	TRH >C10-C16	F1	F2	F3	F4	Benzene	Toluene	Ethylbenzene	Total xylenes
			4	0.4	1	1	1	0.1	1	1	25	50	25	50	100	100	0.2	0.5	1	3
MPS1A	5/04/2017	mg/kg	10	<0.4	16	22	32	<0.1	9	88	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3
MPSAA	5/04/2017	mg/kg	9	<0.4	15	22	32	<0.1	10	170	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3
Difference			1	0	1	0	0	0	1	82	0	0	0	0	0	0	0	0	0	0
RPD			11%	0%	6%	0%	0%	0%	11%	**64%**	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

The calculated RPD values were within the acceptable range with the exception of zinc. However, this is not considered to be significant because:

- The typically low actual differences in the concentrations of the replicate pairs where some RPD exceedances occurred. High RPD values reflect the small differences between two small numbers;
- Soil replicates, rather than homogenised soil duplicates, were used to minimise the risk of possible volatile loss, hence greater variability can be expected;
- Most of the recorded concentrations being relatively close to the LOR/PQL. High RPD values reflect the low concentrations;
- The majority of RPDs within a replicate pair being within the acceptable limits; and
- All other QA/QC parameters met the DQIs.

Overall, the intra-laboratory replicate comparisons indicate that the sampling techniques were generally consistent and repeatable.

Q3. LABORATORY QUALITY ASSURANCE AND QUALITY CONTROL

Q3.1 Chain of Custody

Chain-of-custody procedures are discussed in Section Q2.4.

Q3.2 Analytical Laboratories

Samples were submitted to the following laboratory for analysis:

- Envirolab Services Pty Ltd (ELS)

The laboratory is NATA accredited for the analysis undertaken. ELSôs accreditation number is 2901 and it is accredited for compliance with ISO/IEC 17025.

Q3.3 Holding Times

A review of the laboratory certificates of analysis and chain-of-custody documentation indicated that holding times were met.

Q3.4 Analytical Methods

The laboratory analytical methods are provided on the laboratory certificates of analysis in Appendix D, along with the PQL/LOR.

Q3.5 Laboratory Replicate Results

Laboratory replicates are additional portions of a sample which are analysed in the same manner as the other samples. Laboratory replicate samples were generally analysed at a rate of 1 for every 10 samples in a batch. The laboratory acceptance criteria for replicate samples is as follows:

Table H4: Laboratory Replicate Acceptance Criteria

Laboratory	PQL / LOR Range	Acceptance Criteria
ELS	<5 x PQL	Any RPD
	>5 x PQL	0 ï 50%

The laboratory QC for laboratory replicate results, were generally within the acceptance criteria. Any non-conformities with the acceptance criteria are discussed in Section Q3.10

Q3.6 Laboratory Blank (Reagent Blank) Results

The laboratory blank, sometimes referred to as the method blank or reagent blank is the sample prepared and analysed at the beginning of every analytical run, following calibration of the analytical apparatus. This is the component of the analytical signal which is not derived from the sample but from reagents, glassware etc, it can be determined by processing solvents and reagents in the same manner as for samples. Laboratory blanks are generally analysed at a frequency of 1 in 20, with a minimum of one per batch.

All results should be less than the method PQL or LOR. The report results for the method blanks were generally within the acceptance criteria. Any non-conformities with the acceptance criteria are discussed in Section Q3.10.

Q3.7 Matrix Spike

The matrix spike is a sample replicate prepared by adding a known amount of analyte prior to analysis, and then treated exactly the same as all other samples. The recovery result indicates the proportion of the known concentration of the analyte that is detected during analysis. The laboratory acceptance criteria for matrix spike recoveries is as follows:

Table H5: Laboratory Matrix Spike Acceptance Criteria

Laboratory	Analyte(s)	Accepted Recoveries
ELS	Inorganics / metals	70 ï 130%
	organics	60 ï 140%
	SVOC and speciated phenols	10 ï 140%

The laboratory QC for matrix spikes were generally within the acceptance criteria for the laboratory. Any non-conformities with the acceptance criteria are discussed in Section Q3.10.

Q3.8 Surrogate Spike

The surrogate spike sample is prepared by adding a known amount of surrogate, which behaves similarly to the analyte, prior to analysis of each sample. The recovery result indicates the proportion of the known concentration of the surrogate that is detected during analysis. The laboratory acceptance criteria for surrogate spike recoveries is as follows:

Table H6: Laboratory Surrogate Spike Acceptance Criteria

Laboratory	Analyte(s)	Accepted Recoveries
ELS	Inorganics / metals	70 ï 130%
	organics	60 ï 140%
	SVOC and speciated phenols	10 ï 140%

The laboratory QC for surrogate spikes were generally within the acceptance. Any non-conformities with the acceptance criteria are discussed in Section Q3.10.

Q3.9 Reference / Laboratory Control Sample (LCS)

This sample comprises spiking either a standard reference material or a control matrix (such as a blank of sand or water) with a known concentration of specific analytes. The LCS is then analysed and results compared against each other to determine how the laboratory has performed with regard to sample preparation and analytical procedure. LCSs are generally analysed at a frequency of 1 in 20, with a minimum of one analysed per batch.

The laboratory acceptance criteria for LCS recoveries is as follows:

Table H7: Laboratory LCS Acceptance Criteria

Laboratory	Analyte(s)	Accepted Recoveries
ELS	Inorganics / metals	70 ï 130%
	organics	60 ï 140%
	SVOC and speciated phenols	10 ï 140%

The laboratory QC for LCSs were generally within the acceptance criteria for the laboratory. Any non-conformities with the acceptance criteria are discussed in Section Q3.10.

Q3.10 Laboratory Comments

The laboratory QC for laboratory replicate results, reagent blanks, matrix spikes, surrogate spikes and LCS results are reported in the laboratory certificate of analysis.

The laboratory quality control samples were within the laboratory acceptance criteria. It is considered that an acceptable level of laboratory precision and accuracy was achieved and that surrogate spikes, LCS, laboratory duplicate results, laboratory blanks and matrix spike results were of an acceptable level overall. On the basis of this assessment, the laboratory data set is considered to have complied with the DQIs.

Q4. QA/QC DATA EVALUATION

An evaluation of field and laboratory QA/QC information against the stated DQOs has been undertaken. Overall, the SOPs were generally complied with in the field, and the laboratory quality control samples were generally within the laboratory acceptance criteria. The QC non-conformances, where they occurred, are not considered to have significantly impacted the quality of the results overall as they were generally minor in number compared to the overall QC data. On this basis, it is considered that an acceptable level of laboratory precision and consistency was achieved and that the laboratory data sets are reliable and useable for this assessment.

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QAQC template

Test Pit/ Sample ID[a]	Sampling Date	Units	Metals								Total Recoverable Hydrocarbons						BTEX			
			Arsenic	Cadmium	Chromium (VI)[b]	Copper	Lead	Mercury	Nickel	Zinc	TRH C_6-C_{10}	TRH >C_{10}-C_{16}	F1	F2	F3	F4	Benzene	Toluene	Ethylbenzene	Total xylenes
			4	0.4	1	1	1	0.1	1	1	25	50	25	50	100	100	0.2	0.5	1	3
MPS1A	5/04/2017	mg/kg	10	<0.4	16	22	32	<0.1	9	88	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3
MPSAA	5/04/2017	mg/kg	9	<0.4	15	22	32	<0.1	10	170	<25	<50	<25	<50	<100	<100	<0.2	<0.5	<1	<3
Difference			1	0	1	0	0	0	1	82	0	0	0	0	0	0	0	0	0	0
RPD			11%	0%	6%	0%	0%	0%	11%	64%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%