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Aspect Industrial Estate – Mod 3
Groundwater Management Plan Cover Letter

Our Ref: 30130654_L07_A
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Dear Russell,

1 Introduction

Arcadis Australia Pacific Pty Ltd (**Arcadis**) was engaged by Mirvac Projects Pty Ltd (**Mirvac**) to prepare a Groundwater Management Plan (**GMP**) (Arcadis, *Groundwater Management Plan – Aspect Industrial Estate, Mamre Road, Kemps Creek, NSW – Rev 4 Final*, 2 May 2022) for proposed Aspect Industrial Estate, located at lots 54 to 58 DP259135 Mamre Road, Kemps Creek (**the Site**).

The site comprises an approximate area of 56.3 ha and is located within the Penrith City Council Local Government Area (**LGA**). The Site is currently zoned as IN1 General Industrial land within the Broader Western Sydney Employment Area stipulated within State Environmental Planning Policy (Western Sydney Employment Area) 2009 (**SEPP WSEA**), updated 11 June 2022.

A copy of the GMP is provided as **Attachment A**.

Arcadis understands that Mirvac has prepared a modification package (**Mod 3**) that requires this cover letter to address the Secretary's Environmental Assessment Requirements (**SEARs**) for the Site. This letter addresses the potential alterations to the Groundwater Management under the new modifications for the Site as outline in **Section 2** below.

2 Modification 3 (Mod 3)

Information provided on the proposed redevelopment gleaned from the Mod 3 drawings package (AT&L. 2022. *Aspect Industrial Estate, Stage 1 Civil Works Package Stage Significant Development Mod 3 Application – Rev J*) includes the following:

- Reduction in overall lot numbers from 11 to 9.
- Relocation and shortening of Access Road 4.
- Reconfiguration of warehouse lots 6-11 into 6-9.
- Amendments to warehouse footprints and heights, hardstand locations, car parking, estate landscaping.
- Change in boundary condition to the south including orientation of warehouse hardstand for Warehouse 9 to south (rather than north).
- Reduction in area of Lot 6 Warehouse to 16,160m² and Lot 7 Warehouse to 14,945m².
- Increase in area of Lot 8 Warehouse to 38,865 m² and Lot 9 Warehouse to 64,195m².
- New hardstand areas east of Warehouse 6, west of Warehouse 7, south of Warehouse 8 and north and south of Warehouse 9.

- Reconfiguration of carpark areas to support modified warehouse layout.
- Revised vehicular and truck access of Access Road 1, 3 and 4.

The above Mod 3 package design changes result in estate-wide impacts associated with the management of stormwater, traffic generation, amenity, noise, earthworks and landscaping. However, they do not significantly impact the scope, findings or overall validity of the Arcadis 2022 GMP. Therefore, Arcadis considers that the Arcadis 2022 GMP remains appropriate to address SEARs requirements for the Mod 3 package and design changes, as detailed above.

For completeness, Arcadis have revised the Bulk Earthworks Level compared to the highest recorded groundwater depth table (Table 2-2 of the GMP) in light of Mod 3 design changes as presented below.

Table 2-1 Bulk Earthworks Level compared to highest recorded groundwater depth (mAHD)

Future Lot	Finish Level (m AHD)	Highest Groundwater Contour Level (m AHD)	Groundwater Interception Risk (<2.0 m)
1	48.10	44.00	No
2	48.30	46.00	No
3	49.30	49.00	Yes
4	57.30	56.00	Yes
5	57.30	56.00	Yes
6	56.30	53.00	No
7	50.30	51.00**	Yes
8	52.00	51.00	Yes
9	52.30	53.00**	Yes

Notes:

Groundwater levels were obtained from groundwater contouring undertaken as part of the DSI. Groundwater levels are therefore indicative only.

** indicates groundwater levels are within 0.2 m of the finish level or above the finish level.

Based on the revised bulk earthworks levels and the inferred groundwater contours, Lots 3, 4, 5, 7, 8 and 9 have the potential to encounter groundwater during site development (based on final site level and/or presence of service trenches).

Given the minimal interaction of groundwater with the proposed civil work depths and with low hydraulic conductivity of the shale soils across the site, Arcadis considers it unlikely that the groundwater volume extracted would exceed the trigger volume of 3ML/year to require water access licence from WaterNSW (Water Management (General) Regulation 2018).

3 NSW Aquifer Interference Policy (AIP)

As recommended by the NSW Department of Planning and Environment following the review of MOD3. An assessment of the activities against the 'minimal impact considerations' of the NSW Aquifer Interference Policy (AIP) has been undertaken.

The *Water Management Act 2000* includes the concept of ensuring "no more than minimal harm" for both the granting of water access licences and the granting of approvals. The NSW Department of Primary Industries

(2012). *NSW Aquifer Interference Policy (AIP)* includes minimal impact considerations relating to watertable and groundwater pressure drawdown and changes in groundwater and surface water quality. The AIP establishes 'minimal impact considerations' for groundwater categories of both 'highly productive' and 'less productive' groundwater.

The AIP defines highly productive groundwater based on the following criteria:

1. Has total dissolved solids (**TDS**) of less than 1,500 mg/L, and
2. Contains water supply works that can yield water at a rate greater than 5 L/sec.

As stated in the GMP, groundwater at the Site is present within Bringelly Shale, which typically yields low volumes of saline groundwater. Shale generally has low water transmitting properties, displaying a very low primary porosity with most of the flow being via saturated structural features such as fractures, joints and laminations. Furthermore, water quality parameters recorded during previous groundwater sampling at the Site indicated brackish water, with electrical conductivity (**EC**) ranged between 14,068 – 21,256 $\mu\text{S/cm}$ or approximately 7,737– 11,691 mg/L (assuming 0.55 $\mu\text{S/cm}$ of EC approximates 1mg/L of TDS). Hence, this TDS result is above the criteria for a highly productive groundwater source and therefore it is reasonable to assess the Site under a 'less productive' minimal impact consideration.

The AIP further defines categories for less productive groundwater which includes the following:

- Alluvial.
- Porous rock.
- Fractured rock.

Given the groundwater is located within the Bringelly Shale, 'fractured rock' is considered the most appropriate category.

There are two levels of minimal impact considerations. The AIP states:

"...if the predicted impacts are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable."

Table 3-1 provides an assessment of the level 1 watertable, water pressure and water quality minimal impact considerations for the 'less productive' groundwater source in 'porous or fractured rock' category, associated with the Mod 3 package design.

Table 3-1 Assessment of Minimal Impact Considerations for Less Productive Water Source

Porous or Fractured Rock Water Source	
Minimal Impact Consideration (Level 1)	Assessment
<p><u>Water Table</u></p> <p>Level 1. Less than or equal to 10% cumulative variation in the water table, allowing for typical climatic “post-water sharing plan” variations, 40m from any:</p> <p>(a) high priority groundwater dependent ecosystem; or</p> <p>(b) high priority culturally significant site; listed in the schedule of the relevant water sharing plan.</p> <p>A maximum of a 2m decline cumulatively at any water supply work.</p> <p><u>Water Pressure</u></p> <p>Level 1. A cumulative pressure head decline of not more than a 2m decline, at any water supply work.</p>	<p>The Site is located in the NSW Government (2011). <i>Greater Metropolitan Region Groundwater Source Water Sharing Plan</i> (the Water Sharing Plan). Within the Water Sharing Plan, the project footprint is subject to the rules of the Sydney Basin Central Groundwater source which details the recommended management approaches of surface and groundwater connectivity and protection of water quality.</p> <p>The closest high priority groundwater dependent ecosystem in the Sydney Basin Central Groundwater sources, as listed in Schedule 4 of the Water Sharing Plan, is located at Botany Wetlands, approximately 30 km from the Site, outside of the extent of any potential cumulative drawdown associated with the Mod 3.</p> <p>No high priority culturally significant sites are listed in the Water Sharing Plan.</p> <p>The proposed activities are not expected to result in greater than 3ML/year of groundwater extracted or removed from the Site. Any water extracted would be collected and directed to a water storage pond where upon on-site reuse options would be considered. Hence, the Mod 3 activities are considered highly unlikely to result in a cumulative head decline greater than 2m at any supply work.</p> <p>Based on the watertable and water pressure assessment above, it is considered the level 1 criteria for both is adequately satisfied.</p>
<p><u>Water Quality</u></p> <p>Level 1. Any change in the groundwater quality should not lower the beneficial use category of the groundwater source beyond 40m from the activity.</p>	<p>The groundwater at the Site is brackish and not considered to be of beneficial use for drinking purposes. Further, no ground water bores have been identified within 2km of the Site for authorised extraction purposes.</p> <p>As stated in the Arcadis (2022) GMP, in the event that groundwater is encountered, it will be collected and directed to a water storage pond, where upon on-site reuse options would then be considered. Further, given the nature and extent of contamination identified in soils across the Site and the Bringelly Shale’s low water transmitting properties it is considered unlikely that the proposed activities in the Mod 3 design would significantly impact groundwater, to lower the current beneficial use category of the underlying water source.</p> <p>Based on the water quality assessment above, it is considered the level 1 criteria is adequately satisfied.</p>

Based on the above assessment, the predicted impacts of the Mod 3 design are less than the Level 1 minimal impact considerations, hence, considered as acceptable in accordance with the requirements of the AIP.

4 Closing

Arcadis completed a detailed review of Mod 3 design changes for the Aspect Industrial Estate and considers the existing Arcadis 2022 GMP appropriate to address the SEARs requirements for the Site.

We trust the addition of this cover letter to the Arcadis 2022 GMP meets your requirements for the project. Should you have any queries or wish to discuss any points further, please do not hesitate to contact the undersigned.

Kind regards,

Arcadis Australia Pacific Pty Ltd



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Enclosures:

Attachment A – Groundwater Management Plan

Attachment B – Aspect Industrial Estate Stage 1 Civil Works Package (Mod 3) Application

Attachment A

Groundwater Management Plan

GROUNDWATER MANAGEMENT PLAN – REV 4

Aspect Industrial Estate, Mamre Road, Kemps Creek, NSW

Prepared for Mirvac Projects Pty Ltd

02 MAY 2022



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GROUNDWATER MANAGEMENT PLAN

Aspect Industrial Estate, Mamre Road, Kemps Creek, NSW

Rev 4

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Approver Simon Spyrdz



Report No 10035157_GMP

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Revision Text Rev 4

This report has been prepared for Mirvac Office and Industrial Pty Ltd in accordance with the terms and conditions of appointment in the Consultant Agreement for Lots 54-58 (DP 259135) Mamre Road, Kemps Creek – Phase 2 DSI, FIP, UFP, Dam Decommissioning Strategy, Groundwater Management Plan dated 24 September 2019. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
A	1/11/2019	Draft for client review	PM	DT
B	12/05/2020	Draft for client review	CL	CL
C	9/10/2020	Review of Legislation Amendment	BK	BV
Rev 4	02/05/2022	Updated with revised bulk earthworks levels and PSM 2021 data	MP	SS

CONTENTS

1	INTRODUCTION	1
1.1	Background	1
1.2	Purpose of this document	2
1.3	Objectives	2
1.4	Scope of Work	2
1.5	Proposed Redevelopment	3
2	SITE IDENTIFICATION	4
2.1	Current Site Use	4
2.2	Proposed Site Use	4
2.3	Surrounding Land Use	4
3	SITE CONDITION AND SURROUNDING ENVIRONMENT	5
3.1	Topography	5
3.2	Geology	5
3.3	Hydrogeology	5
3.4	Hydrology	5
3.5	Acid Sulfate Soil Risk	6
3.6	Summary of Previous Investigations and Design Information	6
3.6.1	Preliminary Site Investigation (JBS&G 2019)	6
3.6.2	Detailed Site Investigation (Arcadis 2019)	7
3.6.3	Geotechnical Investigation (PSM, 2020)	8
3.6.4	Additional Geotechnical Investigation (PSM, 2021)	8
3.6.5	Civil Infrastructure Drawings	9
4	CONCEPTUAL SITE MODEL	11
4.1	Source	11
4.2	Potentially Affected Media	11
4.3	Pathways	11
4.4	Receptors	12
4.5	Exposure Assessment	12
5	LEGISLATION AND POLICY	17
5.1	Legislative Framework	17
5.2	Assessment Criteria	17
6	2019 GROUNDWATER MONITORING EVENT	18
6.1	Groundwater Levels and Flow Direction	18
6.1.1	Groundwater Level Fluctuations	18
6.2	Groundwater Quality	18
6.2.1	Physico-Chemical Parameters	19
6.2.2	Analytical Results	19
6.3	Measurement of Hydraulic Conductivity	20
6.4	Expected Volume of Groundwater to be Extracted	20

7	ROLES AND RESPONSIBILITIES.....	22
8	GROUNDWATER MANAGEMENT.....	23
8.1	During Construction	23
8.1.1	Intersected Groundwater Re-Use.....	23
8.1.2	Intersected Groundwater Treatment or Disposal.....	24
8.1.3	Records.....	24
8.2	Post Construction	25
9	REFERENCES	26

APPENDICES

APPENDIX A FIGURES

APPENDIX B ANALYTICAL TABLES

APPENDIX C LABORATORY REPORTS

1 INTRODUCTION

Arcadis Australia Pacific (Arcadis) was engaged by Mirvac Office and Industrial (Mircac) to prepare a Groundwater Management Plan (GMP) to support the proposed Aspect Industrial Estate development located at Lots 54-58 DP259135 Mamre Road, Kemps Creek, NSW 2178 (the site). The location of the site is illustrated in Figure 1, Appendix A.

The site comprises an approximate area of 56.3 ha and is located within the Penrith City Council Local Government Area (LGA). The site is currently zoned as RU2 Rural residential land under Penrith City Council Local Environmental Plan (LEP) 2010.

The site is currently unzoned within the Broader Western Sydney Employment Area stipulated within State Environmental Planning Policy (Western Sydney Employment Area) 2009 (SEPP WSEA). Arcadis is anecdotally aware that the strategic intent is for this land to be zoned for employment purposes.

Mircac require the following documentation to support a State Significant Development (SSD) application relevant to the site:

- Detailed Site Investigation (DSI).
- Fill Importation Protocol (FIP).
- Unexpected Finds Protocol (UFP).
- Dam Decommissioning Strategy (DDS).
- Groundwater Management Plan (GMP).

This GMP is one of five reports that Arcadis has prepared for submission to Mircac to support the industrial redevelopment.

A remediation action plan (RAP) may also be required under the Secretary's Environmental Assessment Requirements (SEARs).

1.1 Background

The site has approx. 950 m of frontage to Mamre Road, with a proposed signalised intersection providing vehicular access via Mamre Road to the M4 Motorway and the Great Western Highway to the north and Elizabeth Drive to the south. Known historical land uses at the site include: rural residential, grazing, dairy farming, poultry farming and horticulture.

Ministerial Local Planning Direction 3.5 precludes future residential development of the site due to its proximity to the Western Sydney Airport ANEF 20 noise contour. However, future land uses relevant to employment generating purposes are consistent with the approved 2020 amendment to the SEPP WSEA and the 2018 Western Sydney Aerotropolis Land Use and Infrastructure Implementation Plan (LUIIP) Stage 1: Initial Precincts.

The proposed redevelopment of the site will facilitate land uses consistent with commercial and industrial use, as prescribed in the National Environmental Protection Measure as amended in 2013 (NEPC, 2013) and will involve the following activities:

- Demolition and removal of existing rural structures.
- Heritage salvage works (if applicable).
- Clearing of existing vegetation on the subject site and associated dam dewatering and decommissioning.
- Realignment of existing creek.
- On-site bulk earthworks including any required ground dewatering.
- Importation, placement and compaction of soil material, consisting of;
 - Virgin Excavated Natural Material (VENM) within the meaning of the POEO Act; and/or

- Excavated Natural Material (ENM) within the meaning of the NSW Environmental Protection Agency's (EPA) Resource Recovery Exemption under Part 9, Clauses 91 and 92 of the POEO (Waste) Regulation 2014 – The Excavated Natural Material Order 2014; and/or
 - Materials covered by a specific NSW EPA Resource Recovery Order and Exemption which are suitable for their proposed use.
- Boundary retaining walls.
 - Catchment level stormwater infrastructure, trunk services connections, utility infrastructure, roads and access infrastructure (signalised intersection with Mamre Road) associated with Stage 1.
 - Construction fit out and 24 hours a day / 7 day per week use of industrial warehouse and distribution buildings within Stage 1.
 - Detailed earthworks, stormwater, services and utility infrastructure associated with the construction of industrial logistics and warehouse buildings within Stage 1.
 - Boundary stormwater management, fencing and landscaping.
 - Staged subdivision of Stage 1.

Information provided to Arcadis by Orion Consulting (Orion), on behalf of Mirvac, indicates that earthworks undertaken as part of site redevelopment works will not require importation of significant volumes of fill material, as the bulk earthworks plan has been designed to achieve an overall cut/fill net balance for the development, whilst taking into consideration possible future planning modifications.

1.2 Purpose of this document

The purpose of this GMP is to describe the requirements for ongoing management at the Site which is proposed to undergo development for industrial and/or commercial land uses. It is expected that this GMP will form part of an overarching Construction Environmental Management Plan (CEMP) that will manage environmental considerations during the construction phase.

This GMP has been prepared with due consideration of the results from a site investigation undertaken at the site in October 2019 (Arcadis 2019).

1.3 Objectives

The objectives of the GMP are to document a procedure that ensures that exposure of identified receptors to impacted groundwater is minimised, and to comply with regulatory requirements. Specifically, the objectives are:

- Outline the geology and hydrogeology of the site;
- Assess if groundwater dewatering will be required during the re-development;
- If dewatering is to occur develop a dewatering strategy that meets the requirements of relevant policy and legislation;
- Outline any licensing requirements;
- Estimate the volume of groundwater that may be extracted during the redevelopment; and
- Assess whether there are any further investigations required to assess potential groundwater impacts.

1.4 Scope of Work

To complete the objectives, Arcadis undertook the following scope to develop the GMP:

- Reviewed relevant reports to establish site characteristics relevant to groundwater considerations, reviewed the baseline groundwater analytical data and determined the likely groundwater flow direction;
- Reviewed concept architectural drawings and preliminary design plans;

- Review geotechnical investigation letter report (PCM, 2019);
- Reviewed the groundwater results from the DSI (Arcadis, 2019);
- Prepared a site-specific Groundwater Management Plan (GMP) detailing the following:
 - Entity responsible for ensuring the GMP is implemented;
 - The location and frequency of monitoring;
 - The Chemicals of Potential Concern (CoPC) which require ongoing analysis; and
 - The triggers and contingency plans for additional monitoring/remediation.
- Development of this GMP.

1.5 Proposed Redevelopment

The proposed site development will change the land-use from rural residential and farming to commercial and industrial use. Arcadis understands that the redevelopment will involve demolition of all infrastructure at the site including buildings, sheds, chicken coups, fencing and farm dams.

The new buildings to be constructed are understood to be single storey industrial warehouses built on a concrete slab. It is further understood that the slabs are to be elevated above the existing ground level founded on reworked soil from the site, negating the requirement to excavate for building foundations. Orion, on behalf of Mirvac, has indicated that significant volumes of imported fill will not be required for the earthworks undertaken as part of the site redevelopment works. No basements are to be excavated.

2 SITE IDENTIFICATION

The location and layout of the site are shown in Figures 1 and 2, Appendix A. The site details are provided in Table 2-1 below and described in detail in the following sections.

Table 2-1 Site Detail Summary

Item	Details
Address	804-882 Mamre Road, Kemps Creek, NSW, 2178
Lot and plan	Lots 54 to 58 DP259135
Local government area	Penrith City Council
Current land use	Rural residential properties
Current zoning	IN2: General Industrial
Proposed land use	Site is proposed to be redeveloped to an industrial and/or commercial land use (employment purposes)
Site coordinates Approx. centre of site (GDA 2020 UTM 56 H)	293603 m E 6250023 m S
Land area (m ²)	Approx. 563,000 m ² (57 ha)

An overview of the site condition and surrounding environment is provided in Section 4. Site history information is provided in Section 5.

2.1 Current Site Use

The site was historically used for light agricultural purposes (i.e. grazing, historical dairy farming, poultry farming and horticulture). Arcadis understands, the site was purchased by Mirvac Projects Pty Ltd to be redeveloped into an industrial/commercial property for employment purposes.

2.2 Proposed Site Use

The site is proposed to be redeveloped into a warehouse and distribution centres, including 11 warehouse and office combined compounds.

Bulk earthworks, including both cutting and filling of the site, will be required as part of the proposed industrial development.

2.3 Surrounding Land Use

The following current land uses have been identified immediately surrounding the site:

- North – rural residential properties,
- South – rural residential properties, market gardens
- East – rural residential properties
- West – Mamre road, with rural residential properties located immediately west of Mamre Road

3 SITE CONDITION AND SURROUNDING ENVIRONMENT

3.1 Topography

The site slopes down to the south west and has an elevation of approx. 37 to 50 m relative level to the Australian Height Datum (RL mAHD). The site exists within a generally flat alluvial plain with localised undulating rises/falls, generally sloping toward Kemps Creek/South Creek to the west.

3.2 Geology

The 1:100,000 Geological Survey of NSW map of Sydney indicates the site is underlain by Bringelly Shale of the Wianamatta Group. This is described as comprising shales, carbonaceous clay, laminate and coal.

The eSPADE NSW Soil and Land Information database indicates that the site is underlain by Blacktown and Luddenham Soil Landscapes.

The soils encountered during fieldwork conducted by Arcadis in October 2019 aligned with the above descriptions and were described as:

- Fill material generally comprising topsoil and brown silty clay to a typical depth of 0.2m below ground level (m bgl) and a maximum depth of 1.2m bgl (in TP110 and MW01); and
- Natural material generally comprising slightly stiff, orange to brown clay with grey mottling turning into grey to brown weathered shale.

3.3 Hydrogeology

Groundwater is present within the Bringelly Shale. Typically, the Bringelly yields low volumes of saline groundwater. Shale generally has low water transmitting properties, displaying a very low primary porosity with most of the flow being via saturated structural features such as fractures, joints and laminations. Groundwater can be perched at the base of the weathered soil profile along the interface with fresh bedrock. The regional aquifer within the shale is often confined or partially confined and rises once intersected in a borehole.

A review of NSW Department of Primary Industries Office of Water records for groundwater bores within a 2,000 m radius of the site did not identify groundwater boreholes around the site. This is consistent with the groundwater within the shale being of moderate salinity, low yielding and a general abundance of surface water.

3.4 Hydrology

A generally north south oriented drainage line bisects the site along which the five dams have been constructed.

Observations were made during field work conducted in October 2019. The five dams were being used for stock watering and irrigation of crops and chicken sheds.

The site is predominately surfaced with grass cover, and as such, it is anticipated surface water generated during periods of rainfall will likely infiltrate at a rate reflective of the silty clay topsoil permeability. During periods of heavy or prolonged rainfall, excess water is likely to result in overland flow and traverse south-west towards Kemps Creek, following the topographic gradient. A portion of the overland flow is also likely to be captured by the existing on-site dams.

The nearest surface water bodies include several small dams on neighbouring properties and Kemps Creek, which is located approx. 600 m to the west of the site. Kemps Creek drains into South Creek approx. 900 m west of the site, before ultimately discharging into the Hawksbury River located approx. 26 km north of the site.

3.5 Acid Sulfate Soil Risk

Acid sulfate soils (ASS) are generally associated with low-lying coastal areas, including estuarine flood plains, rivers and creeks.

JBS&G, 2019 stated that since the site is not located near the coast and the elevation is in excess of 40 m AHD the likelihood of ASS within the study area is low.

Salts are naturally present in soil, bedrock and groundwater. In western Sydney salts naturally occur within the Ashfield Shale and are mobilised in the subsurface by the movement of groundwater. When saline groundwater is present close to the surface the salts can precipitate on the ground as the saline groundwater is drawn to the surface by fluctuating water tables combined with capillary action. Seepage of saline groundwater can cause corrosion of building materials, inhibit growth of most plant species except for highly salt tolerant vegetation, contributing to increased soil erosion. Salinity hazard mapping indicates the site is of moderate salinity potential due to the site being located on Ashfield Shale (DIPNR, 2012). Off site adjacent to drainage lines the salinity potential is considered high as the saline groundwater becomes shallower with an increased potential of the water table intersecting the ground surface.

3.6 Summary of Previous Investigations and Design Information

3.6.1 Preliminary Site Investigation (JBS&G 2019)

In January 2019, JBS&G conducted a Preliminary Site Investigation (PSI) with limited soil sampling at the site.

The JBS&G review of the site history indicated that the site was historically used for light agricultural purposes (i.e. grazing, historical dairy farming, poultry farming and horticulture).

The findings of the desktop study (confirmed by detailed site inspections completed by JBS&G on 30 November 2018 and 16 January 2019) identified current and potential historical sources of on-site contamination. The sources of potential contamination were associated with the following storage, handling and uses on the site:

- Pesticides/herbicides used in former and current market gardens;
- Potential biological impacts from livestock/poultry farming;
- Potential use of hazardous building materials (asbestos, lead based paints, PCBs) in historic and current site structures resulting in localised impacts to soils in proximity to the location of site structures;
- Potential hydrocarbon and pesticide contamination from the storage of materials and consumables at various locations across the site area (former and current sheds).
- Fill materials of unknown origin; and
- Potential asbestos containing materials (ACM) in irrigation lines (conduits).

JBS&G collected soil samples from a total of 38 locations across the site (29 soil boreholes, two test pits and seven stockpiles). The results from the samples collected by JBS&G have been summarised below:

- Elevated Total Recoverable Hydrocarbon (TRH) concentrations were identified in stained soils below a fuel drum (sample BH10 at 0.1m). This impact was limited in lateral extent and did not appear to migrate vertically, based on visual observations of stained soil;
- A small number of heavy metal impacts to surface soils were also identified but were not considered to pose unacceptable ecological health risks under the proposed land use;
- Anthropogenic materials at some locations were present in quantities that may pose an aesthetic concern for sensitive land uses. JBS&G however noted that with the proposed land use (commercial/industrial), these materials may be retained beneath hardstand without any further management. The impacts identified were typical of historical land uses; and

- Trace level friable asbestos was identified at one location (HA13) adjacent to historical structures, which were observed to contain possible ACM sheet board. JBS&G noted that there was the potential for ACM to be present within site structures and in soil in the vicinity of the structures.

JBS&G concluded that whilst the investigation identified localised surficial soil impacts at the site, the investigation did not identify widespread contamination which may preclude future redevelopment of the site. Identified soil impacts are considered representative of common contaminants and historical land use activities which can be readily dealt with during the DA stage for redevelopment and assessment for site suitability. JBS&G also recommended that a Hazardous Building Material Survey (HBMS) be undertaken prior to any demolition of existing site structures.

3.6.2 Detailed Site Investigation (Arcadis 2019)

During October 2019, Arcadis undertook a Detailed Site Investigation (DSI) which involved intrusive works to assess soil, groundwater and surface water on site for contaminants of potential concern (CoPC) identified in the PSI.

Review of previous site reports, observations from site walk overs on 8th, 9th, 16th and 23rd October 2019 and analytical results from soil, surface water, groundwater and potentially asbestos containing material (PACM) indicated that impact at the site is unlikely to be wide-spread. Observations were consistent with the JBS&G findings.

The results from the samples collected by Arcadis have been summarised below:

- Soil samples were taken from 15 test pits and six monitoring wells. One sample reported an outlier exceedance of benzo(a)pyrene at MW02_2.0, however this exceedance was considered an anomaly and does not represent the concentration of benzo(a)pyrene in natural soil materials, nor does it present a risk when compared to ecological screening levels.
- Three soil samples collected from areas adjacent to treated timber posts were assessed, with one sample (SO01) which exceed the NSW EPA General Solid Waste CT1 criteria for nickel.
- Groundwater was encountered in groundwater well at depths ranging from 37.9 m AHD to 57.2 m AHD across the site. Is it anticipated that the higher groundwater table is perched and localised.
- All surface waters reported analytes below the adopted criteria.
- Surface waters reported elevated pH and electrical conductivity when compared to the adopted criteria.
- A small number of heavy metal impacts to groundwater were observed and these were attributed to the elevated background concentrations of metals in on-site clay soils.
- Potential asbestos containing material (PACM) reported positive identification of asbestos at three out of four samples locations. No PACM was observed on roads or access tracks, with identified material adjacent current or former structures.

Based on the findings of the DSI, the site was deemed suitable from a contamination perspective for the proposed development as an industrial estate, pending the removal of identified asbestos containing material and the issuing of a clearance certificate to soil surfaces. Arcadis recommended that a HAZMAT survey and an asbestos register should be developed for the site prior to demolition works, asbestos removal works should be undertaken and a clearance certificate issued post demolition and that a site unexpected finds protocol should be implemented prior to any intrusive works. Arcadis also recommended that on-site surface water should be measured after a significant rainfall event and compared to previously recorded the observations to observed water quality prior to dam de-watering. Accordingly, there is potential for unexpected finds, including contamination or waste, which may be encountered during demolition or earthworks at the site.

3.6.3 Geotechnical Investigation (PSM, 2020)

Pells Sullivan Meynink (PSM) prepared a Geotechnical Investigation Letter Report (PSM, 2020), which included an additional three geotechnical investigations undertaken 30 November 2018, 04 December 2018 and 16 January 2019.

- The geotechnical investigations comprised an inspection of site conditions including:
 - Geology
 - Surface conditions
 - Subsurface conditions
 - Groundwater
- Excavation of 19 test pits to depths of between 1.6 m and 3.5 m.
- Drilling of eight boreholes to depths of between 3.7 m and 15.0 m.
- Five bulk soil samples were recovered for California Bearing Ratio (CBR)
- Twenty-one samples were analysed for:
 - Cation Exchange Capacity (CEC) of calcium, magnesium, potassium and sodium
 - Exchange sodium percentage (ESP)
 - Salinity
 - Soil pH
 - Chlorides
 - Sulphates
 - Resistivity

A summary of results from the investigation indicate the following:

- pH of the soil samples ranged from 5.0 to 9.0, with an average of 6.6
- The electrical conductivity ($EC_{1.5}$) of the soil samples was in the range of 27 $\mu S/cm$ to 1,400 $\mu S/cm$.
- Concentrations of chlorides in samples were in the range of 130 mg/kg to 2,460 mg/kg.
- Concentrations of soluble sulfate in samples were in the range of <100 mg/kg to 930 mg/kg.
- CEC in samples was in the range of <0.2 meq/100g to 26.6 meq/100g.
- ESP was in the range of 5.6% to 53.4 %.
- The majority of soils on site were classified as “on-saline to moderately saline” except for one sample from TP8 that is very saline. TP8 is located within a fill area.
- Groundwater was observed a 3.0 m bgl in BH5 and at 3.0 m in TP1, TP32 and TP35. It is considered that there may possibly be perched water tables. Groundwater was not observed at any other location.

3.6.4 Additional Geotechnical Investigation (PSM, 2021)

PSM prepared an Additional Geotechnical Investigation Letter Report (PSM, 2021) which included advancement of 11 boreholes (**BHs**) to a maximum depth of 17.0 mbgl undertaken between 10 and 15 November 2021.

A summary of results from the additional geotechnical investigation include:

- Water seepage observed at BH06 at 3.5 mbgl (prior to rock coring).
- Water seepage observed at BH11 at 9.0 mbgl.

Arcadis notes that BH06 and BH11 are located in future Lots 7 and 4 respectively, in areas where between 8.0 and 10.0 m of cut is required.

The remaining nine (9) BHs advanced by PSM did not encounter groundwater and were located in the area of future Lots 4, 5, 6, 7, 8 and 11.

3.6.5 Civil Infrastructure Drawings

The Aspect Industrial Estate stage 1 Civil Works Package drawings were initially reviewed to assess proposed cut and fill locations against groundwater depths to determine potential groundwater interference.

Arcadis understands bulk earthworks levels were revised to achieve a balanced cut to fill development, whilst taking into consideration possible future planning modifications. Revised bulk earthworks levels are shown in the following drawings provided to Arcadis by Orion Consulting, on behalf of Mirvac, on 22 March 2022:

- AT&L, *Mirvac-Aspect Industrial Estate-Mamre Road, Kemps Creek Stage 1-Comparison Bulk Earthworks Cut/Fill Plan – Drawing No. 18-596-SKC121*, 16 February 2022.
- AT&L, *Mirvac-Aspect Industrial Estate-Mamre Road, Kemps Creek Stage 1-Bulk Earthworks Contour Plan – Drawing No. 18-596-C1020*, 10 February 2022.
- AT&L, *Mirvac-Aspect Industrial Estate-Mamre Road, Kemps Creek Stage 1-Bulk Earthworks Cut/Fill Plan – Drawing No. 18-596-C1025*, 10 February 2022.

Copies of these drawings showing the revised bulk earthworks levels are provided as **Appendix A**.

A summary review of the design plans indicates proposed cutting beneath existing ground level at the following locations:

- Typical Road Sections Sheet 2: Utility footing excavations to 1200mm
- Typical Sections Sheet 1: Section 3 – cut beneath existing surface.
- Typical Sections Sheet 2: Future Lot 4 – Section 8
- Typical Sections Sheet 3: Future Lot 4 – Section 9
- Typical Sections Sheet 3: Future Lot 5 – Sections 10, 11 and 12
- Typical Sections Sheet 4: Future Lot 7 – Section 13
- Typical Sections Sheet 4: Future Lot 5 – Section 14
- Typical Sections Sheet 4: Future Lot 9 – Section 16
- Bulk Earthworks Cut/Fill Plan – Cut on Lots 3, 4, 6, 7, 8, 9, 10 and 11¹

The finished level for the proposed future lots ranges from approx. RL 47.80 to 52.60 m AHD.

Table 3-1 below presents the bulk earthworks level at each lot (Bulk Earthworks Cut/Fill Plan) along with the highest groundwater contour level available (Figure 2, Appendix A).

Table 3-1 Bulk Earthworks Level compared to highest recorded groundwater depth (mAHD)

Future Lot	Finish Level (m AHD)	Highest Groundwater Contour Level (m AHD)	Groundwater Interception Risk (<2.0 m)
1	47.80	44.00	No
2	48.20	46.00	No
3	49.00	49.00*	Yes
4**	57.00	56.00	Yes

¹ Arcadis notes that the revised Bulk Earthworks Cut/Fill Plan show an overall Cut/Fill balance of -5,614 m³ for the development of the Site.

Future Lot	Finish Level (m AHD)	Highest Groundwater Contour Level (m AHD)	Groundwater Interception Risk (<2.0 m)
5	57.00	56.00	Yes
6	56.00	53.00	No
7**	52.60	53.00*	Yes
8	50.00	51.00*	Yes
9	51.60	46.00	No
10	52.30	49.00	No
11	52.60	52.00	Yes

Notes

Groundwater levels were obtained from groundwater contouring undertaken as part of the DSI. Groundwater levels are therefore indicative only.

* Indicates groundwater levels are within 0.2 m of the finish level or above the finish level.

** Indicates groundwater (perched water and/or contiguous aquifer) was encountered during PSM 2021 Additional Geotechnical Investigation within this Future Lot.

The groundwater data set used during this assessment was that from Arcadis (2019) and PSM (2019). It should be noted that these investigations were not comprehensive hydrogeological studies.

4 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) describes the potential environmental and human health risks of identified areas of possible soil and groundwater contamination. The CSM outlines the complete and/or potential pathways between the known or potential source(s) and the receptor(s).

Based on the information available for the site from the JBS&G PSI (January 2019) and the Arcadis DSI (October 2019), the following preliminary CSM has been prepared.

4.1 Source

Potential sources of contamination at the site and the associated contaminants of potential concern (CoPC) are listed below in Table 3-1.

Table 4-1 Potential On-Site Contaminant Sources

Source	Associated Chemicals	CoPC
Historic and current market gardens and livestock/poultry farming	Pesticides, herbicides	Pesticides, herbicides
Hazardous building materials in historic and current site structures and in the irrigation lines (conduits)	Asbestos containing materials (ACM), lead based paints, electrical components containing Polychlorinated Biphenyls (PCBs)	Asbestos, lead, PCBs
Storage of various materials (such as fuel drums) and consumables in historic and current sheds across the site	Total Recoverable Hydrocarbons (TRHs), pesticides, herbicides	TRHs, pesticides, herbicides
Fill materials of unknown origin	Asbestos, ash, slag, construction waste, demolition waste	Heavy metals, TRH, BTEX, PAHs, organochlorine pesticides (OCPs), organophosphate pesticides (OPP), polychlorinated biphenyls (PCBs), phenols and asbestos

Note

* From the results of the groundwater samples collected in October 2019, it was found that some wells exceeded the ANZG (2018) (95% protection for Fresh Water) and the NEPC (2013) (GILs for Fresh Waters) for some metals. These metals were determined to be of background origin and are not considered a potential contaminant source.

4.2 Potentially Affected Media

The potentially affected media at the site includes:

- Soil;
- Groundwater; and
- Surface water (in the dams).

4.3 Pathways

Pathways or transport mechanisms by which receptors may be exposed to contamination on and off-site include:

- Direct contact with contaminated soil/groundwater;
- Ingestion of dust/abstracted groundwater;
- Inhalation of asbestos fibres; and
- Groundwater flow off-site.

4.4 Receptors

Potential receptors to contamination include:

- Demolition/construction workers;
- Future site users;
- Surrounding residents;
- Environmental receptors (Kemps Creek and South Creek); and
- Groundwater use (off-site).

4.5 Exposure Assessment

Based on the preliminary CSM discussed in Section 3.1 to Section 3.4, the potential for contamination to be present at the site is considered to be **Moderate**. This level of contamination risk can be minimised or removed if precautionary measures are taken. The potentially complete and incomplete pathways are discussed in more detail in the Table 3-2 below.

Table 4-2 Exposure Assessment

Source	Pathway	Receptor	Exposure Assessment	Pathway completeness
Market gardens and livestock/poultry farming	Direct contact	Demolition/construction workers, future site users	Demolition and construction workers developing the site will come into contact with potentially contaminated soil. Workers in service trenches may also encounter groundwater. Depending on the landscaping of the proposed developed on the site, future site workers may be directly exposed to potentially contaminated soil via open grass areas.	Based on the DSI results presented herein, this pathway is incomplete. An UFP Is required during construction works.
		Surrounding residents	Surrounding residents will not come into direct contact with any potentially contaminated soil or groundwater. No groundwater abstraction wells were noted around the site.	The pathway is incomplete.
	Ingestion	Demolition/construction workers, surrounding residents, future site user	Demolition/construction workers and surrounding residents have the potential to be exposed to dust and/or groundwater during the construction phase of the proposed development. Depending on the landscaping of the proposed developed on the site, future site workers may also be directly exposed to potentially contaminated dust via open grass areas.	The pathway is potentially complete and should be managed during construction works with a CEMP and UFP.
Hazardous building materials	Direct contact, inhalation of asbestos fibres	Demolition/construction workers	If any hazardous building materials are present in the currently existing structures, demolition/construction workers may be exposed during demolition works.	The pathway is potentially complete and should be managed through a CEMP during construction works as well as a HAZMAT Assessment.
		Surrounding residents, future site residents	Surrounding residents will not be allowed access onto the site and therefore will not come into contact with any hazardous building materials. Additionally, hazardous materials should be removed from the site before the construction of the proposed boarding home, therefore future residents will not be exposed.	The pathway is incomplete.
	Ingestion	Demolition/construction workers	Demolition/construction workers may be at risk of ingesting hazardous materials during intrusive site construction works.	Based on the DSI results presented herein, this pathway is incomplete.
		Surrounding residents, future site residents	These receptors will not come into contact with any hazardous building materials during or after construction.	The pathway is incomplete.

Source	Pathway	Receptor	Exposure Assessment	Pathway completeness
Storage of various materials (such as fuel drums) and consumables	Direct contact, ingestion	Demolition/ construction workers, future site users	Demolition and construction workers developing the site will come into contact with potentially contaminated soil. Additionally, future site workers may be directly exposed to potentially contaminated soil via open grass areas.	The pathway is potentially complete and should be managed through a CEMP during construction works.
		Surrounding residents	Surrounding residents will not come into direct contact with any potentially contaminated soil or groundwater. No groundwater abstraction wells were noted around the site.	The pathway is incomplete.
Fill materials	Direct contact, ingestion	Demolition/ construction workers, future site users, surrounding residents	Demolition and construction workers developing the site will come into contact with underlying fill during the construction phase. Depending on the landscaping of the proposed developed on the site, future site workers may be directly exposed to potentially contaminated soil via open grass areas. Surrounding residents have the potential to be exposed to dust during the construction phase.	Based on the results presented herein, this pathway is incomplete.
		Inhalation of asbestos fibres	Demolition/construction workers may be exposed to fragments of asbestos in the fill material during demolition works. If the fill is still present and/or exposed on the site after completion of the proposed development, future site workers may also be exposed via open grassed areas.	The pathway is potentially complete and should be managed during construction works through an UFP and a CEMP. HAZMAT assessment prior to demolition is recommended.
		Surrounding residents	Surrounding residents will not come into contact with any fill material during or after construction.	The pathway is incomplete.
Contaminated groundwater	Direct contact	Demolition/ construction workers	Demolition and construction workers developing the site may come into contact with potentially contaminated groundwater during excavation of service trenches and/or during earthworks.	The pathway is potentially complete.
	Ingestion	Future site users, surrounding residents	Future site users and surrounding residents will not come into contact with any groundwater during or after construction, as groundwater is not to be extracted on-site.	The pathway is incomplete.

Source	Pathway	Receptor	Exposure Assessment	Pathway completeness
	Groundwater flow	Environmental receptors (e.g. Kemps Creek and South Creek)	Kemps Creek and South Creek are located down gradient of the site and therefore are potential receptors to contaminated groundwater.	The pathway is potentially complete.
		Off-site groundwater users	No groundwater boreholes were present within a 2000m radius of the site; therefore, it is unlikely that off-site receptors will come into contact with any potentially contaminated groundwater.	The pathway is incomplete.

5 LEGISLATION AND POLICY

5.1 Legislative Framework

Groundwater in NSW is regulated by DPIE-Water under the *Water Act 1912* (NSW) (Water Act), the *Water Management Act 2000* (NSW) (WMA, 2000) and Water Management (General) Regulation, 2011. The WMA, 2000 is gradually replacing the planning and management frameworks in the Water Act, although some provisions of the Water Act remain in operation. The WMA, 2000 regulates groundwater extraction under the NSW Aquifer Interference Policy (AIP), 2012.

- A water access licence to take water.
- A water supply works approval to construct a work.
- A water use approval to use the water.

The AIP (NSW DPI, 2012 and NoW 2012) explains the process of administering water policy under the WM Act for activities that interfere with the aquifer. In accordance with the AIP an activity that results in the loss of water from the environment, a water access licence (WAL) is required, unless the activities are considered to be of 'minimal impact'.

Under the AIP groundwater inflows are considered as a minimal impact activity in the construction of trenching and costeaning. In addition, very small water takes up to 3 ML/year are also considered minimal impact activities as long as the water volume can be substantiated (Dent, et al., 2015).

The project is located in the *Greater Metropolitan Region Groundwater Source Water Sharing Plan* (the Plan) (NoW 2011) which commenced on 1 July 2011. Within the Plan, the project footprint is subject to the rules of the Sydney Basin Central Groundwater Source which outline the recommended management approaches of surface and groundwater connectivity and protection of water quality.

5.2 Assessment Criteria

Groundwater quality is screened against the following guidelines:

- ANZG (2018) Guidelines for Fresh and Marine Water Quality - 95% protection for Fresh Water;
- NEPC (2013) Guideline on Investigation Levels for Soil and Groundwater – Groundwater Investigation Level for Fresh Waters; and
- NHMRC (2008) Guidelines for Managing Risks in Recreational Water – Primary Contact Recreation.

6 2019 GROUNDWATER MONITORING EVENT

A summary of the information collected during the groundwater monitoring event conducted by Arcadis in October 2019 is provided in this section.

6.1 Groundwater Levels and Flow Direction

Groundwater standing water levels were measured in newly installed wells (monitoring wells MW01 to MW06) constructed across the site (Arcadis, 2019). Groundwater levels measured in October 2019 ranged between 2.52 and 8.31 metres below ground level. Review of this data indicates that the standing water levels are shallowest along the central drainage line and as expected becomes deeper higher in the catchment to the east and west. During the drilling program groundwater was intersected at depths deeper than the measured standing water levels (ranging between 2.3 and 6.8 metres). The difference between the standing water level and water strike indicates the groundwater within the shale is partially confined. Consequently, excavations across the site are likely to intersect groundwater at depths deeper than the measured standing water levels.

Reduced standing water levels ranged from 37.98 and 57.18 mAHD. These groundwater elevations indicate groundwater flow is towards the northwest, in the direction of Kemps Creek. Groundwater contours and flow direction are presented in Figure 2, Appendix A.

Groundwater level observations are summarised in Table 6-1. The monitoring wells are screened within the shale and weathered shale.

Table 6-1 Groundwater Monitoring Well Observations

Well	Date	X (UTM 56 – GDA94)	Y (UTM 56 – GDA94)	Elevation (m TOC-AHD)	Depth to water (m TOC)	DTB (TOC)	Standing Water Level (m AHD)
MW01	16.10.19	6253425	294732.3	42.198	4.220	9.057	37.978
MW02	16.10.19	6253413	295305.1	51.525	3.249	11.795	48.276
MW03	23.10.19	6252758	294943.7	61.429	8.310	11.100	53.119
MW04	16.10.19	6252998	295177.3	51.168	3.636	9.045	47.532
MW05	16.10.19	6253089	295271.7	49.925	2.527	9.458	47.398
MW06	16.10.19	6253158	295551.8	62.123	4.946	11.390	57.177

Notes

Top of casing (TOC)

Australian Height Datum (AHD)

Geocentric Datum of Australia 1994 (GDA94)

Universal Transverse Mercator (UTM) [Zone 56]

6.1.1 Groundwater Level Fluctuations

Fluctuations in groundwater must also be considered as a rise in groundwater level will increase the risk of groundwater being encountered during the site redevelopment works. It is noted Western Sydney is experiencing drought conditions and consequently groundwater levels would be expected to be lower than usual. No historical groundwater level monitoring is known to have been undertaken at the site.

Groundwater level fluctuations within the Bringelly Shale would be expected to naturally fluctuate between 0.5 and 1 metre. Thus, following prologued heavy rainfall groundwater levels would be expected to rise. However due to the clayey hard pan nature of the weathered shale soil profile and the low water transmitting properties of the shale groundwater infiltration will be limited, restricting groundwater level rises.

6.2 Groundwater Quality

Groundwater extracted during sampling was observed to be of moderate to low turbidity at most locations. One exception was MW06, which displayed very low turbidity.

No sheens or odours were observed in purged groundwater except MW01 which held a biogenic sheen. These sheens are often naturally associated with groundwater derived from shale and rare due to the organic content within the shale, rather than being indicative of hydrocarbon contamination. No wells were purged dry and well recharge was observed to be adequate for peristaltic pump sampling.

6.2.1 Physico-Chemical Parameters

Water quality parameters recorded during the groundwater sampling are provided in the following table.

Table 6-2 Groundwater Monitoring Well Field Quality Parameters

Well	pH	Temperature (°C)	Electrical Conductivity (uS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)*	Comments
MW01	6.921	15.5	14,068	1.22	346.1	Biogenic sheen, no odour
MW02	6.81	17.8	19,646	1.06	328.6	No sheen, no odour
MW03	6.68	21.1	21,256	7.48	364.6	No sheen, no odour
MW04	6.44	19.2	18,636	1.58	347.1	No sheen, no odour
MW05	6.55	19.2	19,783	0.64	357.1	No sheen, no odour
MW06	6.96	20.3	16,288	3.2	324.1	Clear, no sheen, no odour

Notes

*199mV has been added to all redox field measurements to convert to standard hydrogen electrode (SHE)

Based on the physico-chemical data collected during groundwater sampling, the following conclusions have been made:

- pH values indicate that the groundwater is neutral;
- Electrical conductivity ranged from 14,068–21,256 $\mu\text{S}/\text{cm}$, indicating brackish water;
- Dissolved oxygen ranges from 0.64 to 7.48 mg/L, indicating a low level of dissolved oxygen within the groundwater aquifer.
- Oxygen reduction potential (ORP) ranged between 324.1 mV and 364.6 mV, indicating a moderate to high (positive) ORP, suggesting an oxidative environment.

6.2.2 Analytical Results

The groundwater analytical results are provided in Table 6-3.

Table 6-3 Groundwater Exceedance Analytical Results

Analyte	Guideline Value (mg/kg)	Min ($\mu\text{g}/\text{L}$)	Max ($\mu\text{g}/\text{L}$)	Locations Exceeding Adopted Criteria
Cadmium	0.2 (DGVs, GILs)	<0.2	0.3	MW03, MW04
Copper	1.4 (DGVs, GILs)	<1	2	MW03
Zinc	8 (DGVs, GILs)	<5	47	MW02, MW03, MW04, MW06

Exceedances of the adopted groundwater quality criteria (as specified in Section 5.2) were identified for cadmium, copper and zinc. Total recoverable hydrocarbons C₁₀-C₁₆ and >C₁₀-C₁₆ less naphthalene (F2) reported 70 µg/L, above the Limits of Reporting (LOR) of 50 µg/L. All other analytes (filtered metals, TRHs, BTEX, PAHs, PCBs and OC & OP pesticides) reported less than LOR.

The minor exceedances for dissolved metals is typical of natural background levels and consistent with previous groundwater monitoring from the Bringelly Shale conducted at Badgerys Creek (PPK, 1998).

Summary tables displaying reported analyte concentrations screened against the adopted criteria are provided in Error! Reference source not found.. Laboratory reports are provided in **Appendix C**.

6.3 Measurement of Hydraulic Conductivity

Rising head slug tests were conducted as part of the DSI (Arcadis, 2019) to measure the hydraulic conductivity of the shale. The tests were conducted in monitoring wells MW01 and MW02, located in the north of the site. The results are presented in **Error! Reference source not found.** and confirm the Bringelly Shale has low water transmitting properties. These low values of hydraulic conductivity are consistent with other measurements within the Bringelly Shale (PPK, 1998).

The slug test methodology, analysis and results are provided in the DSI (Arcadis, 2019).

Table 6-4 Aquifer Hydraulic Conductivity

Well	Hydraulic Conductivity using Bouwer & Rice (m/d)	Hydraulic Conductivity using Hvorslev (m/d)
MW01	2.03×10^{-1}	2.60×10^{-1}
MW02	7.16×10^{-2}	9.02×10^{-2}

6.4 Expected Volume of Groundwater to be Extracted

With a knowledge of the local hydrogeology (Sections 6.1 and 6.2) and the general building construction plans the volume of groundwater to be extracted can be estimated.

Standing groundwater levels measured at the site in October 2019 are known to range between 2.52 and 8.31 metres below ground level (mbgl). Once details of the buildings design are known, standing water levels beneath the buildings can be estimated with more confidence. During the drilling program groundwater was intersected at depths deeper than the measured standing water levels (ranging between 2.3 and 6.8 metres).

The only other known intrusive works likely to be conducted at the site are the installation of service trenches to install utilities such as stormwater, sewer, electricity, power, gas and telecommunications. Typically, these service trenches are excavated no deeper than two metres.

Based on the revised bulk earthworks levels, the inferred groundwater contours and the PSM 2021 geotechnical investigation, Lots 3, 4, 5, 7, 8, and 11 have the potential to encounter groundwater (either perched or contiguous aquifer) during site development (based on final site level and/or presence of service trenches/footings, which may extend up to 2.0 m below final bulk earthworks level).

In the event that groundwater is encountered the groundwater inflow is dependent upon a number of factors including the depth of the water table intersected, the hydraulic conductivity of the shale, length of the trench/excavation and the duration the excavation is open. Given that the water table is known to be low compared to the base of the trenches and the hydraulic conductivity of the shale is low groundwater inflows would be expected to be low. The length of the trenches is currently unknown but wouldn't be expected to be more than two kilometres. Similarly, the duration that the trench is open is dependent upon the speed of the construction workers but wouldn't be expected to be open for more than 4 weeks.

In the event that groundwater is encountered the extracted groundwater volume would be required to be measured with a flow meter. The groundwater would be collected and directed to a water storage pond where upon on-site reuse options would be considered as outlined in Section 8.1.1.

As outlined in Section 4.1, a WAL will only be required if groundwater is intersected and exceeds the inflow criteria of 3ML/year.

7 ROLES AND RESPONSIBILITIES

The roles and responsibilities regarding the implementation of this GMP on the site is summarised in the table below.

Table 7-1 *Roles and Responsibilities*

Entity	Role	Responsibility
NSW Department of Natural Resources	Approves the development of the site.	<ul style="list-style-type: none"> • Provide approval for the GMP • Undertake the steps outlined in this GMP
Mirvac (and Mirvac sub-contractors)	Land developer	<ul style="list-style-type: none"> • Developer of the site • Ensure that the requirements outlined within this GMP for the ongoing management of the Site are complied with
Nominated Environmental Consultant (if required)	Provision of environmental expertise.	<ul style="list-style-type: none"> • Carry out groundwater scope of works • Provision of report to Mirvac and Department of Natural Resources
DPIE Water*	To provide water obstruction licensing.	<ul style="list-style-type: none"> • To provide water obstruction licensing if greater than 3ML/year of groundwater is intersected and removed from the site.

Note

*This entity will only need to undertake their roles and responsibilities if groundwater is encountered at the site in excess of 3ML/year.

8 GROUNDWATER MANAGEMENT

Based on the outcomes of the DSI (Arcadis, 2019) and Arcadis' understanding of the redevelopment works groundwater has the potential to be intersected for certain lots as outlined in Table 3-1.

In event that groundwater is intersected during Stage 1 of the redevelopment works, the following management measures should be applied.

8.1 During Construction

A review of the known redevelopment construction strategy indicates that groundwater has the potential to be encountered based on revised bulk earthworks levels and the construction of service trenches. In this event the following management measures as outlined in Table 8-1 are recommended.

Table 8-1 Management Measures for Intersected Groundwater During Construction

Management Measure	Description
Pump groundwater from the excavated area	Intersected groundwater should be pumped from the excavated service trenches and stored in a discharge basin on-site.
Monitor volume of extracted groundwater	The volume of groundwater extracted should be monitored and recorded to assess if the volume extracted does not exceed the 3 ML/year where a WAL is required. If groundwater volumes are higher than expected and it appears that the 3ML/year criteria may be exceeded a WAL application should be completed and submitted to DPIE Water.
Monitor groundwater quality of the extracted groundwater	<p>To assess if the removed groundwater is suitable for on-site re-use, groundwater quality should be monitored for the following parameters:</p> <ul style="list-style-type: none"> • pH; • Salinity; and • Metals. <p>Groundwater will be screened against the adopted guidelines which are outlined in Section 4 of this report.</p> <p>Groundwater treatment may be required before re-using on site to reduce the pH or salinity. The pH is likely to approach neutral due to aeration caused by pumping. Salinity can be lowered by mixing with dam water. Alternatively, the groundwater could be discharged to stormwater or sewer once this infrastructure is installed with appropriate authorisation from Council or Sydney Water respectively.</p>
Monitor groundwater in the existing groundwater wells around the site	If groundwater is intersected during construction works, a round of groundwater level monitoring of the groundwater wells on-site should be triggered to assess any impacts on the water table.

8.1.1 Intersected Groundwater Re-Use

Groundwater re-use options, subject to meeting the adopted groundwater quality guidelines are presented in Table 8-2. These re-use options are consistent with the surface water re-use options as outlined in the Dam Decommissioning Strategy report.

Table 8-2 Intersected Groundwater Re-Use Options

Option	Name	Option Description
1	Dust suppression	The intersected groundwater can be used to spray water across the site for dust suppression during the earthworks and construction phases.
2	On-site irrigation	The groundwater can be circulated around the site for irrigation purposes.
3	Wheel washing	The groundwater can be utilised to spray trucks down before they leave the site to reduce tracking of mud and dirt off-site.
4	Topping up neighbouring dams	The groundwater from the on-site dams can be pumped into off-site neighbouring dams, subject to the dam owner's approval.
5	Discharge to the on-site sediment basin	As a contingency, if there is excess groundwater, an option is to discharge to the on-site sediment basin. The water will have to be flocculated and the water quality monitored. If the water is in accordance with the Australian and New Zealand Guidelines for Fresh Water Quality 95% species protection (ANZG 2018), then the water can be discharged to South Creek via Kamps Creek.

Note

These re-use options are viable only if the groundwater meets the adopted criteria.

8.1.2 Intersected Groundwater Treatment or Disposal

If, however, the intersected groundwater does not meet the water quality adopted criteria it must be managed appropriately. Groundwater treatment or disposal options are outlined in Table 8-3.

It should also be noted that groundwater will not be extracted for water management purposes during or after construction.

Table 8-3 Intersected Groundwater Treatment or Disposal Options

	Option	Option Description
1	Treatment (for turbidity)	For excess turbidity issues, the groundwater should be treated by allowing it to settle in the sedimentation pond and then flocculating if the suspended solids do not precipitate out.
2	Treatment (for pH)	If the intersected groundwater has an acidic pH value, lime should be added as a treatment. For alkaline pH aerating the water is likely to reduce the pH.
3	Treatment (for saline groundwater)	If the intersected groundwater is saline, then it can be mixed with onsite surface water from the dams in order to dilute the salinity.
4	Disposal	If treatment options are not suitable, the intersected groundwater (likely to be of low volume) could be tanked offsite for disposal. Alternatively, the groundwater could be detained onsite for discharge to either stormwater or sewer once this infrastructure has been installed on-site and authorisation from Council or Sydney Water respectively is provided.

8.1.3 Records

The following records relating to groundwater management and monitoring are to be maintained by Mirvac or their on-site representative:

- Spill or incident reports;
- Groundwater inflows into excavations;
- Intersected groundwater quality;
- Groundwater treatment (if necessary);
- Groundwater disposal (if necessary); and

- Groundwater level monitoring if triggered.

All records are to be maintained in compliance with record keeping requirements as outlined in the CEMP.

8.2 Post Construction

Based on revised bulk earthworks levels, the inferred groundwater contours, and the PSM 2021 geotechnical investigation, Lots 3, 4, 5, 7, 8 and 11 have the potential to encounter groundwater (either perched or contiguous aquifer) during site development (based on final site level and/or presence of service trenches/footings, which may extend up to 2.0 m below final bulk earthworks levels). In light of this, consideration should be given to permanent/ongoing groundwater management approaches including civil engineering (drainage, groundwater management system, etc.) and building and foundation design including subsurface infrastructure.

Consideration should be given to ongoing impacts to the local hydrogeological regime which may need to be managed in accordance with the requirements set out by Water NSW and relevant NSW regulations, including but not limited to *Water Act 1912* (NSW) (Water Act), the *Water Management Act 2000* (NSW) (WMA, 2000) and Water Management (General) Regulation, 2011.

Further assessment of groundwater and/or hydrogeological modelling should be considered to provide a better understanding on likelihood of encountering groundwater and volume of water ingress.

9 REFERENCES

Arcadis (2019) *Dam Decommissioning Strategy*.

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APPENDIX A FIGURES

10035157 - Aspect Industrial Estate - Groundwater Management Plan



Legend

- Site Boundary
- Lot Boundaries

1:4,130 at A3



ARCADIS AUSTRALIA PACIFIC PTY LTD
ABN 76 104 485 289
Level 16, 580 George St | Sydney NSW 2000
P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001
Coordinate System: GDA 1994 MGA Zone 56
Date issued: October 24, 2019

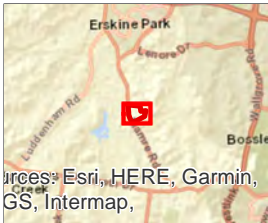
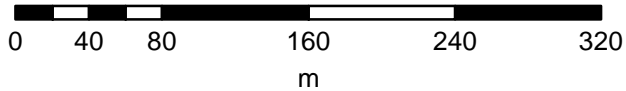
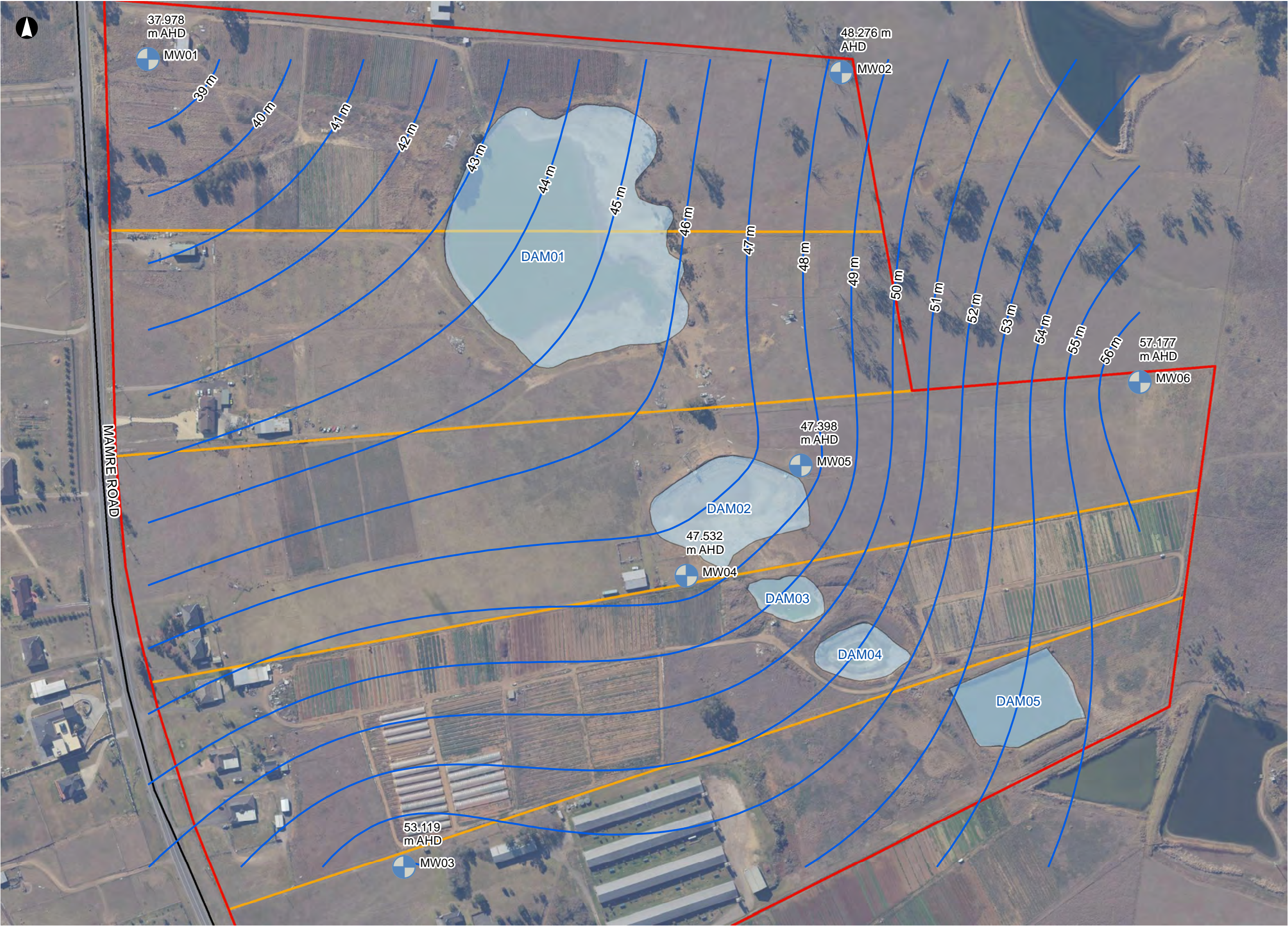


Figure 1 - Site Overview



10035157 - Aspect Industrial Estate - Groundwater Management Plan



Legend

- Groundwater Wells
- Groundwater Contours (m AHD)
- Dams
- Site Boundary
- Lot Boundaries

1:3,100 at A3



ARCADIS AUSTRALIA PACIFIC PTY LTD
ABN 76 104 485 289
Level 16, 580 George St | Sydney NSW 2000
P: +61 (0) 2 8907 9000 | F: +61 (0) 2 8907 9001
Coordinate System: GDA 1994 MGA Zone 56
Date issued: October 24, 2019

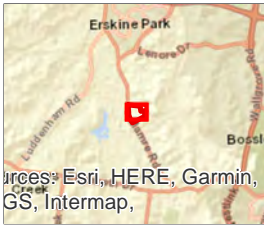
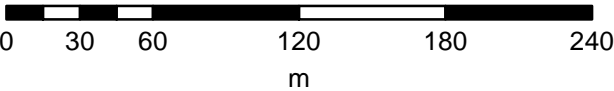


Figure 2 - Groundwater Contours



10035157 - Aspect Industrial Estate - Groundwater Management Plan

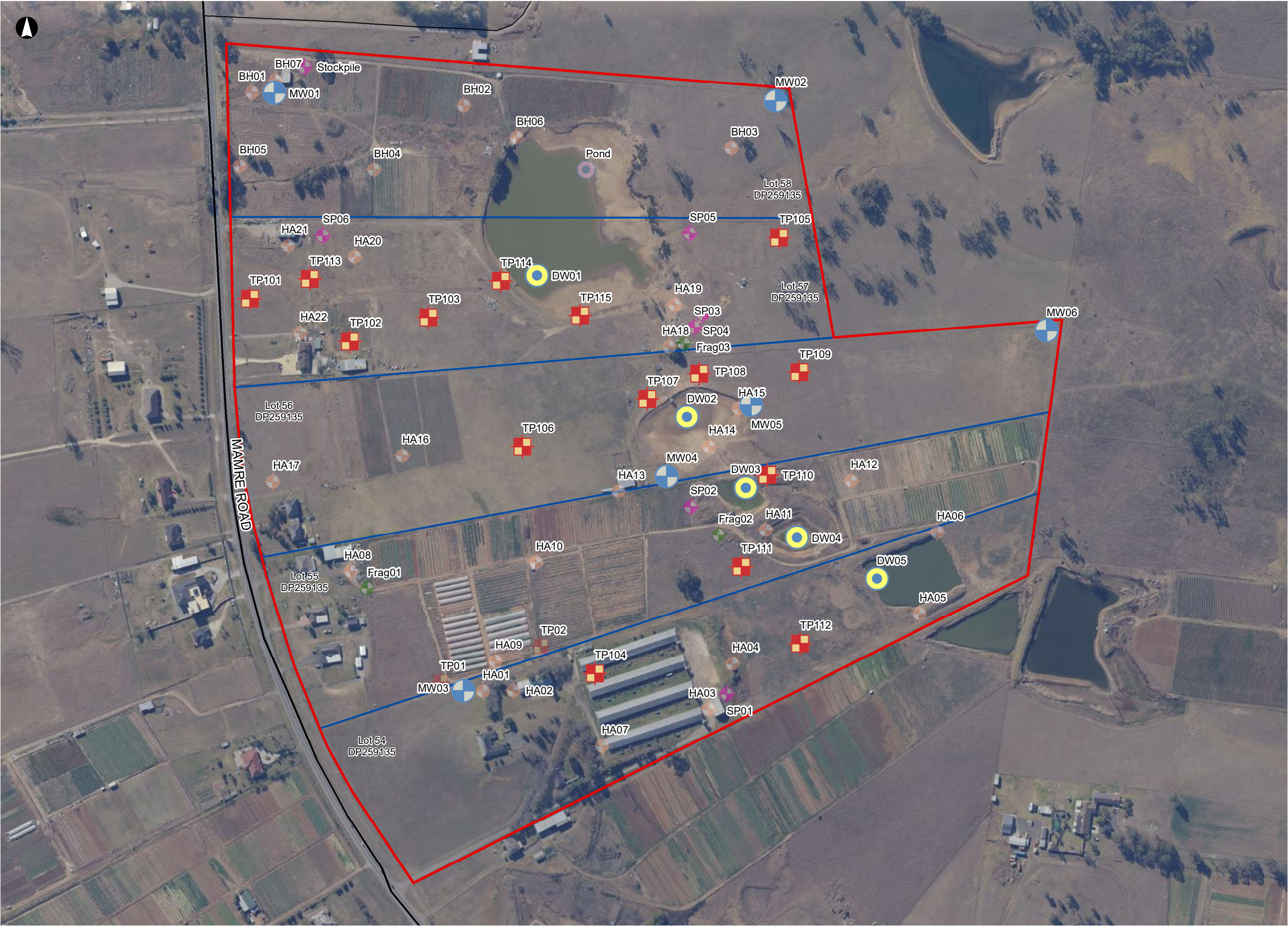
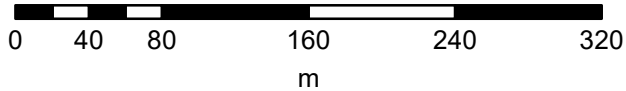
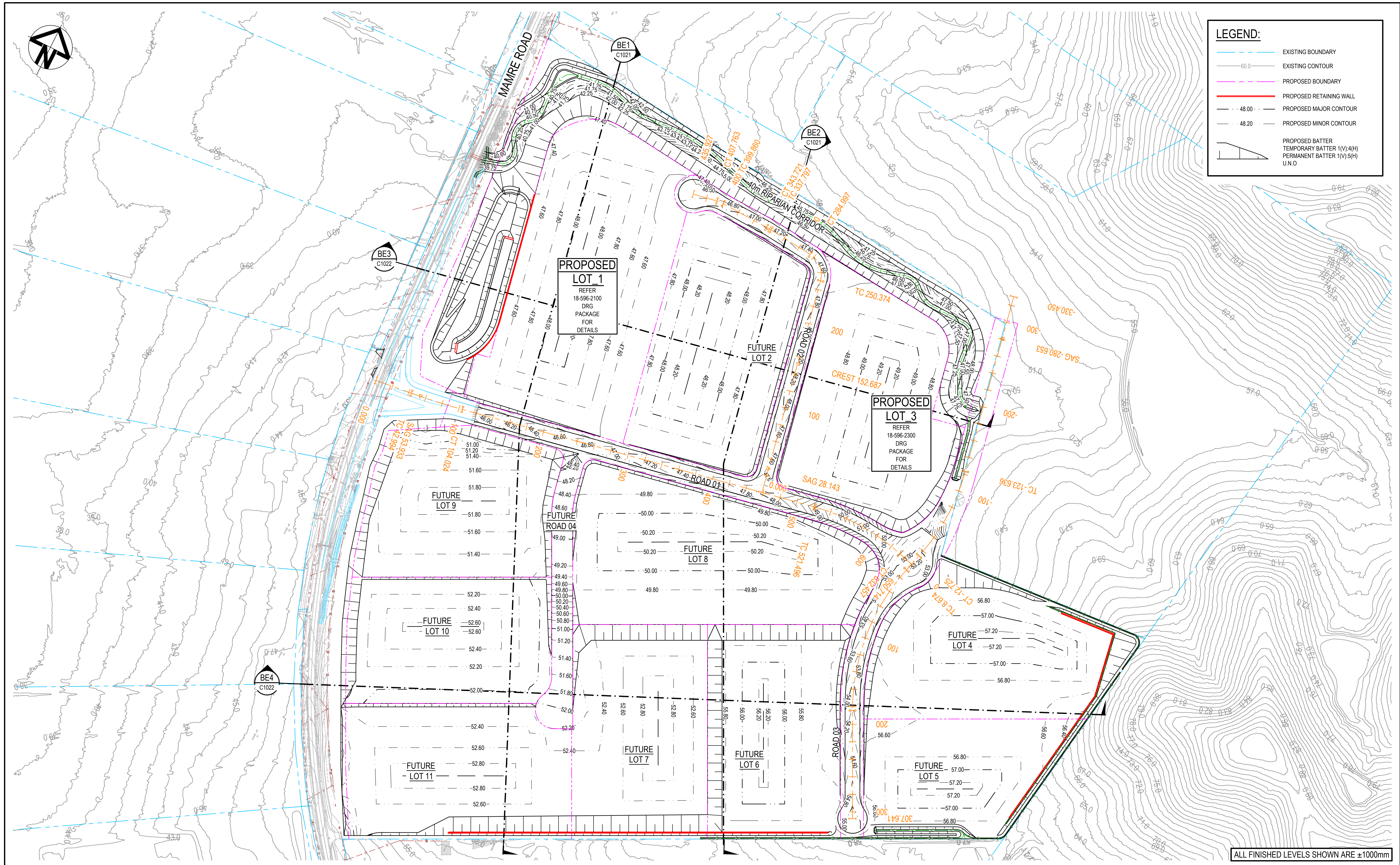




Figure 3 - Previous and Current Sample Locations





LEGEND:

- EXISTING BOUNDARY
- EXISTING CONTOUR
- PROPOSED BOUNDARY
- PROPOSED RETAINING WALL
- PROPOSED MAJOR CONTOUR
- PROPOSED MINOR CONTOUR
- PROPOSED BATTER
TEMPORARY BATTER 1(V):4(H)
PERMANENT BATTER 1(V):5(H)
U.N.O

		Bar Scales		<p>THIS DRAWING CANNOT BE COPIED OR REPRODUCED IN ANY FORM OR USED FOR ANY OTHER PURPOSE OTHER THAN THAT ORIGINALLY INTENDED WITHOUT THE WRITTEN PERMISSION OF AT&L</p>	<p>Client</p> <div></div>	<div><div>Scales</div><div>1:2000</div></div> <div><div>Grid</div><div>MGA</div></div> <div><div>Height Datum</div><div>AHD</div></div>	<div><div>Drawn</div><div>Designed</div></div> <div><div>PDJ</div><div>PDK</div></div> <div><div>Checked</div><div>AT</div></div> <div><div>Approved</div><div>AM</div></div>	<div><div>Project</div><div>ASPECT INDUSTRIAL ESTATE MAMRE ROAD, KEMPS CREEK STAGE 1</div></div> <div><div>Title</div><div>BULK EARTHWORKS CONTOUR PLAN</div></div>	<div><div>Civil Engineers and Project Managers</div><div><div><div>Level 7, 153 Walker Street North Sydney NSW 2060 ABN 96 130 882 405 Tel: 02 9439 1777 Fax: 02 9923 1055 www.atl.net.au info@atl.net.au</div></div></div><div><div>Status</div><div>FOR APPROVAL NOT TO BE USED FOR CONSTRUCTION</div></div><div><div>Project - Drawing No.</div><div>18-596-C1020</div></div></div>	<div><div>A1</div><div>Issue</div><div>F</div></div>
		<div><div>050100150200m</div><div>1 : 2000 @ A1</div></div>								
F	ISSUED FOR DEVELOPMENT APPLICATION	10-02-22								
E	ISSUED FOR DEVELOPMENT APPLICATION	03-02-22								
D	ISSUED FOR DEVELOPMENT APPLICATION	08-10-21								
C	ISSUED FOR DEVELOPMENT APPLICATION	15-10-20								
B	ISSUED FOR DEVELOPMENT APPLICATION	12-10-20								
A	ISSUED FOR DEVELOPMENT APPLICATION	15-05-20								
Issue	Description	Date								

APPENDIX B ANALYTICAL TABLES

Summary of Analytical Results -
Groundwater

ARCADIS Design & Consultancy for natural and built assets	Metals																TPH					TRH						
	Arsenic	Arsenic (Filtered)	Cadmium	Cadmium (Filtered)	Chromium (III+VI)	Chromium (III+VI) (Filtered)	Copper	Copper (Filtered)	Lead	Lead (Filtered)	Mercury	Mercury (Filtered)	Nickel	Nickel (Filtered)	Zinc	Zinc (Filtered)	C6-C9	C10-C14	C15-C28	C29-C36	C10-C36 (Sum of total)	C6-C10	>C6-C10 less BTEX (F1)	C10-C16	>C10-C16 less Naphthalene (F2)	C16-C34	C34-C40	>C10 - C40 (Sum of total)
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
	1	1	0.2	0.2	1	1	1	1	1	1	0.1	0.1	1	1	5	5	20	50	100	100	100	20	20	50	50	100	100	100
	100 ^{#5}	100 ^{#5}	20 ^{#5}	20 ^{#5}	500 ^{#6}	500 ^{#6}	20000 ^{#5}	20000 ^{#5}	100 ^{#5}	100 ^{#5}	10 ^{#5}	10 ^{#5}	200 ^{#5}	200 ^{#5}														
EQL	1	1	0.2	0.2	1	1	1	1	1	1	0.1	0.1	1	1	5	5	20	50	100	100	100	20	20	50	50	100	100	100
ANZG (2018) Freshwater 95% toxicant DGVs			0.2 ^{#1}	0.2 ^{#1}			1.4 ^{#1}	1.4 ^{#1}	3.4 ^{#2}	3.4 ^{#2}	0.6 ^{#3}	0.06 ^{#3 #7}	11 ^{#3}	11 ^{#3}	8 ^{#4}	8 ^{#4}												
NHMRC 2008 Primary Contact Recreation	100 ^{#5}	100 ^{#5}	20 ^{#5}	20 ^{#5}	500 ^{#6}	500 ^{#6}	20000 ^{#5}	20000 ^{#5}	100 ^{#5}	100 ^{#5}	10 ^{#5}	10 ^{#5}	200 ^{#5}	200 ^{#5}														
NEPM 2013 Table 1C GILs, Fresh Waters			0.2 ^{#8}	0.2 ^{#8}			1.4 ^{#8}	1.4 ^{#8}	3.4 ^{#8}	3.4 ^{#8}	0.06 ^{#9}	0.06 ^{#9}	11 ^{#8}	11 ^{#8}	8 ^{#8}	8 ^{#8}												

Field_ID	Sampled_Date_Time																												
MW01	16-Oct-19	-	<1	-	<0.2	-	<1	-	<1	-	<1	-	<0.1	-	<1	-	<5	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
MW02	16-Oct-19	-	<1	-	<0.2	-	<1	-	<1	-	<1	-	<0.1	-	9	-	10	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
MW03	23-Oct-19	-	<1	-	0.3	-	<1	-	2	-	<1	-	<0.1	-	4	-	12	<20	<50	<100	<100	<100	<20	<20	70	70	<100	<100	<100
MW04	16-Oct-19	-	<1	-	0.3	-	<1	-	<1	-	<1	-	<0.1	-	3	-	9	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
MW05	16-Oct-19	-	<1	-	<0.2	-	<1	-	<1	-	<1	-	<0.1	-	<1	-	<5	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
MW06	16-Oct-19	-	3	-	<0.2	-	<1	-	<1	-	<1	-	<0.1	-	2	-	47	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100

Statistical Summary																												
Number of Results	0	6	0	6	0	6	0	6	0	6	0	6	0	6	0	6	6	6	6	6	6	6	6	6	6	6	6	6
Number of Detects	0	1	0	2	0	0	0	1	0	0	0	0	0	4	0	4	0	0	0	0	0	0	0	1	1	0	0	0
Minimum Concentration	ND	<1	ND	<0.2	ND	<1	ND	<1	ND	<1	ND	<0.1	ND	<1	ND	<5	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
Minimum Detect	ND	3	ND	0.3	ND	ND	ND	2	ND	ND	ND	ND	ND	2	ND	9	ND	ND	ND	ND	ND	ND	ND	70	70	ND	ND	ND
Maximum Concentration	0	3	0	0.3	0	<1	0	2	0	<1	0	<0.1	0	9	0	47	<20	<50	<100	<100	<100	<20	<20	70	70	<100	<100	<100
Maximum Detect	ND	3	ND	0.3	ND	ND	ND	2	ND	ND	ND	ND	ND	9	ND	47	ND	ND	ND	ND	ND	ND	ND	70	70	ND	ND	ND
Average Concentration		0.92		0.17		0.5		0.75		0.5		0.05		3.2		14	10	25	50	50	50	10	10	33	33	50	50	50
Median Concentration		0.5		0.1		0.5		0.5		0.5		0.05		2.5		9.5	10	25	50	50	50	10	10	25	25	50	50	50
Standard Deviation		1		0.1		0		0.61		0		0		3.2		17	0	0	0	0	0	0	0	18	18	0	0	0
Number of Guideline Exceedances	0	0	0	6	0	0	0	1	0	0	0	6	0	1	0	6	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	2	0	0	0	1	0	0	0	0	0	1	0	4	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Description
NEPM 2013 Table 1C GILs, Fresh Waters:A Apply to typical slightly-moderately disturbed systems
B From ADWG
C May not protect key species from chronic toxicity

Env Stds Comments
#1:Very high reliability
#2:Moderate reliability
#3:Low reliability
#4:High reliability
#5:ADWG 2015 Health
#6:NHMRC 2008 Risk in Recreational Water
#7: ANZG (2018) Freshwater 99% toxicant DGVs
#8:Values calculated using hardness of 30 mg/L CaCO3. Refer ANZECC & ARMCANZ (2000) for site specific hardness guidance
#9:Chemical for which possible bioaccumulation and secondary poisoning effects should be considered, refer to ANZECC & ARMCANZ (2000) for further guidance.
#10:Figure may not protect key species from chronic toxicity, refer to ANZECC & ARMCANZ (2000) for further guidance.

Summary of Analytical Results -
Groundwater

ARCADIS Design & Consultancy for natural and built assets	BTEX						PAH																Phenols	
	Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Acenaphthene	Acenaphthylene	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b,h,i)perylene	Benzo(b-i)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenzo(a,h)anthracene	Fluoranthene	Fluorene	Indeno(1,2,3-c,d)pyrene	Naphthalene	Phenanthrene	Pyrene	PAHs (Sum of total)	Phenolics Total
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	1	1	1	2	1	3	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	50
ANZG (2018) Freshwater 95% toxicant DGVs	950 ^{#2}				350 ^{#3}															16 ^{#3}				
NHMRC 2008 Primary Contact Recreation	10 ^{#5}	8000 ^{#5}	3000 ^{#5}			6000 ^{#5}				0.12 ^{#7}	0.1 ^{#6}													
NEPM 2013 Table 1C GILs, Fresh Waters	950				350															16				

Field_ID	Sampled_Date_Time																							
MW01	16-Oct-19	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
MW02	16-Oct-19	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
MW03	23-Oct-19	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
MW04	16-Oct-19	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
MW05	16-Oct-19	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
MW06	16-Oct-19	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-

Statistical Summary																								
Number of Results	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	0
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<1	<1	<1	<2	<1	<3	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	0.5	0.5	0.5	1	0.5	1.5	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Median Concentration	0.5	0.5	0.5	1	0.5	1.5	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Number of Guideline Exceedances	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Description
NEPM 2013 Table 1C GILs, Fresh Waters:A Apply to typ
B From ADWG
C May not protect key species from chronic toxicity

Env Stds Comments
#1:Very high reliability
#2:Moderate reliability
#3:Low reliability
#4:High reliability
#5:ADWG 2015 Health
#6:NHMRC 2008 Risk in Recreational Water
#7: ANZG (2018) Freshwater 99% toxicant DGVs
#8:Values calculated using hardness of 30 mg/L CaCO3.
#9:Chemical for which possible bioaccumulation and se
#10:Figure may not protect key species from chronic to

Summary of Analytical Results -
Groundwater

ARCADIS Design & Consultancy for natural and built assets	PCBs								Organochlorine Pesticides																											
	Arochlor 1016	Arochlor 1221	Arochlor 1232	Arochlor 1242	Arochlor 1248	Arochlor 1254	Arochlor 1260	PCBs (Sum of total)	a-BHC	Aldrin	Dieldrin	Aldrin + Dieldrin	b-BHC	chlordan	d-BHC	DDD	4,4-DDE	DDT	DDT+DDE+DDD	Endrin ketone	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Methoxychlor	Toxaphene	Organochlorine pesticides EPAVic	Other organochlorine pesticides EPAVic				
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	ug/L	ug/L				
EQL	1	1	1	1	1	1	1	1	0.1	0.1	0.1	0.1	0.1	1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	10	1	1				
ANZG (2018) Freshwater 95% toxicant DGVs				0.6 ^{#3}		0.03 ^{#2}								0.08 ^{#2}				0.01 ^{#2}						0.02 ^{#2}		0.2 ^{#2}	0.09 ^{#2}			0.2 ^{#2}						
NHMRC 2008 Primary Contact Recreation												3 ^{#5}		20 ^{#5}				90 ^{#5}								100 ^{#5}	3 ^{#5}									
NEPM 2013 Table 1C GILs, Fresh Waters				0.3 ^{#9}		0.01 ^{#9}								0.03 ^{#9}				0.006 ^{#9}						0.01 ^{#9}		0.2	0.01 ^{#9}			0.1 ^{#9}						

Field_ID	Sampled_Date_Time																																
MW01	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW02	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW03	23-Oct-19	<5	<1	<5	<5	<5	<5	<5	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<1	<1	
MW04	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW05	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW06	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Statistical Summary																																
Number of Results	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<5	<1	<5	<5	<5	<5	<5	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<1	<1	
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<5	<1	<5	<5	<5	<5	<5	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<10	<1	<1	
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration																																
Median Concentration	2.5	0.5	2.5	2.5	2.5	2.5	2.5	0.5	0.05	0.05	0.05	0.05	0.05	0.5	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	5	0.5	0.5
Standard Deviation																																
Number of Guideline Exceedances	1	1	1	1	1	1	1	1	1	1	1	0	0	1	0	0	0	1	0	0	0	0	0	1	0	1	1	1	0	1	0	0
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Env Stds Description
NEPM 2013 Table 1C GILs, Fresh Waters:A Apply to typ
B From ADWG
C May not protect key species from chronic toxicity

Env Stds Comments
#1:Very high reliability
#2:Moderate reliability
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#4:High reliability
#5:ADWG 2015 Health
#6:NHMRC 2008 Risk in Recreational Water
#7: ANZG (2018) Freshwater 99% toxicant DGVs
#8:Values calculated using hardness of 30 mg/L CaCO3.
#9:Chemical for which possible bioaccumulation and se
#10:Figure may not protect key species from chronic to

Summary of Analytical Results -
Groundwater



	Organophosphorous Pesticides																												Pesticides	Herbicides	Halogenated Benzenes				
	Azinophos methyl	Bolstar (Sulprofos)	Chlorfenvinphos	Chlorpyrifos	Chlorpyrifos-methyl	Coumaphos	Demeton-O	Demeton-S	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethoprop	Ethion	Fensulfothion	Fenitrothion	Fenthion	EPN	Malathion	Merphos	Methyl parathion	Mevinphos (Phosdrin)	Naled (Dibrom)	Monocrotophos	Omethoate	Parathion	Phorate	Pyrazophos	Ronnel	Terbufos	Trichloronate	Tetrachlorvinphos	Pririmiphos-methyl	Tokuthion	Hexachlorobenzene
	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	ug/L	ug/L	mg/L	µg/L	
EQL	2	2	2	20	2	20	2	20	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	20	0.002	0.1	
ANZG (2018) Freshwater 95% toxicant DGVs	0.02 ^{#2}			0.01 ^{#3}					0.01 ^{#2}		0.15 ^{#3}					0.2 ^{#2}			0.05 ^{#2}						0.004 ^{#2}										
NHMRC 2008 Primary Contact Recreation	300 ^{#5}	100 ^{#5}	20 ^{#5}	100 ^{#5}					40 ^{#5}	50 ^{#5}	70 ^{#5}	40 ^{#5}	10 ^{#5}	40 ^{#5}	100 ^{#5}	70 ^{#5}	70 ^{#5}		700 ^{#5}		7 ^{#5}	50 ^{#5}		20 ^{#5}	10 ^{#5}	200 ^{#5}		200 ^{#5}		9 ^{#5}		1000 ^{#5}	900 ^{#5}		
NEPM 2013 Table 1C GILs, Fresh Waters				0.01 ^{#9}					0.01		0.15					0.2			0.05						0.004 ^{#10}										

Field_ID	Sampled_Date_Time																																		
MW01	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW02	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW03	23-Oct-19	<2	<2	<2	<20	<2	<20	<2	<20	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<20	<0.002	<0.1		
MW04	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW05	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
MW06	16-Oct-19	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

Statistical Summary																																				
Number of Results	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Number of Detects	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Minimum Concentration	<2	<2	<2	<20	<2	<20	<2	<20	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<20	<0.002	<0.1		
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<2	<2	<2	<20	<2	<20	<2	<20	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<20	<0.002	<0.1			
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration																																				
Median Concentration	1	1	1	10	1	10	1	10	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	10	0.001	0.05
Standard Deviation																																				
Number of Guideline Exceedances	1	0	0	1	0	0	0	0	1	0	1	0	1	0	0	1	0	1	1	0	1	0	0	0	1	1	0	0	0	1	0	0	0	0	0	1
Number of Guideline Exceedances(Detects Only)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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#7: ANZG (2018) Freshwater 99% toxicant DGVs
#8:Values calculated using hardness of 30 mg/L CaCO3.
#9:Chemical for which possible bioaccumulation and se
#10:Figure may not protect key species from chronic to

APPENDIX C LABORATORY REPORTS

Arcadis Australia
Lvl 16/580 George Street
Sydney
NSW 2000



NATA Accredited
Accreditation Number 1261
Site Number 18217

Accredited for compliance with ISO/IEC 17025 – Testing
The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: **Jack Palma**

Report **683212-W**
Project name **MIRVAC - KEMPS CREEK**
Project ID **10035157**
Received Date **Oct 17, 2019**

Client Sample ID			MW01 Water	MW02 Water	MW04 Water	MW05 Water
Sample Matrix			S19-Oc26968	S19-Oc26969	S19-Oc26970	S19-Oc26971
Eurofins Sample No.			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
Date Sampled						
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	82	87	89	89
Polycyclic Aromatic Hydrocarbons (Trace level)						
Acenaphthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Acenaphthylene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benz(a)anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(a)pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(b&j)fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(g,h,i)perylene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(k)fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Chrysene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Dibenz(a,h)anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Fluorene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001

Client Sample ID			MW01 Water	MW02 Water	MW04 Water	MW05 Water
Sample Matrix			S19-Oc26968	S19-Oc26969	S19-Oc26970	S19-Oc26971
Eurofins Sample No.			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
Date Sampled						
Test/Reference	LOR	Unit				
Polycyclic Aromatic Hydrocarbons (Trace level)						
Indeno(1.2.3-cd)pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Naphthalene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Phenanthrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Total PAH*	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
2-Fluorobiphenyl (surr.)	1	%	63	63	68	67
p-Terphenyl-d14 (surr.)	1	%	75	54	86	60
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	0.0003	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	< 0.001	0.009	0.003	< 0.001
Zinc (filtered)	0.005	mg/L	< 0.005	0.010	0.009	< 0.005

Client Sample ID			MW06 Water	DW01 Water	DW02 Water	DW03 Water
Sample Matrix			S19-Oc26972	S19-Oc26973	S19-Oc26974	S19-Oc26975
Eurofins Sample No.			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
Date Sampled						
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.01	mg/L	< 0.01	< 0.01	< 0.01	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1	< 0.1
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	< 0.002
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003	< 0.003
4-Bromofluorobenzene (surr.)	1	%	97	94	93	96

Client Sample ID			MW06 Water S19-Oc26972 Oct 16, 2019	DW01 Water S19-Oc26973 Oct 16, 2019	DW02 Water S19-Oc26974 Oct 16, 2019	DW03 Water S19-Oc26975 Oct 16, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Chlordanes - Total	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
4,4'-DDD	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
4,4'-DDE	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
4,4'-DDT	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
a-BHC	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Aldrin	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
b-BHC	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
d-BHC	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Dieldrin	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Endosulfan I	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Endosulfan II	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Endosulfan sulphate	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Endrin	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Endrin aldehyde	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Endrin ketone	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
g-BHC (Lindane)	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Heptachlor	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Heptachlor epoxide	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Hexachlorobenzene	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Methoxychlor	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Toxaphene	0.01	mg/L	-	< 0.01	< 0.01	< 0.01
Aldrin and Dieldrin (Total)*	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
DDT + DDE + DDD (Total)*	0.0001	mg/L	-	< 0.0001	< 0.0001	< 0.0001
Vic EPA IWRG 621 OCP (Total)*	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Vic EPA IWRG 621 Other OCP (Total)*	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Dibutylchloroendate (surr.)	1	%	-	83	67	54
Tetrachloro-m-xylene (surr.)	1	%	-	58	94	82
Organophosphorus Pesticides						
Azinphos-methyl	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Bolstar	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Chlorfenvinphos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Chlorpyrifos	0.02	mg/L	-	< 0.02	< 0.02	< 0.02
Chlorpyrifos-methyl	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Coumaphos	0.02	mg/L	-	< 0.02	< 0.02	< 0.02
Demeton-S	0.02	mg/L	-	< 0.02	< 0.02	< 0.02
Demeton-O	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Diazinon	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Dichlorvos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Dimethoate	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Disulfoton	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
EPN	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Ethion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Ethoprop	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Ethyl parathion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Fenitrothion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Fensulfothion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Fenthion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Malathion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Merphos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002

Client Sample ID			MW06 Water S19-Oc26972 Oct 16, 2019	DW01 Water S19-Oc26973 Oct 16, 2019	DW02 Water S19-Oc26974 Oct 16, 2019	DW03 Water S19-Oc26975 Oct 16, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Methyl parathion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Mevinphos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Monocrotophos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Naled	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Omethoate	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Phorate	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Pirimiphos-methyl	0.02	mg/L	-	< 0.02	< 0.02	< 0.02
Pyrazophos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Ronnel	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Terbufos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Tetrachlorvinphos	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Tokuthion	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Trichloronate	0.002	mg/L	-	< 0.002	< 0.002	< 0.002
Triphenylphosphate (surr.)	1	%	-	69	77	81
Polychlorinated Biphenyls						
Aroclor-1016	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Aroclor-1221	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Aroclor-1232	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Aroclor-1242	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Aroclor-1248	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Aroclor-1254	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Aroclor-1260	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Total PCB*	0.001	mg/L	-	< 0.001	< 0.001	< 0.001
Dibutylchlorendate (surr.)	1	%	-	83	67	54
Tetrachloro-m-xylene (surr.)	1	%	-	58	94	82
Polycyclic Aromatic Hydrocarbons (Trace level)						
Acenaphthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Acenaphthylene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benz(a)anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(a)pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(b&j)fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(g,h,i)perylene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Benzo(k)fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Chrysene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Dibenz(a,h)anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Fluorene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Indeno(1,2,3-cd)pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Naphthalene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Phenanthrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
Total PAH*	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	< 0.00001
2-Fluorobiphenyl (surr.)	1	%	78	93	78	66
p-Terphenyl-d14 (surr.)	1	%	64	90	73	74
Phenolics (total)	0.05	mg/L	-	< 0.05	< 0.05	< 0.05

Client Sample ID			MW06 Water S19-Oc26972 Oct 16, 2019	DW01 Water S19-Oc26973 Oct 16, 2019	DW02 Water S19-Oc26974 Oct 16, 2019	DW03 Water S19-Oc26975 Oct 16, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Heavy Metals						
Arsenic (filtered)	0.001	mg/L	0.003	0.001	0.002	0.002
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	< 0.001	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	< 0.0001	< 0.0001
Nickel (filtered)	0.001	mg/L	0.002	< 0.001	0.002	0.002
Zinc (filtered)	0.005	mg/L	0.047	< 0.005	< 0.005	< 0.005

Client Sample ID			DW04 Water S19-Oc26976 Oct 16, 2019	DW05 Water S19-Oc26977 Oct 16, 2019	QA1 Water S19-Oc26978 Oct 16, 2019	RINSATE Water S19-Oc26979 Oct 16, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Total Recoverable Hydrocarbons - 2013 NEPM Fractions						
Naphthalene ^{N02}	0.01	mg/L	< 0.01	< 0.01	< 0.01	-
TRH C6-C10	0.02	mg/L	< 0.02	< 0.02	< 0.02	-
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02	< 0.02	< 0.02	-
TRH >C10-C16	0.05	mg/L	< 0.05	< 0.05	< 0.05	-
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	< 0.05	< 0.05	< 0.05	-
TRH >C16-C34	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
TRH >C34-C40	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
Total Recoverable Hydrocarbons - 1999 NEPM Fractions						
TRH C6-C9	0.02	mg/L	< 0.02	< 0.02	< 0.02	-
TRH C10-C14	0.05	mg/L	< 0.05	< 0.05	< 0.05	-
TRH C15-C28	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
TRH C29-C36	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
TRH C10-C36 (Total)	0.1	mg/L	< 0.1	< 0.1	< 0.1	-
BTEX						
Benzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Toluene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Ethylbenzene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
m&p-Xylenes	0.002	mg/L	< 0.002	< 0.002	< 0.002	-
o-Xylene	0.001	mg/L	< 0.001	< 0.001	< 0.001	-
Xylenes - Total	0.003	mg/L	< 0.003	< 0.003	< 0.003	-
4-Bromofluorobenzene (surr.)	1	%	95	81	87	-
Organochlorine Pesticides						
Chlordanes - Total	0.001	mg/L	< 0.001	< 0.001	-	-
4,4'-DDD	0.0001	mg/L	< 0.0001	< 0.0001	-	-
4,4'-DDE	0.0001	mg/L	< 0.0001	< 0.0001	-	-
4,4'-DDT	0.0001	mg/L	< 0.0001	< 0.0001	-	-
a-BHC	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Aldrin	0.0001	mg/L	< 0.0001	< 0.0001	-	-
b-BHC	0.0001	mg/L	< 0.0001	< 0.0001	-	-
d-BHC	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Dieldrin	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Endosulfan I	0.0001	mg/L	< 0.0001	< 0.0001	-	-

Client Sample ID			DW04 Water S19-Oc26976 Oct 16, 2019	DW05 Water S19-Oc26977 Oct 16, 2019	QA1 Water S19-Oc26978 Oct 16, 2019	RINSATE Water S19-Oc26979 Oct 16, 2019
Sample Matrix						
Eurofins Sample No.						
Date Sampled						
Test/Reference	LOR	Unit				
Organochlorine Pesticides						
Endosulfan II	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Endosulfan sulphate	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Endrin	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Endrin aldehyde	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Endrin ketone	0.0001	mg/L	< 0.0001	< 0.0001	-	-
g-BHC (Lindane)	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Heptachlor	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Heptachlor epoxide	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Hexachlorobenzene	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Methoxychlor	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Toxaphene	0.01	mg/L	< 0.01	< 0.01	-	-
Aldrin and Dieldrin (Total)*	0.0001	mg/L	< 0.0001	< 0.0001	-	-
DDT + DDE + DDD (Total)*	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Vic EPA IWRG 621 OCP (Total)*	0.001	mg/L	< 0.001	< 0.001	-	-
Vic EPA IWRG 621 Other OCP (Total)*	0.001	mg/L	< 0.001	< 0.001	-	-
Dibutylchloroendate (surr.)	1	%	114	58	-	-
Tetrachloro-m-xylene (surr.)	1	%	78	82	-	-
Organophosphorus Pesticides						
Azinphos-methyl	0.002	mg/L	< 0.002	< 0.002	-	-
Bolstar	0.002	mg/L	< 0.002	< 0.002	-	-
Chlorfenvinphos	0.002	mg/L	< 0.002	< 0.002	-	-
Chlorpyrifos	0.02	mg/L	< 0.02	< 0.02	-	-
Chlorpyrifos-methyl	0.002	mg/L	< 0.002	< 0.002	-	-
Coumaphos	0.02	mg/L	< 0.02	< 0.02	-	-
Demeton-S	0.02	mg/L	< 0.02	< 0.02	-	-
Demeton-O	0.002	mg/L	< 0.002	< 0.002	-	-
Diazinon	0.002	mg/L	< 0.002	< 0.002	-	-
Dichlorvos	0.002	mg/L	< 0.002	< 0.002	-	-
Dimethoate	0.002	mg/L	< 0.002	< 0.002	-	-
Disulfoton	0.002	mg/L	< 0.002	< 0.002	-	-
EPN	0.002	mg/L	< 0.002	< 0.002	-	-
Ethion	0.002	mg/L	< 0.002	< 0.002	-	-
Ethoprop	0.002	mg/L	< 0.002	< 0.002	-	-
Ethyl parathion	0.002	mg/L	< 0.002	< 0.002	-	-
Fenitrothion	0.002	mg/L	< 0.002	< 0.002	-	-
Fensulfothion	0.002	mg/L	< 0.002	< 0.002	-	-
Fenthion	0.002	mg/L	< 0.002	< 0.002	-	-
Malathion	0.002	mg/L	< 0.002	< 0.002	-	-
Merphos	0.002	mg/L	< 0.002	< 0.002	-	-
Methyl parathion	0.002	mg/L	< 0.002	< 0.002	-	-
Mevinphos	0.002	mg/L	< 0.002	< 0.002	-	-
Monocrotophos	0.002	mg/L	< 0.002	< 0.002	-	-
Naled	0.002	mg/L	< 0.002	< 0.002	-	-
Omethoate	0.002	mg/L	< 0.002	< 0.002	-	-
Phorate	0.002	mg/L	< 0.002	< 0.002	-	-
Pirimiphos-methyl	0.02	mg/L	< 0.02	< 0.02	-	-
Pyrazophos	0.002	mg/L	< 0.002	< 0.002	-	-
Ronnel	0.002	mg/L	< 0.002	< 0.002	-	-
Terbufos	0.002	mg/L	< 0.002	< 0.002	-	-

Client Sample ID			DW04 Water	DW05 Water	QA1 Water	RINSATE Water
Sample Matrix			S19-Oc26976	S19-Oc26977	S19-Oc26978	S19-Oc26979
Eurofins Sample No.			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
Date Sampled						
Test/Reference	LOR	Unit				
Organophosphorus Pesticides						
Tetrachlorvinphos	0.002	mg/L	< 0.002	< 0.002	-	-
Tokuthion	0.002	mg/L	< 0.002	< 0.002	-	-
Trichloronate	0.002	mg/L	< 0.002	< 0.002	-	-
Triphenylphosphate (surr.)	1	%	88	60	-	-
Polychlorinated Biphenyls						
Aroclor-1016	0.001	mg/L	< 0.001	< 0.001	-	-
Aroclor-1221	0.001	mg/L	< 0.001	< 0.001	-	-
Aroclor-1232	0.001	mg/L	< 0.001	< 0.001	-	-
Aroclor-1242	0.001	mg/L	< 0.001	< 0.001	-	-
Aroclor-1248	0.001	mg/L	< 0.001	< 0.001	-	-
Aroclor-1254	0.001	mg/L	< 0.001	< 0.001	-	-
Aroclor-1260	0.001	mg/L	< 0.001	< 0.001	-	-
Total PCB*	0.001	mg/L	< 0.001	< 0.001	-	-
Dibutylchloroendate (surr.)	1	%	114	58	-	-
Tetrachloro-m-xylene (surr.)	1	%	78	82	-	-
Polycyclic Aromatic Hydrocarbons (Trace level)						
Acenaphthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Acenaphthylene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Benz(a)anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Benzo(a)pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Benzo(b&j)fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Benzo(g,h,i)perylene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Benzo(k)fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Chrysene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Dibenz(a,h)anthracene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Fluoranthene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Fluorene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Indeno(1,2,3-cd)pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Naphthalene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Phenanthrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Pyrene	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
Total PAH*	0.00001	mg/L	< 0.00001	< 0.00001	< 0.00001	-
2-Fluorobiphenyl (surr.)	1	%	67	66	89	-
p-Terphenyl-d14 (surr.)	1	%	56	61	70	-
Phenolics (total)	0.05	mg/L	< 0.05	< 0.05	-	-
Heavy Metals						
Arsenic	0.001	mg/L	-	-	0.004	< 0.001
Arsenic (filtered)	0.001	mg/L	0.001	0.002	-	-
Cadmium	0.0002	mg/L	-	-	< 0.0002	< 0.0002
Cadmium (filtered)	0.0002	mg/L	< 0.0002	< 0.0002	-	-
Chromium	0.001	mg/L	-	-	< 0.001	< 0.001
Chromium (filtered)	0.001	mg/L	< 0.001	< 0.001	-	-
Copper	0.001	mg/L	-	-	< 0.001	< 0.001
Copper (filtered)	0.001	mg/L	< 0.001	< 0.001	-	-
Lead	0.001	mg/L	-	-	< 0.001	< 0.001
Lead (filtered)	0.001	mg/L	< 0.001	< 0.001	-	-
Mercury	0.0001	mg/L	-	-	< 0.0001	< 0.0001

Client Sample ID			DW04	DW05	QA1	RINSATE
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			S19-Oc26976	S19-Oc26977	S19-Oc26978	S19-Oc26979
Date Sampled			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
Test/Reference	LOR	Unit				
Heavy Metals						
Mercury (filtered)	0.0001	mg/L	< 0.0001	< 0.0001	-	-
Nickel	0.001	mg/L	-	-	0.004	< 0.001
Nickel (filtered)	0.001	mg/L	0.001	0.002	-	-
Zinc	0.005	mg/L	-	-	0.032	< 0.005
Zinc (filtered)	0.005	mg/L	< 0.005	< 0.005	-	-

Client Sample ID			R20TS	TB
Sample Matrix			Water	Water
Eurofins Sample No.			S19-Oc26980	S19-Oc26981
Date Sampled			Oct 16, 2019	Oct 16, 2019
Test/Reference	LOR	Unit		
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				
Naphthalene ^{N02}	0.01	mg/L	88	< 0.01
TRH C6-C10	0.02	mg/L	72	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	-	< 0.02
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				
TRH C6-C9	0.02	mg/L	71	< 0.02
BTEX				
Benzene	0.001	mg/L	93	< 0.001
Toluene	0.001	mg/L	95	< 0.001
Ethylbenzene	0.001	mg/L	91	< 0.001
m&p-Xylenes	0.002	mg/L	88	< 0.002
o-Xylene	0.001	mg/L	95	< 0.001
Xylenes - Total	0.003	mg/L	90	< 0.003
4-Bromofluorobenzene (surr.)	1	%	98	87

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - Method: LTM-ORG-2010 TRH C6-C40	Melbourne	Oct 21, 2019	7 Days
Eurofins mgt Suite B7 (filtered metals/PAH trace level)			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Melbourne	Oct 21, 2019	7 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Melbourne	Oct 21, 2019	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Melbourne	Oct 21, 2019	7 Days
BTEX - Method: LTM-ORG-2010 TRH C6-C40	Melbourne	Oct 21, 2019	14 Days
Polycyclic Aromatic Hydrocarbons (Trace level) - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water (trace)	Melbourne	Oct 21, 2019	7 Days
Metals M8 filtered - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Melbourne	Oct 21, 2019	28 Days
Eurofins mgt Suite B15			
Organochlorine Pesticides - Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8270)	Melbourne	Oct 21, 2019	7 Days
Organophosphorus Pesticides - Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS (USEPA 8081)	Melbourne	Oct 21, 2019	7 Days
Polychlorinated Biphenyls - Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8082)	Melbourne	Oct 21, 2019	7 Days
Phenolics (total) - Method: LTM-INO-4050 Total Phenolics in Waters and solids by CFA	Melbourne	Oct 21, 2019	7 Days
Eurofins mgt Suite B7 (PAH trace level)			
Metals M8 - Method:	Melbourne	Oct 21, 2019	180 Days

Company Name: Arcadis Australia
Address: Lvl 16/580 George Street
Sydney
NSW 2000

Project Name: MIRVAC - KEMPS CREEK
Project ID: 10035157

Order No.:
Report #: 683212
Phone: 02 8907 9000
Fax:

Received: Oct 17, 2019 4:33 PM
Due: Oct 24, 2019
Priority: 5 Day
Contact Name: Jack Palma

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Asbestos Absence / Presence	HOLD	Phenolics (total)	Metals M7	Metals M8	Eurofins mgt Suite B15	Moisture Set	BTEXN and Volatile TRH	Eurofins mgt Suite B7 (PAH trace level)	Eurofins mgt Suite B7 (filtered metals/PAH trace level)
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X									
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
External Laboratory															
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID										
1	MW01	Oct 16, 2019		Water	S19-Oc26968										X
2	MW02	Oct 16, 2019		Water	S19-Oc26969										X
3	MW04	Oct 16, 2019		Water	S19-Oc26970										X
4	MW05	Oct 16, 2019		Water	S19-Oc26971										X
5	MW06	Oct 16, 2019		Water	S19-Oc26972										X
6	DW01	Oct 16, 2019		Water	S19-Oc26973			X			X				X
7	DW02	Oct 16, 2019		Water	S19-Oc26974			X			X				X
8	DW03	Oct 16, 2019		Water	S19-Oc26975			X			X				X
9	DW04	Oct 16, 2019		Water	S19-Oc26976			X			X				X

Company Name: Arcadis Australia
Address: Lvl 16/580 George Street
Sydney
NSW 2000
Project Name: MIRVAC - KEMPS CREEK
Project ID: 10035157

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Received: Oct 17, 2019 4:33 PM
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Contact Name: Jack Palma

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Asbestos Absence / Presence	HOLD	Phenolics (total)	Metals M7	Metals M8	Eurofins mgt Suite B15	Moisture Set	BTEXN and Volatile TRH	Eurofins mgt Suite B7 (PAH trace level)	Eurofins mgt Suite B7 (filtered metals/PAH trace level)
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X									
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
10	DW05	Oct 16, 2019		Water	S19-Oc26977			X			X				X
11	QA1	Oct 16, 2019		Water	S19-Oc26978									X	
12	RINSATE	Oct 16, 2019		Water	S19-Oc26979					X					
13	TS	Oct 16, 2019		Water	S19-Oc26980								X		
14	TB	Oct 16, 2019		Water	S19-Oc26981								X		
15	SO01	Oct 16, 2019		Soil	S19-Oc26982				X			X			
16	SO02	Oct 16, 2019		Soil	S19-Oc26983		X								
17	SO03	Oct 16, 2019		Soil	S19-Oc26984				X			X			
18	SO04	Oct 16, 2019		Soil	S19-Oc26985				X			X			
19	SO05	Oct 16, 2019		Soil	S19-Oc26986		X								
20	ASB01	Oct 16, 2019		Building Materials	S19-Oc26987	X									

Company Name: Arcadis Australia
Address: Lvl 16/580 George Street
Sydney
NSW 2000
Project Name: MIRVAC - KEMPS CREEK
Project ID: 10035157

Order No.:
Report #: 683212
Phone: 02 8907 9000
Fax:

Received: Oct 17, 2019 4:33 PM
Due: Oct 24, 2019
Priority: 5 Day
Contact Name: Jack Palma

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Asbestos Absence / Presence	HOLD	Phenolics (total)	Metals M7	Metals M8	Eurofins mgt Suite B15	Moisture Set	BTEXN and Volatile TRH	Eurofins mgt Suite B7 (PAH trace level)	Eurofins mgt Suite B7 (filtered metals/PAH trace level)
Melbourne Laboratory - NATA Site # 1254 & 14271							X	X	X	X	X	X	X	X	X
Sydney Laboratory - NATA Site # 18217						X									
Brisbane Laboratory - NATA Site # 20794															
Perth Laboratory - NATA Site # 23736															
21	ASB02	Oct 16, 2019		Building Materials	S19-Oc26988	X									
22	ASB03	Oct 16, 2019		Building Materials	S19-Oc26989	X									
23	ASB04	Oct 16, 2019		Building Materials	S19-Oc26990	X									
Test Counts						4	2	5	3	1	5	3	2	1	10

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/L	< 0.001			0.001	Pass	
4,4'-DDD	mg/L	< 0.0001			0.0001	Pass	
4,4'-DDE	mg/L	< 0.0001			0.0001	Pass	
4,4'-DDT	mg/L	< 0.0001			0.0001	Pass	
a-BHC	mg/L	< 0.0001			0.0001	Pass	
Aldrin	mg/L	< 0.0001			0.0001	Pass	
b-BHC	mg/L	< 0.0001			0.0001	Pass	
d-BHC	mg/L	< 0.0001			0.0001	Pass	
Dieldrin	mg/L	< 0.0001			0.0001	Pass	
Endosulfan I	mg/L	< 0.0001			0.0001	Pass	
Endosulfan II	mg/L	< 0.0001			0.0001	Pass	
Endosulfan sulphate	mg/L	< 0.0001			0.0001	Pass	
Endrin	mg/L	< 0.0001			0.0001	Pass	
Endrin aldehyde	mg/L	< 0.0001			0.0001	Pass	
Endrin ketone	mg/L	< 0.0001			0.0001	Pass	
g-BHC (Lindane)	mg/L	< 0.0001			0.0001	Pass	
Heptachlor	mg/L	< 0.0001			0.0001	Pass	
Heptachlor epoxide	mg/L	< 0.0001			0.0001	Pass	
Hexachlorobenzene	mg/L	< 0.0001			0.0001	Pass	
Methoxychlor	mg/L	< 0.0001			0.0001	Pass	
Toxaphene	mg/L	< 0.01			0.01	Pass	
Method Blank							
Organophosphorus Pesticides							
Azinphos-methyl	mg/L	< 0.002			0.002	Pass	
Bolstar	mg/L	< 0.002			0.002	Pass	
Chlorfenvinphos	mg/L	< 0.002			0.002	Pass	
Chlorpyrifos	mg/L	< 0.02			0.02	Pass	
Chlorpyrifos-methyl	mg/L	< 0.002			0.002	Pass	
Coumaphos	mg/L	< 0.02			0.02	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Demeton-S	mg/L	< 0.02			0.02	Pass	
Demeton-O	mg/L	< 0.002			0.002	Pass	
Diazinon	mg/L	< 0.002			0.002	Pass	
Dichlorvos	mg/L	< 0.002			0.002	Pass	
Dimethoate	mg/L	< 0.002			0.002	Pass	
Disulfoton	mg/L	< 0.002			0.002	Pass	
EPN	mg/L	< 0.002			0.002	Pass	
Ethion	mg/L	< 0.002			0.002	Pass	
Ethoprop	mg/L	< 0.002			0.002	Pass	
Ethyl parathion	mg/L	< 0.002			0.002	Pass	
Fenitrothion	mg/L	< 0.002			0.002	Pass	
Fensulfothion	mg/L	< 0.002			0.002	Pass	
Fenthion	mg/L	< 0.002			0.002	Pass	
Malathion	mg/L	< 0.002			0.002	Pass	
Merphos	mg/L	< 0.002			0.002	Pass	
Methyl parathion	mg/L	< 0.002			0.002	Pass	
Mevinphos	mg/L	< 0.002			0.002	Pass	
Monocrotophos	mg/L	< 0.002			0.002	Pass	
Naled	mg/L	< 0.002			0.002	Pass	
Omethoate	mg/L	< 0.002			0.002	Pass	
Phorate	mg/L	< 0.002			0.002	Pass	
Pirimiphos-methyl	mg/L	< 0.02			0.02	Pass	
Pyrazophos	mg/L	< 0.002			0.002	Pass	
Ronnel	mg/L	< 0.002			0.002	Pass	
Terbufos	mg/L	< 0.002			0.002	Pass	
Tetrachlorvinphos	mg/L	< 0.002			0.002	Pass	
Tokuthion	mg/L	< 0.002			0.002	Pass	
Trichloronate	mg/L	< 0.002			0.002	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/L	< 0.001			0.001	Pass	
Aroclor-1221	mg/L	< 0.001			0.001	Pass	
Aroclor-1232	mg/L	< 0.001			0.001	Pass	
Aroclor-1242	mg/L	< 0.001			0.001	Pass	
Aroclor-1248	mg/L	< 0.001			0.001	Pass	
Aroclor-1254	mg/L	< 0.001			0.001	Pass	
Aroclor-1260	mg/L	< 0.001			0.001	Pass	
Total PCB*	mg/L	< 0.001			0.001	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons (Trace level)							
Acenaphthene	mg/L	< 0.00001			0.00001	Pass	
Acenaphthylene	mg/L	< 0.00001			0.00001	Pass	
Anthracene	mg/L	< 0.00001			0.00001	Pass	
Benz(a)anthracene	mg/L	< 0.00001			0.00001	Pass	
Benzo(a)pyrene	mg/L	< 0.00001			0.00001	Pass	
Benzo(b&j)fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Benzo(g,h,i)perylene	mg/L	< 0.00001			0.00001	Pass	
Benzo(k)fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Chrysene	mg/L	< 0.00001			0.00001	Pass	
Dibenz(a,h)anthracene	mg/L	< 0.00001			0.00001	Pass	
Fluoranthene	mg/L	< 0.00001			0.00001	Pass	
Fluorene	mg/L	< 0.00001			0.00001	Pass	
Indeno(1,2,3-cd)pyrene	mg/L	< 0.00001			0.00001	Pass	
Naphthalene	mg/L	< 0.00001			0.00001	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Phenanthrene	mg/L	< 0.00001			0.00001	Pass	
Pyrene	mg/L	< 0.00001			0.00001	Pass	
Total PAH*	mg/L	< 0			0.00001	Pass	
Method Blank							
Phenolics (total)	mg/L	< 0.05			0.05	Pass	
Method Blank							
Heavy Metals							
Arsenic	mg/L	< 0.001			0.001	Pass	
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium	mg/L	< 0.0002			0.0002	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium	mg/L	< 0.001			0.001	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury	mg/L	< 0.0001			0.0001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel	mg/L	< 0.001			0.001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc	mg/L	< 0.005			0.005	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	85			70-130	Pass	
TRH C6-C10	%	98			70-130	Pass	
TRH >C10-C16	%	76			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	95			70-130	Pass	
TRH C10-C14	%	79			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	92			70-130	Pass	
Toluene	%	89			70-130	Pass	
Ethylbenzene	%	82			70-130	Pass	
m&p-Xylenes	%	81			70-130	Pass	
Xylenes - Total	%	82			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	114			70-130	Pass	
4,4'-DDD	%	104			70-130	Pass	
4,4'-DDE	%	105			70-130	Pass	
4,4'-DDT	%	97			70-130	Pass	
a-BHC	%	113			70-130	Pass	
Aldrin	%	94			70-130	Pass	
b-BHC	%	110			70-130	Pass	
d-BHC	%	112			70-130	Pass	
Dieldrin	%	90			70-130	Pass	
Endosulfan I	%	93			70-130	Pass	
Endosulfan II	%	104			70-130	Pass	
Endosulfan sulphate	%	94			70-130	Pass	
Endrin	%	94			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Endrin aldehyde			%	126			70-130	Pass	
Endrin ketone			%	104			70-130	Pass	
g-BHC (Lindane)			%	124			70-130	Pass	
Heptachlor			%	95			70-130	Pass	
Heptachlor epoxide			%	97			70-130	Pass	
Hexachlorobenzene			%	114			70-130	Pass	
Methoxychlor			%	86			70-130	Pass	
LCS - % Recovery									
Organophosphorus Pesticides									
Diazinon		%	115				70-130	Pass	
Dimethoate		%	80				70-130	Pass	
Ethion		%	110				70-130	Pass	
Fenitrothion		%	103				70-130	Pass	
Methyl parathion		%	102				70-130	Pass	
Mevinphos		%	98				70-130	Pass	
LCS - % Recovery									
Polychlorinated Biphenyls									
Aroclor-1260		%	120				70-130	Pass	
LCS - % Recovery									
Polycyclic Aromatic Hydrocarbons (Trace level)									
Acenaphthene		%	79				70-130	Pass	
Acenaphthylene		%	77				70-130	Pass	
Anthracene		%	72				70-130	Pass	
Benz(a)anthracene		%	99				70-130	Pass	
Benzo(a)pyrene		%	101				70-130	Pass	
Benzo(b&j)fluoranthene		%	77				70-130	Pass	
Benzo(g,h,i)perylene		%	78				70-130	Pass	
Benzo(k)fluoranthene		%	89				70-130	Pass	
Chrysene		%	82				70-130	Pass	
Dibenz(a,h)anthracene		%	93				70-130	Pass	
Fluoranthene		%	77				70-130	Pass	
Fluorene		%	83				70-130	Pass	
Indeno(1.2.3-cd)pyrene		%	72				70-130	Pass	
Naphthalene		%	86				70-130	Pass	
Phenanthrene		%	83				70-130	Pass	
Pyrene		%	82				70-130	Pass	
LCS - % Recovery									
Phenolics (total)		%	100				70-130	Pass	
LCS - % Recovery									
Heavy Metals									
Arsenic		%	95				80-120	Pass	
Cadmium		%	97				80-120	Pass	
Chromium		%	97				80-120	Pass	
Copper		%	96				80-120	Pass	
Lead		%	95				80-120	Pass	
Mercury		%	95				75-125	Pass	
Nickel		%	95				80-120	Pass	
Zinc		%	97				80-120	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1					
TRH >C10-C16		W19-Oc25712	NCP	%	90		70-130	Pass	
Spike - % Recovery									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1					

Test	Lab Sample ID	QA Source	Units	Result 1		Acceptance Limits	Pass Limits	Qualifying Code
TRH C10-C14	W19-Oc25712	NCP	%	95		70-130	Pass	
Spike - % Recovery								
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1				
Naphthalene	S19-Oc26969	CP	%	72		70-130	Pass	
TRH C6-C10	S19-Oc26969	CP	%	94		70-130	Pass	
Spike - % Recovery								
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1				
TRH C6-C9	S19-Oc26969	CP	%	95		70-130	Pass	
Spike - % Recovery								
BTEX				Result 1				
Benzene	S19-Oc26969	CP	%	98		70-130	Pass	
Toluene	S19-Oc26969	CP	%	97		70-130	Pass	
Ethylbenzene	S19-Oc26969	CP	%	94		70-130	Pass	
m&p-Xylenes	S19-Oc26969	CP	%	90		70-130	Pass	
o-Xylene	S19-Oc26969	CP	%	92		70-130	Pass	
Xylenes - Total	S19-Oc26969	CP	%	91		70-130	Pass	
Spike - % Recovery								
Polycyclic Aromatic Hydrocarbons (Trace level)				Result 1				
Acenaphthene	B19-Oc28739	NCP	%	85		70-130	Pass	
Acenaphthylene	B19-Oc28739	NCP	%	91		70-130	Pass	
Anthracene	B19-Oc28739	NCP	%	81		70-130	Pass	
Benz(a)anthracene	B19-Oc28739	NCP	%	77		70-130	Pass	
Benzo(a)pyrene	B19-Oc28739	NCP	%	84		70-130	Pass	
Benzo(b&j)fluoranthene	B19-Oc28739	NCP	%	76		70-130	Pass	
Benzo(g,h,i)perylene	B19-Oc28739	NCP	%	87		70-130	Pass	
Benzo(k)fluoranthene	B19-Oc28739	NCP	%	106		70-130	Pass	
Chrysene	B19-Oc28739	NCP	%	100		70-130	Pass	
Dibenz(a,h)anthracene	B19-Oc28739	NCP	%	73		70-130	Pass	
Fluoranthene	B19-Oc28739	NCP	%	92		70-130	Pass	
Fluorene	B19-Oc28739	NCP	%	98		70-130	Pass	
Indeno(1,2,3-cd)pyrene	B19-Oc28739	NCP	%	121		70-130	Pass	
Naphthalene	B19-Oc28739	NCP	%	73		70-130	Pass	
Phenanthrene	B19-Oc28739	NCP	%	84		70-130	Pass	
Pyrene	B19-Oc28739	NCP	%	87		70-130	Pass	
Spike - % Recovery								
Organochlorine Pesticides				Result 1				
4,4'-DDE	M19-Oc18417	NCP	%	90		70-130	Pass	
a-BHC	M19-Oc18417	NCP	%	111		70-130	Pass	
Aldrin	M19-Oc18417	NCP	%	75		70-130	Pass	
b-BHC	M19-Oc18417	NCP	%	94		70-130	Pass	
d-BHC	M19-Oc18417	NCP	%	99		70-130	Pass	
Dieldrin	M19-Oc18417	NCP	%	85		70-130	Pass	
Endosulfan I	M19-Oc18417	NCP	%	83		70-130	Pass	
Endosulfan II	M19-Oc18417	NCP	%	88		70-130	Pass	
Endrin	M19-Oc18417	NCP	%	87		70-130	Pass	
Endrin aldehyde	M19-Oc18417	NCP	%	82		70-130	Pass	
g-BHC (Lindane)	M19-Oc18417	NCP	%	122		70-130	Pass	
Heptachlor	M19-Oc18417	NCP	%	71		70-130	Pass	
Heptachlor epoxide	M19-Oc18417	NCP	%	74		70-130	Pass	
Hexachlorobenzene	M19-Oc18417	NCP	%	124		70-130	Pass	
Spike - % Recovery								
Organophosphorus Pesticides				Result 1				
Diazinon	B19-Oc28018	NCP	%	99		70-130	Pass	
Dimethoate	B19-Oc28018	NCP	%	75		70-130	Pass	

Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Ethion	B19-Oc28018	NCP	%	90			70-130	Pass	
Fenitrothion	B19-Oc28018	NCP	%	108			70-130	Pass	
Methyl parathion	B19-Oc28018	NCP	%	91			70-130	Pass	
Mevinphos	B19-Oc28018	NCP	%	103			70-130	Pass	
Spike - % Recovery									
				Result 1					
Phenolics (total)	S19-Oc26973	CP	%	106			70-130	Pass	
Spike - % Recovery									
				Result 1					
Heavy Metals									
				Result 1					
Arsenic (filtered)	S19-Oc26975	CP	%	92			70-130	Pass	
Cadmium (filtered)	S19-Oc26975	CP	%	88			70-130	Pass	
Chromium (filtered)	S19-Oc26975	CP	%	93			70-130	Pass	
Copper (filtered)	S19-Oc26975	CP	%	90			70-130	Pass	
Lead (filtered)	S19-Oc26975	CP	%	88			70-130	Pass	
Mercury (filtered)	S19-Oc26975	CP	%	80			70-130	Pass	
Nickel (filtered)	S19-Oc26975	CP	%	88			70-130	Pass	
Zinc (filtered)	S19-Oc26975	CP	%	90			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Total Recoverable Hydrocarbons - 2013 NEPM Fractions				Result 1	Result 2	RPD			
Naphthalene	S19-Oc26968	CP	mg/L	< 0.01	< 0.01	<1	30%	Pass	
TRH C6-C10	S19-Oc26968	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH >C10-C16	S19-Oc28806	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
Duplicate									
Total Recoverable Hydrocarbons - 1999 NEPM Fractions				Result 1	Result 2	RPD			
TRH C6-C9	S19-Oc26968	CP	mg/L	< 0.02	< 0.02	<1	30%	Pass	
TRH C10-C14	S19-Oc28806	NCP	mg/L	< 0.05	< 0.05	<1	30%	Pass	
TRH C15-C28	S19-Oc28806	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
TRH C29-C36	S19-Oc28806	NCP	mg/L	< 0.1	< 0.1	<1	30%	Pass	
Duplicate									
BTEX				Result 1	Result 2	RPD			
Benzene	S19-Oc26968	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Toluene	S19-Oc26968	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Ethylbenzene	S19-Oc26968	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
m&p-Xylenes	S19-Oc26968	CP	mg/L	< 0.002	< 0.002	<1	30%	Pass	
o-Xylene	S19-Oc26968	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Xylenes - Total	S19-Oc26968	CP	mg/L	< 0.003	< 0.003	<1	30%	Pass	
Duplicate									
Polycyclic Aromatic Hydrocarbons (Trace level)				Result 1	Result 2	RPD			
Acenaphthene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Acenaphthylene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Anthracene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Benz(a)anthracene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Benzo(a)pyrene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Benzo(b&j)fluoranthene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Benzo(g,h,i)perylene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Benzo(k)fluoranthene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Chrysene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Dibenz(a,h)anthracene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Fluoranthene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Fluorene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Indeno(1,2,3-cd)pyrene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Naphthalene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Phenanthrene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	
Pyrene	B19-Oc28738	NCP	mg/L	< 0.00001	< 0.00001	<1	30%	Pass	

Duplicate								
Organochlorine Pesticides				Result 1	Result 2	RPD		
Chlordanes - Total	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
4,4'-DDD	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
4,4'-DDE	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
4,4'-DDT	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
a-BHC	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Aldrin	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
b-BHC	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
d-BHC	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Dieldrin	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Endosulfan I	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Endosulfan II	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Endosulfan sulphate	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Endrin	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Endrin aldehyde	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Endrin ketone	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
g-BHC (Lindane)	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Heptachlor	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Heptachlor epoxide	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Hexachlorobenzene	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Methoxychlor	M19-Oc24938	NCP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Duplicate								
Organophosphorus Pesticides				Result 1	Result 2	RPD		
Azinphos-methyl	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Bolstar	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Chlorfenvinphos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Chlorpyrifos	M19-Oc24938	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass
Chlorpyrifos-methyl	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Coumaphos	M19-Oc24938	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass
Demeton-S	M19-Oc24938	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass
Demeton-O	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Diazinon	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Dichlorvos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Dimethoate	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Disulfoton	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
EPN	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Ethion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Ethoprop	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Ethyl parathion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Fenitrothion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Fensulfthion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Fenthion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Malathion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Merphos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Methyl parathion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Mevinphos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Monocrotophos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Naled	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Omethoate	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Phorate	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Pirimiphos-methyl	M19-Oc24938	NCP	mg/L	< 0.02	< 0.02	<1	30%	Pass
Pyrazophos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Ronnel	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Terbufos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Tetrachlorvinphos	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass

Duplicate								
Organophosphorus Pesticides				Result 1	Result 2	RPD		
Tokuthion	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Trichloronate	M19-Oc24938	NCP	mg/L	< 0.002	< 0.002	<1	30%	Pass
Duplicate								
Polychlorinated Biphenyls				Result 1	Result 2	RPD		
Aroclor-1016	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Aroclor-1221	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Aroclor-1232	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Aroclor-1242	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Aroclor-1248	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Aroclor-1254	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Aroclor-1260	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Total PCB*	M19-Oc24938	NCP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Duplicate								
				Result 1	Result 2	RPD		
Phenolics (total)	S19-Oc26973	CP	mg/L	< 0.05	< 0.05	<1	30%	Pass
Duplicate								
Heavy Metals				Result 1	Result 2	RPD		
Arsenic (filtered)	S19-Oc26975	CP	mg/L	0.002	0.002	1.0	30%	Pass
Cadmium (filtered)	S19-Oc26975	CP	mg/L	< 0.0002	< 0.0002	<1	30%	Pass
Chromium (filtered)	S19-Oc26975	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Copper (filtered)	S19-Oc26975	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Lead (filtered)	S19-Oc26975	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass
Mercury (filtered)	S19-Oc26975	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass
Nickel (filtered)	S19-Oc26975	CP	mg/L	0.002	0.002	4.0	30%	Pass
Zinc (filtered)	S19-Oc26975	CP	mg/L	< 0.005	< 0.005	<1	30%	Pass

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.
R20	This sample is a Trip Spike and therefore all results are reported as a percentage

Authorised By

Ursula Long	Analytical Services Manager
Emily Rosenberg	Senior Analyst-Metal (VIC)
Harry Bacalis	Senior Analyst-Volatile (VIC)
Joseph Edouard	Senior Analyst-Organic (VIC)
Julie Kay	Senior Analyst-Inorganic (VIC)



Glenn Jackson General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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The results of the tests, calibrations and/or
measurements included in this document are traceable
to Australian/national standards.

Attention: **Jack Palma**

Report **684323-W**
Project name **MIRVAC - KEMPS CREEK**
Project ID **10035157**
Received Date **Oct 24, 2019**

Client Sample ID			MW03
Sample Matrix			Water
Eurofins Sample No.			S19-Oc37310
Date Sampled			Oct 23, 2019
Test/Reference	LOR	Unit	
Total Recoverable Hydrocarbons - 1999 NEPM Fractions			
TRH C6-C9	0.02	mg/L	< 0.02
TRH C10-C14	0.05	mg/L	< 0.05
TRH C15-C28	0.1	mg/L	< 0.1
TRH C29-C36	0.1	mg/L	< 0.1
TRH C10-C36 (Total)	0.1	mg/L	< 0.1
BTEX			
Benzene	0.001	mg/L	< 0.001
Toluene	0.001	mg/L	< 0.001
Ethylbenzene	0.001	mg/L	< 0.001
m&p-Xylenes	0.002	mg/L	< 0.002
o-Xylene	0.001	mg/L	< 0.001
Xylenes - Total	0.003	mg/L	< 0.003
4-Bromofluorobenzene (surr.)	1	%	83
Total Recoverable Hydrocarbons - 2013 NEPM Fractions			
Naphthalene ^{N02}	0.01	mg/L	< 0.01
TRH C6-C10	0.02	mg/L	< 0.02
TRH C6-C10 less BTEX (F1) ^{N04}	0.02	mg/L	< 0.02
TRH >C10-C16	0.05	mg/L	0.07
TRH >C10-C16 less Naphthalene (F2) ^{N01}	0.05	mg/L	0.07
TRH >C16-C34	0.1	mg/L	< 0.1
TRH >C34-C40	0.1	mg/L	< 0.1
TRH >C10-C40 (total)*	0.1	mg/L	< 0.1
Organochlorine Pesticides			
Chlordanes - Total	0.001	mg/L	< 0.001
4,4'-DDD	0.0001	mg/L	< 0.0001
4,4'-DDE	0.0001	mg/L	< 0.0001
4,4'-DDT	0.0001	mg/L	< 0.0001
a-BHC	0.0001	mg/L	< 0.0001
Aldrin	0.0001	mg/L	< 0.0001
b-BHC	0.0001	mg/L	< 0.0001
d-BHC	0.0001	mg/L	< 0.0001
Dieldrin	0.0001	mg/L	< 0.0001
Endosulfan I	0.0001	mg/L	< 0.0001
Endosulfan II	0.0001	mg/L	< 0.0001
Endosulfan sulphate	0.0001	mg/L	< 0.0001

Client Sample ID			MW03
Sample Matrix			Water
Eurofins Sample No.			S19-Oc37310
Date Sampled			Oct 23, 2019
Test/Reference	LOR	Unit	
Organochlorine Pesticides			
Endrin	0.0001	mg/L	< 0.0001
Endrin aldehyde	0.0001	mg/L	< 0.0001
Endrin ketone	0.0001	mg/L	< 0.0001
g-BHC (Lindane)	0.0001	mg/L	< 0.0001
Heptachlor	0.0001	mg/L	< 0.0001
Heptachlor epoxide	0.0001	mg/L	< 0.0001
Hexachlorobenzene	0.0001	mg/L	< 0.0001
Methoxychlor	0.0001	mg/L	< 0.0001
Toxaphene	0.01	mg/L	< 0.01
Aldrin and Dieldrin (Total)*	0.0001	mg/L	< 0.0001
DDT + DDE + DDD (Total)*	0.0001	mg/L	< 0.0001
Vic EPA IWRG 621 OCP (Total)*	0.001	mg/L	< 0.001
Vic EPA IWRG 621 Other OCP (Total)*	0.001	mg/L	< 0.001
Dibutylchlorendate (surr.)	1	%	140
Tetrachloro-m-xylene (surr.)	1	%	135
Organophosphorus Pesticides			
Azinphos-methyl	0.002	mg/L	< 0.002
Bolstar	0.002	mg/L	< 0.002
Chlorfenvinphos	0.002	mg/L	< 0.002
Chlorpyrifos	0.02	mg/L	< 0.02
Chlorpyrifos-methyl	0.002	mg/L	< 0.002
Coumaphos	0.02	mg/L	< 0.02
Demeton-S	0.02	mg/L	< 0.02
Demeton-O	0.002	mg/L	< 0.002
Diazinon	0.002	mg/L	< 0.002
Dichlorvos	0.002	mg/L	< 0.002
Dimethoate	0.002	mg/L	< 0.002
Disulfoton	0.002	mg/L	< 0.002
EPN	0.002	mg/L	< 0.002
Ethion	0.002	mg/L	< 0.002
Ethoprop	0.002	mg/L	< 0.002
Ethyl parathion	0.002	mg/L	< 0.002
Fenitrothion	0.002	mg/L	< 0.002
Fensulfothion	0.002	mg/L	< 0.002
Fenthion	0.002	mg/L	< 0.002
Malathion	0.002	mg/L	< 0.002
Merphos	0.002	mg/L	< 0.002
Methyl parathion	0.002	mg/L	< 0.002
Mevinphos	0.002	mg/L	< 0.002
Monocrotophos	0.002	mg/L	< 0.002
Naled	0.002	mg/L	< 0.002
Omethoate	0.002	mg/L	< 0.002
Phorate	0.002	mg/L	< 0.002
Pirimiphos-methyl	0.02	mg/L	< 0.02
Pyrazophos	0.002	mg/L	< 0.002
Ronnel	0.002	mg/L	< 0.002
Terbufos	0.002	mg/L	< 0.002
Tetrachlorvinphos	0.002	mg/L	< 0.002
Tokuthion	0.002	mg/L	< 0.002

Client Sample ID			MW03
Sample Matrix			Water
Eurofins Sample No.			S19-Oc37310
Date Sampled			Oct 23, 2019
Test/Reference	LOR	Unit	
Organophosphorus Pesticides			
Trichloronate	0.002	mg/L	< 0.002
Triphenylphosphate (surr.)	1	%	20
Polychlorinated Biphenyls			
Aroclor-1016	0.005	mg/L	< 0.005
Aroclor-1221	0.001	mg/L	< 0.001
Aroclor-1232	0.005	mg/L	< 0.005
Aroclor-1242	0.005	mg/L	< 0.005
Aroclor-1248	0.005	mg/L	< 0.005
Aroclor-1254	0.005	mg/L	< 0.005
Aroclor-1260	0.005	mg/L	< 0.005
Total PCB*	0.001	mg/L	< 0.001
Dibutylchloroendate (surr.)	1	%	140
Tetrachloro-m-xylene (surr.)	1	%	135
Polycyclic Aromatic Hydrocarbons (Trace level)			
Acenaphthene	0.00001	mg/L	< 0.00001
Acenaphthylene	0.00001	mg/L	< 0.00001
Anthracene	0.00001	mg/L	< 0.00001
Benz(a)anthracene	0.00001	mg/L	< 0.00001
Benzo(a)pyrene	0.00001	mg/L	< 0.00001
Benzo(b&j)fluoranthene	0.00001	mg/L	< 0.00001
Benzo(g,h,i)perylene	0.00001	mg/L	< 0.00001
Benzo(k)fluoranthene	0.00001	mg/L	< 0.00001
Chrysene	0.00001	mg/L	< 0.00001
Dibenz(a,h)anthracene	0.00001	mg/L	< 0.00001
Fluoranthene	0.00001	mg/L	< 0.00001
Fluorene	0.00001	mg/L	< 0.00001
Indeno(1,2,3-cd)pyrene	0.00001	mg/L	< 0.00001
Naphthalene	0.00001	mg/L	< 0.00001
Phenanthrene	0.00001	mg/L	< 0.00001
Pyrene	0.00001	mg/L	< 0.00001
Total PAH*	0.00001	mg/L	< 0.00001
2-Fluorobiphenyl (surr.)	1	%	71
p-Terphenyl-d14 (surr.)	1	%	66
Heavy Metals			
Arsenic (filtered)	0.001	mg/L	< 0.001
Cadmium (filtered)	0.0002	mg/L	0.0003
Chromium (filtered)	0.001	mg/L	< 0.001
Copper (filtered)	0.001	mg/L	0.002
Lead (filtered)	0.001	mg/L	< 0.001
Mercury (filtered)	0.0001	mg/L	< 0.0001
Nickel (filtered)	0.001	mg/L	0.004
Zinc (filtered)	0.005	mg/L	0.012

Sample History

Where samples are submitted/analysed over several days, the last date of extraction and analysis is reported.
A recent review of our LIMS has resulted in the correction or clarification of some method identifications. Due to this, some of the method reference information on reports has changed. However, no substantive change has been made to our laboratory methods, and as such there is no change in the validity of current or previous results.

If the date and time of sampling are not provided, the Laboratory will not be responsible for compromised results should testing be performed outside the recommended holding time.

Description	Testing Site	Extracted	Holding Time
Total Recoverable Hydrocarbons - 1999 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Oct 24, 2019	7 Days
BTEX - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Oct 24, 2019	14 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Oct 24, 2019	7 Days
Total Recoverable Hydrocarbons - 2013 NEPM Fractions - Method: LTM-ORG-2010 TRH C6-C40	Sydney	Oct 24, 2019	
Polycyclic Aromatic Hydrocarbons (Trace level) - Method: LTM-ORG-2130 PAH and Phenols in Soil and Water (trace)	Melbourne	Oct 25, 2019	7 Days
Metals M8 filtered - Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS	Sydney	Oct 24, 2019	28 Days
Organochlorine Pesticides - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Oct 24, 2019	7 Days
Organophosphorus Pesticides - Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS	Sydney	Oct 24, 2019	7 Days
Polychlorinated Biphenyls - Method: LTM-ORG-2220 OCP & PCB in Soil and Water	Sydney	Oct 24, 2019	7 Days

Company Name: Arcadis Australia
Address: Lvl 16/580 George Street
Sydney
NSW 2000

Project Name: MIRVAC - KEMPS CREEK
Project ID: 10035157

Order No.:
Report #: 684323
Phone: 02 8907 9000
Fax:

Received: Oct 24, 2019 9:26 AM
Due: Oct 25, 2019
Priority: 1 Day
Contact Name: Jack Palma

Eurofins Analytical Services Manager : Ursula Long

Sample Detail						Eurofins mgt Suite B15	Eurofins mgt Suite B7 (filtered metals/PAH trace level)
Melbourne Laboratory - NATA Site # 1254 & 14271							X
Sydney Laboratory - NATA Site # 18217						X	X
Brisbane Laboratory - NATA Site # 20794							
Perth Laboratory - NATA Site # 23736							
External Laboratory							
No	Sample ID	Sample Date	Sampling Time	Matrix	LAB ID		
1	MW03	Oct 23, 2019		Water	S19-Oc37310	X	X
Test Counts						1	1

Internal Quality Control Review and Glossary

General

1. Laboratory QC results for Method Blanks, Duplicates, Matrix Spikes, and Laboratory Control Samples follows guidelines delineated in the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended May 2013 and are included in this QC report where applicable. Additional QC data may be available on request.
2. All soil/sediment/solid results are reported on a dry basis, unless otherwise stated.
3. All biota/food results are reported on a wet weight basis on the edible portion, unless otherwise stated.
4. Actual LORs are matrix dependant. Quoted LORs may be raised where sample extracts are diluted due to interferences.
5. Results are uncorrected for matrix spikes or surrogate recoveries except for PFAS compounds.
6. SVOC analysis on waters are performed on homogenised, unfiltered samples, unless noted otherwise.
7. Samples were analysed on an 'as received' basis.
8. Information identified on this report with blue colour, indicates data provided by customer, that may have an impact on the results.
9. This report replaces any interim results previously issued.

Holding Times

Please refer to 'Sample Preservation and Container Guide' for holding times (QS3001).

For samples received on the last day of holding time, notification of testing requirements should have been received at least 6 hours prior to sample receipt deadlines as stated on the SRA.

If the Laboratory did not receive the information in the required timeframe, and regardless of any other integrity issues, suitably qualified results may still be reported.

Holding times apply from the date of sampling, therefore compliance to these may be outside the laboratory's control.

For VOCs containing vinyl chloride, styrene and 2-chloroethyl vinyl ether the holding time is 7 days however for all other VOCs such as BTEX or C6-10 TRH then the holding time is 14 days.

****NOTE:** pH duplicates are reported as a range NOT as RPD

Units

mg/kg: milligrams per kilogram

mg/L: milligrams per litre

ug/L: micrograms per litre

ppm: Parts per million

ppb: Parts per billion

%: Percentage

org/100mL: Organisms per 100 millilitres

NTU: Nephelometric Turbidity Units

MPN/100mL: Most Probable Number of organisms per 100 millilitres

Terms

Dry	Where a moisture has been determined on a solid sample the result is expressed on a dry basis.
LOR	Limit of Reporting.
SPIKE	Addition of the analyte to the sample and reported as percentage recovery.
RPD	Relative Percent Difference between two Duplicate pieces of analysis.
LCS	Laboratory Control Sample - reported as percent recovery.
CRM	Certified Reference Material - reported as percent recovery.
Method Blank	In the case of solid samples these are performed on laboratory certified clean sands and in the case of water samples these are performed on de-ionised water.
Surr - Surrogate	The addition of a like compound to the analyte target and reported as percentage recovery.
Duplicate	A second piece of analysis from the same sample and reported in the same units as the result to show comparison.
USEPA	United States Environmental Protection Agency
APHA	American Public Health Association
TCLP	Toxicity Characteristic Leaching Procedure
COC	Chain of Custody
SRA	Sample Receipt Advice
QSM	US Department of Defense Quality Systems Manual Version 5.3
CP	Client Parent - QC was performed on samples pertaining to this report
NC	Non-Client Parent - QC performed on samples not pertaining to this report, QC is representative of the sequence or batch that client samples were analysed within.
TEQ	Toxic Equivalency Quotient

QC - Acceptance Criteria

RPD Duplicates: Global RPD Duplicates Acceptance Criteria is 30% however the following acceptance guidelines are equally applicable:

Results <10 times the LOR : No Limit

Results between 10-20 times the LOR : RPD must lie between 0-50%

Results >20 times the LOR : RPD must lie between 0-30%

Surrogate Recoveries: Recoveries must lie between 20-130% Phenols & 50-150% PFASs

PFAS field samples that contain surrogate recoveries in excess of the QC limit designated in QSM 5.3 where no positive PFAS results have been reported have been reviewed and no data was affected.

WA DWER (n=10): PFBA, PFPeA, PFHxA, PFHpA, PFOA, PFBS, PFHxS, PFOS, 6:2 FTSA, 8:2 FTSA

QC Data General Comments

1. Where a result is reported as a less than (<), higher than the nominated LOR, this is due to either matrix interference, extract dilution required due to interferences or contaminant levels within the sample, high moisture content or insufficient sample provided.
2. Duplicate data shown within this report that states the word "BATCH" is a Batch Duplicate from outside of your sample batch, but within the laboratory sample batch at a 1:10 ratio. The Parent and Duplicate data shown is not data from your samples.
3. Organochlorine Pesticide analysis - where reporting LCS data, Toxaphene & Chlordane are not added to the LCS.
4. Organochlorine Pesticide analysis - where reporting Spike data, Toxaphene is not added to the Spike.
5. Total Recoverable Hydrocarbons - where reporting Spike & LCS data, a single spike of commercial Hydrocarbon products in the range of C12-C30 is added and it's Total Recovery is reported in the C10-C14 cell of the Report.
6. pH and Free Chlorine analysed in the laboratory - Analysis on this test must begin within 30 minutes of sampling. Therefore laboratory analysis is unlikely to be completed within holding time. Analysis will begin as soon as possible after sample receipt.
7. Recovery Data (Spikes & Surrogates) - where chromatographic interference does not allow the determination of Recovery the term "INT" appears against that analyte.
8. Polychlorinated Biphenyls are spiked only using Aroclor 1260 in Matrix Spikes and LCS.
9. For Matrix Spikes and LCS results a dash " - " in the report means that the specific analyte was not added to the QC sample.
10. Duplicate RPDs are calculated from raw analytical data thus it is possible to have two sets of data.

Quality Control Results

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Method Blank							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	mg/L	< 0.02			0.02	Pass	
TRH C10-C14	mg/L	< 0.05			0.05	Pass	
TRH C15-C28	mg/L	< 0.1			0.1	Pass	
TRH C29-C36	mg/L	< 0.1			0.1	Pass	
Method Blank							
BTEX							
Benzene	mg/L	< 0.001			0.001	Pass	
Toluene	mg/L	< 0.001			0.001	Pass	
Ethylbenzene	mg/L	< 0.001			0.001	Pass	
m&p-Xylenes	mg/L	< 0.002			0.002	Pass	
o-Xylene	mg/L	< 0.001			0.001	Pass	
Xylenes - Total	mg/L	< 0.003			0.003	Pass	
Method Blank							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	mg/L	< 0.01			0.01	Pass	
TRH C6-C10	mg/L	< 0.02			0.02	Pass	
TRH >C10-C16	mg/L	< 0.05			0.05	Pass	
TRH >C16-C34	mg/L	< 0.1			0.1	Pass	
TRH >C34-C40	mg/L	< 0.1			0.1	Pass	
Method Blank							
Organochlorine Pesticides							
Chlordanes - Total	mg/L	< 0.001			0.001	Pass	
4,4'-DDD	mg/L	< 0.0001			0.0001	Pass	
4,4'-DDE	mg/L	< 0.0001			0.0001	Pass	
4,4'-DDT	mg/L	< 0.0001			0.0001	Pass	
a-BHC	mg/L	< 0.0001			0.0001	Pass	
Aldrin	mg/L	< 0.0001			0.0001	Pass	
b-BHC	mg/L	< 0.0001			0.0001	Pass	
d-BHC	mg/L	< 0.0001			0.0001	Pass	
Dieldrin	mg/L	< 0.0001			0.0001	Pass	
Endosulfan I	mg/L	< 0.0001			0.0001	Pass	
Endosulfan II	mg/L	< 0.0001			0.0001	Pass	
Endosulfan sulphate	mg/L	< 0.0001			0.0001	Pass	
Endrin	mg/L	< 0.0001			0.0001	Pass	
Endrin aldehyde	mg/L	< 0.0001			0.0001	Pass	
Endrin ketone	mg/L	< 0.0001			0.0001	Pass	
g-BHC (Lindane)	mg/L	< 0.0001			0.0001	Pass	
Heptachlor	mg/L	< 0.0001			0.0001	Pass	
Heptachlor epoxide	mg/L	< 0.0001			0.0001	Pass	
Hexachlorobenzene	mg/L	< 0.0001			0.0001	Pass	
Methoxychlor	mg/L	< 0.0001			0.0001	Pass	
Toxaphene	mg/L	< 0.01			0.01	Pass	
Method Blank							
Organophosphorus Pesticides							
Azinphos-methyl	mg/L	< 0.002			0.002	Pass	
Bolstar	mg/L	< 0.002			0.002	Pass	
Chlorfenvinphos	mg/L	< 0.002			0.002	Pass	
Chlorpyrifos	mg/L	< 0.02			0.02	Pass	
Chlorpyrifos-methyl	mg/L	< 0.002			0.002	Pass	
Coumaphos	mg/L	< 0.02			0.02	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Demeton-S	mg/L	< 0.02			0.02	Pass	
Demeton-O	mg/L	< 0.002			0.002	Pass	
Diazinon	mg/L	< 0.002			0.002	Pass	
Dichlorvos	mg/L	< 0.002			0.002	Pass	
Dimethoate	mg/L	< 0.002			0.002	Pass	
Disulfoton	mg/L	< 0.002			0.002	Pass	
EPN	mg/L	< 0.002			0.002	Pass	
Ethion	mg/L	< 0.002			0.002	Pass	
Ethoprop	mg/L	< 0.002			0.002	Pass	
Ethyl parathion	mg/L	< 0.002			0.002	Pass	
Fenitrothion	mg/L	< 0.002			0.002	Pass	
Fensulfothion	mg/L	< 0.002			0.002	Pass	
Fenthion	mg/L	< 0.002			0.002	Pass	
Malathion	mg/L	< 0.002			0.002	Pass	
Merphos	mg/L	< 0.002			0.002	Pass	
Methyl parathion	mg/L	< 0.002			0.002	Pass	
Mevinphos	mg/L	< 0.002			0.002	Pass	
Monocrotophos	mg/L	< 0.002			0.002	Pass	
Naled	mg/L	< 0.002			0.002	Pass	
Omethoate	mg/L	< 0.002			0.002	Pass	
Phorate	mg/L	< 0.002			0.002	Pass	
Pirimiphos-methyl	mg/L	< 0.02			0.02	Pass	
Pyrazophos	mg/L	< 0.002			0.002	Pass	
Ronnel	mg/L	< 0.002			0.002	Pass	
Terbufos	mg/L	< 0.002			0.002	Pass	
Tetrachlorvinphos	mg/L	< 0.002			0.002	Pass	
Tokuthion	mg/L	< 0.002			0.002	Pass	
Trichloronate	mg/L	< 0.002			0.002	Pass	
Method Blank							
Polychlorinated Biphenyls							
Aroclor-1016	mg/L	< 0.005			0.005	Pass	
Aroclor-1221	mg/L	< 0.001			0.001	Pass	
Aroclor-1232	mg/L	< 0.005			0.005	Pass	
Aroclor-1242	mg/L	< 0.005			0.005	Pass	
Aroclor-1248	mg/L	< 0.005			0.005	Pass	
Aroclor-1254	mg/L	< 0.005			0.005	Pass	
Aroclor-1260	mg/L	< 0.005			0.005	Pass	
Total PCB*	mg/L	< 0.001			0.001	Pass	
Method Blank							
Polycyclic Aromatic Hydrocarbons (Trace level)							
Total PAH*	mg/L	< 0			0.00001	Pass	
Method Blank							
Heavy Metals							
Arsenic (filtered)	mg/L	< 0.001			0.001	Pass	
Cadmium (filtered)	mg/L	< 0.0002			0.0002	Pass	
Chromium (filtered)	mg/L	< 0.001			0.001	Pass	
Copper (filtered)	mg/L	< 0.001			0.001	Pass	
Lead (filtered)	mg/L	< 0.001			0.001	Pass	
Mercury (filtered)	mg/L	< 0.0001			0.0001	Pass	
Nickel (filtered)	mg/L	< 0.001			0.001	Pass	
Zinc (filtered)	mg/L	< 0.005			0.005	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 1999 NEPM Fractions							
TRH C6-C9	%	100			70-130	Pass	

Test	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
TRH C10-C14	%	78			70-130	Pass	
LCS - % Recovery							
BTEX							
Benzene	%	95			70-130	Pass	
Toluene	%	92			70-130	Pass	
Ethylbenzene	%	90			70-130	Pass	
m&p-Xylenes	%	89			70-130	Pass	
o-Xylene	%	93			70-130	Pass	
Xylenes - Total	%	90			70-130	Pass	
LCS - % Recovery							
Total Recoverable Hydrocarbons - 2013 NEPM Fractions							
Naphthalene	%	86			70-130	Pass	
TRH C6-C10	%	102			70-130	Pass	
TRH >C10-C16	%	84			70-130	Pass	
LCS - % Recovery							
Organochlorine Pesticides							
Chlordanes - Total	%	99			70-130	Pass	
4,4'-DDD	%	103			70-130	Pass	
4,4'-DDE	%	104			70-130	Pass	
4,4'-DDT	%	92			70-130	Pass	
a-BHC	%	88			70-130	Pass	
Aldrin	%	97			70-130	Pass	
b-BHC	%	101			70-130	Pass	
d-BHC	%	93			70-130	Pass	
Dieldrin	%	103			70-130	Pass	
Endosulfan I	%	105			70-130	Pass	
Endosulfan II	%	102			70-130	Pass	
Endosulfan sulphate	%	95			70-130	Pass	
Endrin	%	106			70-130	Pass	
Endrin aldehyde	%	91			70-130	Pass	
Endrin ketone	%	101			70-130	Pass	
g-BHC (Lindane)	%	94			70-130	Pass	
Heptachlor	%	91			70-130	Pass	
Heptachlor epoxide	%	104			70-130	Pass	
Hexachlorobenzene	%	83			70-130	Pass	
Methoxychlor	%	95			70-130	Pass	
Toxaphene	%	101			70-130	Pass	
LCS - % Recovery							
Organophosphorus Pesticides							
Diazinon	%	90			70-130	Pass	
Dimethoate	%	87			70-130	Pass	
Ethion	%	115			70-130	Pass	
Fenitrothion	%	90			70-130	Pass	
Methyl parathion	%	90			70-130	Pass	
Mevinphos	%	116			70-130	Pass	
LCS - % Recovery							
Polychlorinated Biphenyls							
Aroclor-1260	%	86			70-130	Pass	
LCS - % Recovery							
Heavy Metals							
Arsenic (filtered)	%	100			70-130	Pass	
Cadmium (filtered)	%	100			70-130	Pass	
Chromium (filtered)	%	101			70-130	Pass	
Copper (filtered)	%	100			70-130	Pass	

Test			Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Lead (filtered)			%	100			70-130	Pass	
Mercury (filtered)			%	93			70-130	Pass	
Nickel (filtered)			%	100			70-130	Pass	
Zinc (filtered)			%	97			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Spike - % Recovery									
Heavy Metals				Result 1					
Arsenic (filtered)	S19-Oc38762	NCP	%	116			70-130	Pass	
Cadmium (filtered)	S19-Oc38762	NCP	%	97			70-130	Pass	
Chromium (filtered)	S19-Oc38762	NCP	%	95			70-130	Pass	
Copper (filtered)	S19-Oc38762	NCP	%	86			70-130	Pass	
Lead (filtered)	S19-Oc38762	NCP	%	92			70-130	Pass	
Mercury (filtered)	S19-Oc38762	NCP	%	100			70-130	Pass	
Nickel (filtered)	S19-Oc38762	NCP	%	83			70-130	Pass	
Zinc (filtered)	S19-Oc38762	NCP	%	84			70-130	Pass	
Test	Lab Sample ID	QA Source	Units	Result 1			Acceptance Limits	Pass Limits	Qualifying Code
Duplicate									
Heavy Metals				Result 1	Result 2	RPD			
Arsenic (filtered)	S19-Oc37310	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Cadmium (filtered)	S19-Oc37310	CP	mg/L	0.0003	0.0003	13	30%	Pass	
Chromium (filtered)	S19-Oc37310	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Copper (filtered)	S19-Oc37310	CP	mg/L	0.002	0.002	11	30%	Pass	
Lead (filtered)	S19-Oc37310	CP	mg/L	< 0.001	< 0.001	<1	30%	Pass	
Mercury (filtered)	S19-Oc37310	CP	mg/L	< 0.0001	< 0.0001	<1	30%	Pass	
Nickel (filtered)	S19-Oc37310	CP	mg/L	0.004	0.004	3.0	30%	Pass	
Zinc (filtered)	S19-Oc37310	CP	mg/L	0.012	0.011	13	30%	Pass	

Comments

Sample Integrity

Custody Seals Intact (if used)	N/A
Attempt to Chill was evident	Yes
Sample correctly preserved	Yes
Appropriate sample containers have been used	Yes
Sample containers for volatile analysis received with minimal headspace	Yes
Samples received within HoldingTime	Yes
Some samples have been subcontracted	No

Qualifier Codes/Comments

Code	Description
N01	F2 is determined by arithmetically subtracting the "naphthalene" value from the ">C10-C16" value. The naphthalene value used in this calculation is obtained from volatiles (Purge & Trap analysis).
N02	Where we have reported both volatile (P&T GCMS) and semivolatile (GCMS) naphthalene data, results may not be identical. Provided correct sample handling protocols have been followed, any observed differences in results are likely to be due to procedural differences within each methodology. Results determined by both techniques have passed all QAQC acceptance criteria, and are entirely technically valid.
N04	F1 is determined by arithmetically subtracting the "Total BTEX" value from the "C6-C10" value. The "Total BTEX" value is obtained by summing the concentrations of BTEX analytes. The "C6-C10" value is obtained by quantitating against a standard of mixed aromatic/aliphatic analytes.

Authorised By

Ursula Long	Analytical Services Manager
Andrew Sullivan	Senior Analyst-Organic (NSW)
Gabriele Cordero	Senior Analyst-Metal (NSW)
Joseph Edouard	Senior Analyst-Organic (VIC)



Glenn Jackson

General Manager

Final report - this Report replaces any previously issued Report

- Indicates Not Requested

* Indicates NATA accreditation does not cover the performance of this service

Measurement uncertainty of test data is available on request or please [click here](#).

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