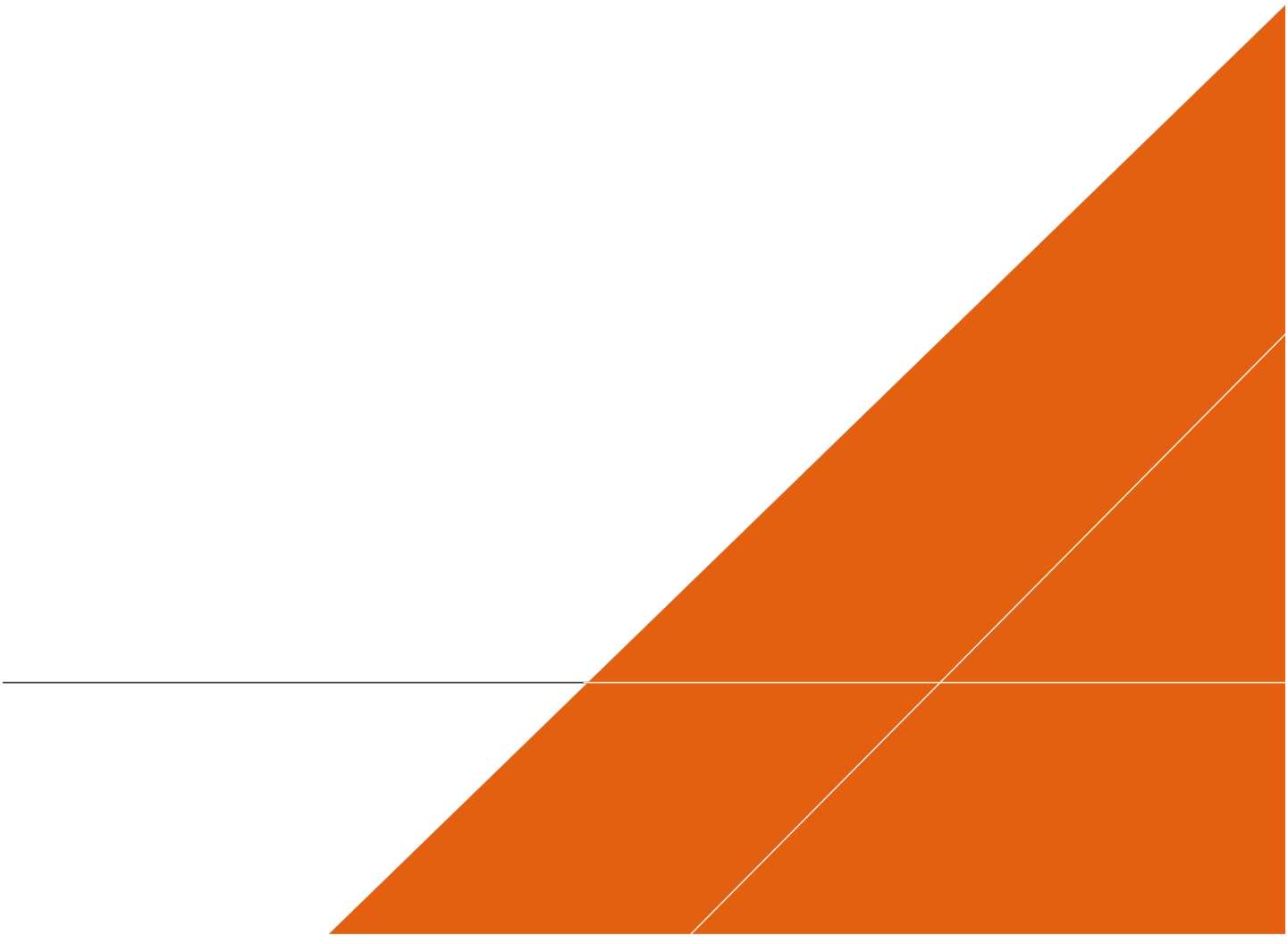
ARCADIS Design & Consultancy for natural and built assets

DAM DECOMMISSIONING STRATEGY – REV 1

Aspect Industrial Estate, Mamre Road, Kemps Creek, NSW

Prepared for Mirvac Office and Industrial Pty Ltd

09 OCTOBER 2020



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DAM DECOMMISSIONING STRATEGY

Aspect Industrial Estate, Mamre Road, Kemps Creek, NSW

Draft Document Prepared for Client Review

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APPENDICES

1 INTRODUCTION

Arcadis Australia Pacific (Arcadis) was engaged by Mirvac Office and Industrial (Mirvac) to prepare a Dam Decommissioning Strategy (DDS) 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 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 2020.

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

- Phase 2 Detailed Site Investigation (DSI).
- Fill Importation Protocol (FIP).
- Unexpected Finds Protocol (UFP).
- Dam Decommissioning Strategy (DDS).
- Groundwater Management Plan (GMP).

This DDS is one of five reports that Arcadis has prepared for submission to Mirvac 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 approximately 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.
- Construction of 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 Mirvac indicates that approximately 200,000 m^3 of VENM and/or ENM will be imported onto the site to support earthworks undertaken as part of the Stage 1 site redevelopment works.

1.2 Purpose of this Document

The purpose of this DDS is to outline the requirements to dewater and decommission the dams located at the site which is proposed to undergo development for industrial and/or commercial land uses. It is expected that this DDS will form part of an overarching Construction Environmental Management Plan (CEMP) that will manage environmental considerations during the construction phase.

This DDS has been prepared with due consideration of the results from an intrusive site investigation undertaken at the site in October 2019 (Arcadis, 2019).

1.3 Objectives

The objective of this DDS is to provide a viable strategy to dewater and decommission the five dams located across the site. Dam decommissioning will involve the removal of water and sediments from the dams, removal of the dam embankments and infilling of the void. The objectives of this report are to provide a strategy to:

- Assess the water quality within each dam;
- Provide water re-use options;
- Outline a methodology for removing the dam structure;
- Outline a methodology to remove sediments from the base of the dam;
- Assess and classify the sediments and dam wall soils with a view of no-site re-use;
- Provide void infill options; and
- Consider surface water flow during and after dam removal.

1.4 Scope of Works

To complete the DDS, Arcadis undertook the following scope of work:

- Developed the DDS objectives and methodology;
- Reviewed the dam water analytical results (Arcadis, 2019);
- Compiled water re-use options;
- Considered water treatment options;
- Outlined a methodology to estimate the volume of water to be removed from the dams;

- Developed project specific water quality objectives in general accordance with the ANZECC 2000/ANZG 2018 criteria; and
- Developed a proposed dam dewatering strategy.

2 SITE DESCRIPTION AND ENVIRONMENTAL SETTING

2.1 Site Identification

The site location and five on-site dams are shown in Figures 1 and 2, **Appendix A**. The site details are summarised in Table 2-1 and described in the following sections.

Table 2-1 Site Detail Summary

Site Characteristic	Detail
Street Address	804-882 Mamre Road, Kemps Creek, NSW, 2178
Deposited Plan	Lots 54-58 DP259135
Closest Cross Road(s)	Mamre Rd and Bakers Ln
Local Government Area	Penrith City Council
Land Use Zoning Information	IN2 General Industrial
Site Coordinates to the approximate centre of the site (Geographic)	Latitude: -33.842987 Longitude: 150.784934
Current Land Use	Rural residential properties
Proposed Future Land Use (Assumed)	Employment purposes (industrial and/or commercial land use)
Approximate Site Area	Approximately 563,000 m^2

2.2 Topography

The site is located within a generally flat alluvial plain with localised undulating rises/falls and generally slopes toward Kemps Creek/South Creek to the west. The site slopes to the south west and has an elevation of approximately 40 to 50 m relative to the Australian Height Datum (AHD). A generally north south oriented drainage line bisects the site along which the five dams have been constructed.

2.3 Hydrology

Observations were made during field work conducted in October 2019. The five dams were being used for stock watering and irrigation of crops and a chicken coup. The site is primarily covered by grass with some bare patches observed due to the drought. Rainfall infiltration is expected to be limited due to the low permeability, clayey nature of the topsoil with rainfall runoff directed towards the dams.

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

2.4 Geology

The Sydney 1:100,000 Geological Survey of NSW map indicates that the site is underlain by the Triassic aged 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 0.2 m below ground level (m bgl) and a maximum depth of 1.2 m 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.

2.5 Hydrogeology

Groundwater is present within the Bringelly Shale. Typically, the Bringelly Shale yields low volumes of saline groundwater. The shale generally has low water transmitting properties, displaying a very low primary porosity with the majority of 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 and Environment – Water (DPIE-Water) database of registered groundwater bores indicates there no boreholes present within a 2000 m radius of the site. This is consistent with groundwater in the Kemps Creek area having low beneficial use due to poor groundwater quality and the presence of surface water.

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 north west, in the direction of Kemps Creek.

2.6 Acid Sulfate Soil and Salinity

Acid sulfate soils (ASS) are generally associated with low-lying coastal areas, including estuarine flood plains, rivers and creeks. JBS&G, 2019 state 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 Bringelly 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, prevent growth of all but highly salt tolerant vegetation contributing to increased soil erosion. Salinity hazard mapping (DIPNR, 2012) indicates the site is of moderate salinity potential due to the site being located on Bringelly Shale. Off-site adjacent to drainage lines near Kemps Creek the salinity potential is considered high as the saline groundwater becomes shallower near natural surface water features where there is an increased potential of groundwater reaching the ground surface.

2.7 Summary of Previous Investigations

2.7.1 Preliminary Site Investigation (JBS&G 2019)

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

JBS&G's review of the site history indicated that the site appeared to be utilised for light agricultural purposes (i.e. grazing, historical dairy farming, poultry farming and horticulture). Based on the findings of the desktop study and followed by detailed site inspections by JBS&G on 30 November 2018 and 16 January 2019, potential sources of on-site contamination, both historical and current, were considered likely to be from surficial sources associated with:

- 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 stockpile). JBS&G also collected one surface water sample (labelled 'Pond') from Dam01. These sampling locations are provided in Figure 3, **Appendix A**.

When assessed against the ANZG (2018) Freshwater 95% toxicant DGVs Guidelines, the surface water sample did not present any exceedances.

The soil investigation identified minor exceedances including:

- One trace of friable asbestos at one location adjacent to historic structures;
- Elevated TRH at one location where localised surface staining was visible around a drum; and
- Minor exceedances of heavy metals.

2.7.2 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 fifteen (15) test pits and six (6) 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 (3) 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.
- 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.

2.8 Dam Descriptions

Five farm dams labelled Dam01 (northern) to Dam05 (southern) are to be decommissioned as shown in Figure 2, **Appendix A**. Photographs of the dams taken in October 2019 are provided in **Appendix D**.

The dams are located along a north-west trending creek line that discharges into Kemps Creek. The dams have been formed by constructing earthen embankments across the creek line creating voids in the lowest part of the catchment. Off-site to the south-west there are two dams that have been constructed in a similar manner.

The source of water that infills the dams is rainfall runoff-rather than the dams intersecting groundwater. This is supported by electrical conductivity (EC) measurements of the dam water measured in October 2019 ranging between 1,300 and 2,600 µS/cm which is fresh to brackish and indicative of rainfall runoff. In contrast the EC measured in October 2019 in monitoring wells screened in the shale ranged from 14,000 to 20,000 µS/cm which is saline. In addition, the standing water level within the shale is lower than the elevation of the dams. Soil observed at the site was a hard-silty clay which is inducive to rainfall runoff flowing towards the dams rather than infiltrating to groundwater.

Although the dams are constructed along the creek line it appears that the majority of rainfall runoff enters the dams from the east rather than from along the creek line to the south east.

Descriptions of each of the five dams observed during the Arcadis fieldwork to support the Detailed Site Investigation in October 2019 are summarised in Table 2-2. The surface area and volume of each dam has been approximated and is discussed in Section 2.8.1.

Table 2-2 Dam Descriptions

Dam	Description
Dam01	Dam01 is the largest dam on the site and spans across the central to southern portion of the two northern-most properties (Lots 58 and 57 DP259135). The dam appeared to be at less than half capacity. The construction material of the dam embankment appeared to comprise of local natural reworked soils. The western embankment of Dam01 was observed to be raised approximately 3m above the ground surface. A dry watercourse connecting Dam01 to the other dams on-site appears on its south-eastern most point. Another watercourse connecting the dam to Kemps Creek (located to the west of

Dam	Description
	the site) was also apparent on the north-western point of Dam01. The dam appears to be infilled by rainfall runoff from the east.
Dam02	Dam02 is situated at the central to southern portion of Lot 56 DP259135. At the time of inspection, the water level in the dam was noted to be very low. It was also noted that at full capacity, Dam02 and Dam03 (to the south) would join together to become a single larger dam. This is also evident in the historical photographs provided in JBS&G's report (2019). The construction material of the dam embankment appeared to comprise of local natural reworked soils. The northern embankment was observed to be raised approximately 3m above the ground surface. A dry watercourse connecting Dam02 to Dam01 appears on its northern most point. The dam appears to be infilled from rainfall runoff from the east and south-east.
Dam03	Dam03 is located at a central to northern portion of Lot 55 DP259135. At full capacity, Dam03 and Dam02 (to the north) join together to become a single larger dam. The construction material of the dam embankment appeared to comprise of local natural reworked soils with the embankments raised approximately 3m above the ground surface. A dry watercourse connecting Dam03 to Dam04 appears to exist on its southern most point. The dam appears to be infilled from rainfall runoff from the south-west.
Dam04	Dam04 is located at a central to southern portion of Lot 55 DP259135. The construction material of the dam embankment appeared to comprise of local natural reworked soils with the embankments raised approximately 3m above the ground surface. A dry watercourse connecting Dam04 to Dam03 is apparent on its north-western point. Another dry watercourse connecting Dam04 to Dam05 appears on its south-eastern point. The dam appears to be infilled from rainfall runoff from the south and south-west.
Dam05	Dam05 is located towards the eastern end of Lot 54 DP259135. At the time of inspection, the water level of the dam was low enough that a soil barrier could be seen separating the water within the dam. This separation barrier ran approximately west to east across the dam. The southern separated portion of water was observed to be elevated slightly higher than the northern separated portion of water. The construction material of the dam embankment appears to comprise of local natural reworked soils with the embankments raised approximately 3m above the ground surface. A dry watercourse connecting Dam05 to Dam04 is apparent on its north-western point. Another dry watercourse connecting Dam04 to a dam on the neighbouring property is apparent to the east.

2.8.1 Current Dam Volume Estimations

The volume of each dam will be required at the time of dewatering to ensure there is sufficient storage in other dams to contain the dam water and there is sufficient material to infill the dam void. An approximate estimate of the current (October 2019) surface area and volume of each of the dams is provided in Table 2-3. The estimates are calculated for the current volume in the dams using a recent aerial photograph.

A methodology for more accurately calculating the volume of each dam is provided in Section 4.2.2.

Table 2-3 Estimations of Current (October 2019) Dam Capacity Areas and Volumes

Dam	Area (m^2)	Estimated average depth (m)	Water Volume (m^3) *	Water Volume (ML)
Dam01	16,000	0.6	3,840	3.84
Dam02	1,000	0.5	200	0.2
Dam03	1,150	0.6	276	0.276
Dam04	360	0.5	72	0.072
Dam05	5,300	0.6	1,272	1.272

**This approximate volume has been calculated using the formula presented in Section 4.2.2.1.*

Note: These calculated values are rough estimates only.

It is noted that the water volume of the dams is subject to change depending on rainfall conditions and water usage. At the time of dewatering each dam it is recommended a more up to date volume and accurate water volume is estimated.

3 LEGISLATION AND POLICY

3.1 Legislative Requirements

Surface water and groundwater resources in NSW are managed by the NSW Department of Primary Industry and Environment (Water) (DPIE-Water) under the Water Act 1912 and the Water Management Act 2000.

The NSW Dam Safety Committee (DSC) are responsible managing the safety of prescribed dams which are defined as extreme, high and significant category dams along with low consequence category dams over 15 metres high. Since the farm dams are less than 15 metres high, they are not managed under the DSC although the general principles of public and ecological safety apply. Dam safety is regulated under the Dams Safety Act 2015 which has replaced the Dams Safety Act 1978.

Water NSW is responsible is responsible for managing dam safety for all dams across NSW including the decommissioning of farm dams.

3.2 Assessment Criteria

Surface water quality is screened against the following guidelines:

- ANZG (2018) Guidelines for Fresh and Marine Water Quality - 95% protection for Fresh Water; and
- NHMRC (2008) Guidelines for Managing Risks in Recreational Water – Primary Contact Recreation.

Sediment and dam embankment soil is screened against the following guidelines prior to assist in the re-use or off-site disposal process:

- NEPM (2013) Guideline on Investigation Levels for Soil and Groundwater – Health Investigation Levels for Soil Contaminants for Commercial/Industrial sites (HIL-D); and
- NEPM (2013) Guideline on Investigation Levels for Soil and Groundwater – Health Screening Levels Commercial/Industrial sites (HSL-D).

4 DECOMMISSIONING CONSIDERATIONS

4.1 Dam Decommissioning Strategy

It is recommended the decommissioning of all five on-site dams is undertaken in sequence with water transferred between the dams for storage. The ultimate decommissioning sequence will be in part dictated by the water management requirements of the site and the re-development plan of works schedule. Currently (October 2019) water levels in the dams are relatively low due to the extended period of low rainfall. Should these drought conditions be broken prior to the commencement of site earthworks there may be a surplus of water at the site. Alternatively, if high rainfall conditions are experienced during site works, on-site storage will be required to manage surface water to minimise the risk of water discharging of-site.

It is recommended that Dam01, as the largest and most northernly dam, is maintained as the sediment basin and as a source of water for the duration of the construction program.

Subject to the staging of site works which are currently unknown, dams can be decommissioned in sequence commencing with Dam05 followed by Dams 04, 03 and 02 and ultimately Dam01. Since the dams are constructed on a natural watercourse it is recommended that the current creek line is realigned, and surface water runoff is directed into this artificial water course to reduce inflow to the dams. Once the dams are removed, surface water runoff would naturally discharge into Kemps Creek which is consistent with pre dam conditions.

As the northern most dam, Dam01 can be used as a sediment basin during redevelopment works and as a source of water. If turbidity is high the water would be flocculated to improve water clarity. Removal of the dams will reduce water storage capacity across the site, although the additional storage provided by these dams will not be required as rainfall runoff is directed to Kemps Creek via the realigned creek. In the unlikely event that during the redevelopment program the dams reach full capacity, excess water could be discharged to Kemps Creek from the sediment basin (Dam01) following flocculation as required.

Towards the end of redevelopment when the sedimentation basin is no longer required, dam levels can be lowered by on-going water use from the dam and redirecting rainfall runoff into the realigned creek. Once empty and bunding is in place Dam01 can be decommissioned.

As per the DSI, prior to initiating this DDS on-site surface water should be measured after a significant rainfall event and compared to the observations in the DSI. This should be done in order to assess the potential contributions (surface material leaching, groundwater impact, evaporation) to observed water quality for dam de-watering purposes

4.2 Dam Water

Removal of the dam water will require an understanding of the water quality and an estimate of the dam volume to assess re-use or disposal options. On-site re-use is the preferred disposal option.

4.2.1 Dam Water Quality

A surface water sample was collected in October 2019 from each of the five dams to assess the dam water quality. The dam water generally contained low suspended solids, was clear and no sheen or odour was observed. However, within the water polystyrene and plastic (plastic bags, polypipe of-cuts) debris was observed. The locations of the dam and the sampling points are shown in Figure 2, **Appendix A**. A more detailed discussion of dam water quality results is provided in the DSI prepared by Arcadis (2019).

4.2.1.1 Physico-Chemical Parameters

Water quality parameters were recorded for each of the surface water samples collected from the five dams and are presented in Table 4-1.

Based on the physico-chemical data collected during surface water sampling, the following conclusions are made:

- pH values indicate that the surface water is neutral to alkaline;
- The electrical conductivity values indicate that the water is fresh to brackish;
- The dissolved oxygen indicates anaerobic conditions within Dam05, and aerobic conditions in Dams 01-04; and
- Oxygen reduction potential (ORP) indicate a moderate to high (positive) ORP, suggesting an oxidative environment.

4.2.1.2 Analytical Results

The dam surface water samples collected in October 2019 (Arcadis, 2019) were analysed and assessed against the water quality guidelines outlined in Section 3.2. No exceedances were observed against the adopted guidelines. Some detections above the laboratory limits of reporting were observed for Arsenic (Filtered) and Nickel (Filtered), however these were minor and did not exceed the adopted guidelines.

A summary of the analytical results from the collected dam surface water samples is presented in **Appendix B** and the laboratory reports of the analysed samples are presented in **Appendix C**.

4.2.1.3 Dam Water Quality Discussion

The preliminary water quality results collected for the dam waters indicate the water is of low to moderate salinity and the pH is neutral to alkaline. In addition, the analytical results did not identify any contamination within the dam waters. These results indicate the water would be suitable for on-site usage as recommended in Table 4-2, subject to the turbidity which is expected to vary depending on site conditions. Some treatment may be required to lower the pH although the pH may be lowered naturally by mixing the waters and aerating the water by pumping it around the site.

During the dewatering process, it is recommended the pumped water is filtered through a gross pollutant trap or similar, to remove solids and plastic debris.

Table 4-1 Physico-Chemical Parameters of sampled dam water

Dam	pH	Temperature ℃	Electrical Conductivity (µS/cm)	Dissolved Oxygen (mg/L)	Redox Potential (mV)*	Flow Conditions	Comments
Dam01	8.34	20.8	1785	6.31	301.9	Stagnant	Low water volume in dam
Dam02	9.19	24.3	1498	13.56	287.3	Stagnant	Algae present
Dam03	9.41	24.6	1544	18.09	283	Stagnant	Algal growth, barrels in water + bag, saline odour
Dam04	8.13	22.3	1313	7.03	301.6	Stagnant	Emergents, no algae
Dam05	7.14	24.8	2656	0.94	320.3	Stagnant	No emergents, blood worms, excavated soil.

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

4.2.2 Calculating Volume of Dam Water

An estimate of the volume of water within each dam is required to approximate the storage capacity to collect the pumped water from each dam.

An estimate of dam volumes (based on aerial photography in October 2018) has been provided in Section 2.8.1 of this report based on the methodology outlined in Section 4.2.2.1. It is noted that dam levels in October 2019 are low due to drought conditions across NSW. A conservative calculation should be made based on the volume of water that will collect in the dams after a heavy rainfall event. A methodology of calculating more accurately the volume of water in the dams when they are at full capacity is outlined below.

4.2.2.1 Methodology of Calculating Volume of Dam Water

The NSW Office of Water has provided a methodology of estimating dam capacity (NSW Office of Water, 2010). The following formula will allow the capacity of each dam to be calculated:

$$Volume\ (m^3) = 0.4 \times Surface\ Area\ (m^2) \times Maximum\ Depth\ (m)$$

Note: 0.4 is a conversion factor that takes into account the slope of the sides of the dam.

The recommended method to measure the maximum depth of each of the dam is to paddle a kayak or canoe into the centre of each dam and a measure the depth with a graduated staff or by lowering a weighted rope to the base. In the case of Dam 01 it is recommended the depth measurements are taken from multiple positions as this dam is relatively large compared to the other four dams. Once the depth from the surface of the water to the base has been obtained it should be added to the length of exposed embankment above the water surface, if any is present. By adding these two lengths, the 'maximum depth' in the above formula can be found, which will allow an estimate of the full capacity of each dam to be calculated.

The surface area of each of the dams can be determined using aerial photography or an area calculation tool on a platform such as SIX Maps (https://maps.six.nsw.gov.au/).

4.3 Surface Water Re-Use Options

The Department of Natural Resources, Mines and Energy has specified that no off-site discharge of stormwater will be allowed during or after the redevelopment of the site. It is expected that once the natural creek line is re-established natural rainfall runoff from across the catchment will flow into the creek and discharge into Kemps Creek. Stormwater and sewer services have yet to be installed on-site. Consequently, discharge of surface water during development via these options is not possible. It is proposed to re-use the surface water on-site primarily for site management purposes. If there is water in excess of site management requirements, discharging water to neighbouring dams may be considered. Surface water re-use options are outlined in Table 4-2.

Table 4-2 Surface Water Re-Use Options

	Option	Option Description
1	Dust suppression	The surface water pumped from the dams can be used to spray water across the site for dust suppression during the earthworks and construction phases.
2	On-site irrigation	The surface water can be sprayed around the site for irrigation purposes.
3	Wheel washing	The surface water can be utilised to spray trucks down before they leave the site to reduce tracking of mud and dirt off-site.

	Option	Option Description
4	Topping up neighbouring dams	The surface water 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 surface water, 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 Kemps Creek.

4.4 Removal of Dam Structure

After dewatering each dam, bunds should be emplaced around the dam void to direct rainfall run-off away from the void and into a drainage line directing surface water towards Kemps Creek. Bunding should be constructed in accordance with the NSW hydrology "Blue Book" (Landcom, 2004).

The dam structure will be removed by excavating the earthen dam embankments and the sediments at the base of the dam. Both the soil and sediments would need to be sampled and analysed to assess disposal options to assess if the soils are suitable for on-site reuse. The preferred option would be to use the embankment soils and sediments to partially infill the dam voids. The soil assessment and field investigation would be undertaken in accordance with a site-specific Sampling Analysis and Quality Plan (SAQP).

4.4.1 Dam Embankment Soils

Field observations suggest the embankment soils have been locally sourced and thus would be compatible with other soil at the site. The embankment soils are likely be re-used on-site as fill to either infill the dam void, provided the soils meet the guidelines as outlined in Section 3.2.

Should the soil fail to meet the guideline criteria it would be classified under the NSW EPA Waste Classification Guidelines (2014) to assess off-site disposal options.

4.4.2 Dam Sediments

It is anticipated that the saturated sediments would be excavated from the dam, and "land farmed" to remove excess water. Water is removed from the sediments to reduce the risk of settlement following compaction. As for the dam embankment soils, the sediments are likely to be re-used on-site as fill to either infill the dam void provided the soils meet the adopted guidelines.

Should the dried sediments fail to meet the guideline criteria it would be classified under the NSW EPA Waste Classification Guidelines (2014) to assess off-site disposal options.

4.5 Infill of Dam Voids

The dam voids will be infilled after the removal of surface water, embankments and sediments as per the options outlined in Table 4-3.

Table 4-3 Options for the Infill of the Dam Voids

	Option	Option Description
1	Use the dam embankment soils and sediments	If the dam embankment soils and/or the dam sediments meet the required criteria as per outlined in Section 3.3, they can be re-used within the dam voids as fill material. Sediments will need to be dried out prior to re-use as fill.
2	Import fill (Virgin Excavated Natural Material (VENM) and/or Excavated Natural Material (ENM)).	Mirvac has indicated that approximately 200,000 m^3 of VENM and/or ENM will be imported onto the site to support earthworks undertaken as part of the Stage 1 site redevelopment works. Some of this imported fill can be used to infill the dam voids.

The voids should be infilled to restore the site to the same conditions before the dam's construction. Infilled voids should then be compacted so surface water will not pond on the former void. Bunding and a construction of a permanent drainage line as outlined in Section 4.4 will direct rainfall runoff away from the infilled voids.

There will be a deficit of fill during redevelopment to infill the dam voids and provide foundations for buildings. Material to be used on-site including VENM and ENM will have to be sampled in accordance with a SAQP to ensure the material is suitable.

5 CONCLUSIONS

A strategy has been outlined to decommission the five farm dams to be undertaken during the redevelopment. The ultimate decommissioning sequence will be in part dictated by the water management requirements of the site and the re-development plan of works schedule. Subject to the staging of site works which are currently unknown, dams can be decommissioned in sequence commencing with Dam05 followed by Dams 04, 03 and 02 and ultimately Dam01.

Since the dams are constructed on a natural watercourse it is recommended that the current creek line is realigned, and surface water runoff is directed into this artificial water course to reduce inflow to the dams. Once the dams are removed surface water runoff would naturally discharge into Kemps Creek which is consistent with pre dam conditions. Bunding would also be installed around the dams during decommissioning in accordance with constructed in accordance with the NSW hydrology “Blue Book” (Landcom, 2004).

Preliminary water quality testing of the dam water indicates the water would be suitable for a number of on-site re-use options such as wheel washing, on-site irrigation dust suppression, topping up neighbouring dams or discharge into the sedimentation basin. Some minor water treatment may be required to reduce the turbidity or pH, although once the water is aerated by pumping the pH may naturally decline. No water contamination was identified within the dam waters other than some plastic debris.

Once the dams are dewatered the voids will be infilled. Initial observations made of the dam earthen embankments indicate this material should be suitable for partially infilling the voids, subject to appropriate analytical soil testing. Similarly, it is expected that the sediments to be excavated from the base of the dams are likely to be suitable to fill the void once excess water is removed and appropriate analytical testing has been completed. Since there is a deficit of on-site fill VENM and ENM will be imported to site, subject to appropriate sampling.

As per the DSI, prior to initiating this DDS on-site surface water should be measured after a significant rainfall event and compared to the observations in the DSI. This should be done in order to assess the potential contributions (surface material leaching, groundwater impact, evaporation) to observed water quality for dam de-watering purposes

6 LIMITATIONS

The findings of this report are based on the scope of work outlined in Section 1.4. Arcadis performed its services in a manner consistent with the normal level of care and expertise exercised by members of the environmental assessment profession. No warranties, express or implied are made.

The environmental investigation works detailed within this report are limited to the assessment of the identified site, associated with the historical use of the site and scope of work above only. This report does not constitute a site wide environmental investigation of all potential contamination issues, therefore the site's overall suitability from a human health and environmental perspective cannot be determined.

Subject to the scope of work, Arcadis' assessment was limited strictly to identifying the environmental conditions associated with the site and does not include evaluation of any other issues. The sampling methodologies used by Arcadis during this investigation have been designed to limit uncertainty in the results. Arcadis is confident that the results of this validation give an accurate representation of the current status of the site but note that in all subsurface investigations the potential remains for variability between sampling points and for conditions to be different on site from the conditions reported herein.

This report does not comment on any regulatory obligations based on the findings. This report relates only to the objectives stated and does not relate to any other work undertaken for the Client. It is a report based on the concentrations of contaminants observed in soil and water at the time of the sample collection. These conditions may change with time and space.

All conclusions and recommendations regarding the property are the professional opinions of the Arcadis personnel involved with the project, subject to the qualifications made above. While normal assessments of data reliability have been made, Arcadis assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements or sources outside of Arcadis, or developments resulting from situations outside the scope of this project.

Arcadis is not engaged in environmental assessment and reporting for the purpose of advertising sales promoting, or endorsement of any client interests, including raising investment capital, recommending investment decisions, or other publicity purposes. The client acknowledges that this report is for the exclusive use of the client.

7 REFERENCES

Arcadis (2019); Detailed Site Investigation. Aspect Industrial Estate, Mamre Road, Kemps Creek, NSW. Prepared for Mirvac Office and Industrial Pty Ltd.

ANZG (2018); *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

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DIPNR (2002); *Map of Salinity Potential in Western Sydney 2002*. Department of Infrastructure, Planning and Natural Resources.

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NEPM (2013) as amended Schedule B(1) Guideline on the Investigation Levels for Soil and Groundwater Health Investigation.

National Environment Protection Council (NEPC) (2013); *Guideline on Investigation Levels for Soil and Groundwater.*

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NHMRC (2008); *Guidelines for Managing Risks in Recreational Water.*

NSW Department of Planning, Industry and Environment (2009) *State Environmental Planning Policy (Western Sydney Employment Area) 2009*, amended 11 June 2020.

NSW EPA (2014); *Waste Classification Guidelines.*

NSW Office of Water (2010); *Dams in NSW: What size are your existing dams?* Department of Environment, Climate Change and Water.

APPENDIX A FIGURES

10035157 - Aspect Industrial Estate - Dam Decommissioning Strategy

Legend

- Site Boundary
- Lot Boundaries

1:4,130 at A3

mirvac

ARCADIS Design & Consultancy for natural and built assets

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Coordinate System: GDA 1994 MGA Zone 56
Date issued: October 24, 2019

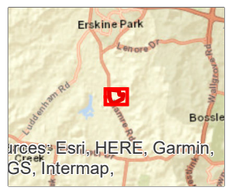


Figure 1 - Site Overview

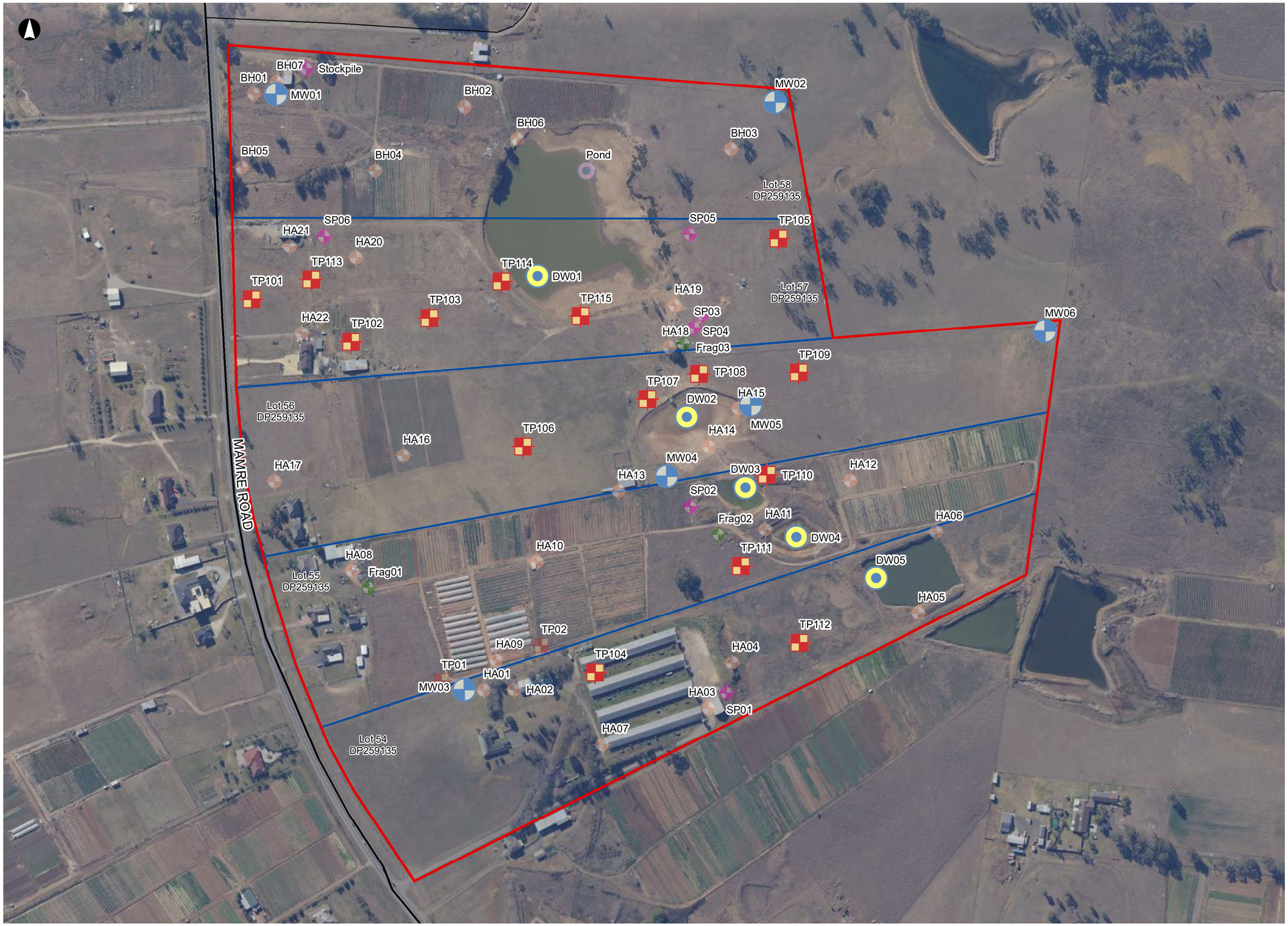
0 40 80 160 240 320
m

Date: 24/10/2019 Path: H:\AAP_ER_GIS\Projects\10035157\DS\Figure 1 - Site Overview.mxd
Created by : Environmental Restoration
QA by : Environmental Restoration

Figure 2 - Dam locations and Surface Water Samples

Date: 24/10/2019 Path: H:\AAP_ER_GIS\Projects\10035157\DDS\Figure 2 - Sample Locations - Dam Locations and SW.mxd
Created by : Environmental Restoration
QA by : Environmental Restoration

10035157 - Aspect Industrial Estate - Dam Decommissioning Strategy



Legend

Proposed Sample Locations

Type

- Monitoring Well
- Surface Water Sample
- Test Pit

Previous Sample Locations

Type

- Borehole
- Fragment
- Hand Auger
- Stockpile
- Surface Water
- Test Pit
- Lots
- Site Boundary

1:4,128 at A3

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Coordinate System: GDA 1994 MGA Zone 56
Date issued: October 2, 2019

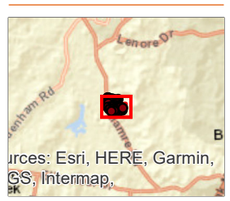

Figure 3 - Previous and Current Sample Locations

0 40 80 160 240 320
m

Date: 2/10/2019 Path: C:\Arc Templates\Temporary Projects\Proposals\Mirvac Kemps Creek\Previous Sample Locations.mxd
Created by : Environmental Restoration
QA by : Environmental Restoration

APPENDIX B TABLES

Summary of Analytical Results - Dam Surface Water

		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
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]															
Field_ID	**Sampled_Date_Time**																													
DW01	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
DW02	16-Oct-19	-	2	-	<0.2	-	<1	-	<1	-	<1	-	<0.1	-	2	-	<5	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
DW03	16-Oct-19	-	2	-	<0.2	-	<1	-	<1	-	<1	-	<0.1	-	2	-	<5	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
DW04	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
DW05	16-Oct-19	-	2	-	<0.2	-	<1	-	<1	-	<1	-	<0.1	-	2	-	<5	<20	<50	<100	<100	<100	<20	<20	<50	<50	<100	<100	<100
Statistical Summary																														
Number of Results		2	5	2	5	2	5	2	5	2	5	2	5	2	5	2	5	8	6	6	6	6	8	7	6	6	6	6	6
Number of Detects		1	5	0	0	0	0	0	0	0	0	0	0	1	4	1	0	1	0	0	0	0	1	0	0	0	0	0	0
Minimum Concentration		<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
Minimum Detect		4	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	1	32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration		4	2	<0.2	<0.2	<1	<1	<1	<1	<1	<1	<0.1	<0.1	4	2	32	<5	ND	<50	<100	<100	<100	ND	<20	<50	<50	<100	<100	<100
Maximum Detect		4	2	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	4	2	32	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration			1.6		0.1		0.5		0.5		0.5		0.05		1.5		2.5	10	25	50	50	50	10	10	25	25	50	50	50
Median Concentration		2.25	2	0.1	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.05	2.25	2	17.25	2.5	10	25	50	50	50	10	10	25	25	50	50	50
Standard Deviation			0.55		0		0		0		0		0		0.71		0	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances		0	0	2	5	0	0	0	0	0	0	2	5	0	0	2	5	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	1	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 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 - Dam Surface Water

		BTEX						PAH																	Phenols
		Benzene	Toluene	Ethylbenzene	Xylene (m & p)	Xylene (o)	Xylene Total	Acenaphthene	Acenaphthylene	Anthracene	Benz(a)anthracene	Benzo(a) pyrene	Benzo(g,h,i)perylene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenz(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	ug/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]													
Field_ID	**Sampled_Date_Time**																								
DW01	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	<0.01	<50
DW02	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	<0.01	<50
DW03	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	<0.01	<50
DW04	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	<0.01	<50
DW05	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	<0.01	<50
Statistical Summary																									
Number of Results		8	8	8	8	8	8	6	6	6	6	6	6	6	6	6	6	6	6	6	8	6	6	6	5
Number of Detects		1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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	<50
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		ND	ND	ND	ND	ND	ND	<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	<0.01	<0.01	<0.01	<50
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	11001	0.005	0.005	0.005	25
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	25
Standard Deviation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31112	0	0	0	0
Number of Guideline Exceedances		1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	0	0
Number of Guideline Exceedances(Detects Only)		1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	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

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#5:ADWG 2015 Health
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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

Aspect Industrial Estate
10035157

Summary of Analytical Results - Dam Surface Water

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	chlordane	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	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]					
Field_ID	**Sampled_Date_Time**																																			
DW01	16-Oct-19	<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	<0.1	<10	<1	<1
DW02	16-Oct-19	<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	<0.1	<10	<1	<1
DW03	16-Oct-19	<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	<0.1	<10	<1	<1
DW04	16-Oct-19	<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	<0.1	<10	<1	<1
DW05	16-Oct-19	<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	<0.1	<10	<1	<1
Statistical Summary																																				
Number of Results		5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
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
Minimum Concentration		<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	<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	ND	ND	ND
Maximum Concentration		<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	<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	ND	ND	ND
Average Concentration		0.5	0.5	0.5	0.5	0.5	0.5	0.5	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	0.05	5	0.5	0.5
Median Concentration		0.5	0.5	0.5	0.5	0.5	0.5	0.5	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	0.05	5	0.5	0.5
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	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances		0	5	5	5	5	5	5	5	5	5	5	0	0	5	0	0	0	5	0	0	0	0	0	5	0	5	5	5	0	5	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	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

Aspect Industrial Estate
10035157

Summary of Analytical Results - Dam Surface Water

ARCADIS Design & Consultancy for natural and built assets

	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	Pirimiphos-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	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	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	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]		
Field_ID **Sampled_Date_Time**																																			
DW01 16-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	<2	<2	<2	<20	<0.002	<0.1
DW02 16-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	<2	<2	<2	<20	<0.002	<0.1
DW03 16-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	<2	<2	<2	<20	<0.002	<0.1
DW04 16-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	<2	<2	<2	<20	<0.002	<0.1
DW05 16-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	<2	<2	<2	<20	<0.002	<0.1
Statistical Summary																																			
Number of Results	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5
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
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	<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
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	<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
Average 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	10	0.001	0.05
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	10	0.001	0.05
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	0	0	0	0	0	0	0	0	0	0	0	0
Number of Guideline Exceedances	5	0	0	5	0	0	0	0	5	0	5	0	5	0	0	5	0	5	5	0	5	0	0	0	5	5	0	0	0	5	0	0	0	0	5
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

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

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**	**MW02**	**MW04**	**MW05**
Sample Matrix			**Water**	**Water**	**Water**	**Water**
Eurofins Sample No.			**S19-Oc26968**	**S19-Oc26969**	**S19-Oc26970**	**S19-Oc26971**
Date Sampled			**Oct 16, 2019**	**Oct 16, 2019**	**Oct 16, 2019**	**Oct 16, 2019**
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	MW02	MW04	MW05
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			S19-Oc26968	S19-Oc26969	S19-Oc26970	S19-Oc26971
Date Sampled			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
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	DW01	DW02	DW03
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			S19-Oc26972	S19-Oc26973	S19-Oc26974	S19-Oc26975
Date Sampled			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
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	DW01	DW02	DW03
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			S19-Oc26972	S19-Oc26973	S19-Oc26974	S19-Oc26975
Date Sampled			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
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
Dibutylchlorendate (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	DW01	DW02	DW03
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			S19-Oc26972	S19-Oc26973	S19-Oc26974	S19-Oc26975
Date Sampled			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
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	DW01	DW02	DW03
Sample Matrix			Water	Water	Water	Water
Eurofins Sample No.			S19-Oc26972	S19-Oc26973	S19-Oc26974	S19-Oc26975
Date Sampled			Oct 16, 2019	Oct 16, 2019	Oct 16, 2019	Oct 16, 2019
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	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				
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	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				
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	-	-
Dibutylchlorendate (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	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				
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	-	-
Dibutylchlorendate (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			[R20]TS	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	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Eurofins | mgt Suite B7 (filtered metals/PAH trace level)			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 2013 NEPM Fractions	Melbourne	Oct 21, 2019	
- Method: LTM-ORG-2010 TRH C6-C40			
Total Recoverable Hydrocarbons - 1999 NEPM Fractions	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-ORG-2010 TRH C6-C40			
BTEX	Melbourne	Oct 21, 2019	14 Days
- Method: LTM-ORG-2010 TRH C6-C40			
Polycyclic Aromatic Hydrocarbons (Trace level)	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-ORG-2130 PAH and Phenols in Soil and Water (trace)			
Metals M8 filtered	Melbourne	Oct 21, 2019	28 Days
- Method: LTM-MET-3040 Metals in Waters, Soils & Sediments by ICP-MS			
Eurofins | mgt Suite B15			
Organochlorine Pesticides	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8270)			
Organophosphorus Pesticides	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-ORG-2200 Organophosphorus Pesticides by GC-MS (USEPA 8081)			
Polychlorinated Biphenyls	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-ORG-2220 OCP & PCB in Soil and Water (USEPA 8082)			
Phenolics (total)	Melbourne	Oct 21, 2019	7 Days
- Method: LTM-INO-4050 Total Phenolics in Waters and solids by CFA			
Eurofins | mgt Suite B7 (PAH trace level)			
Metals M8	Melbourne	Oct 21, 2019	180 Days
- Method:			

eurofins | Environment Testing

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

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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									

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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
NCP	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									
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	
Fensulfothion	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.

APPENDIX D PHOTOBOARD

SITE PHOTOGRAPHS

Project: Dam Decommissioning Strategy

Client: Mirvac

Project Number: 10035157

Location: Lots 54-58 DP259135, Mamre Road, Kemps Creek

Photo 1

Date: 16/10/2019

Dam01

Photo 2

Date: 16/10/2019

Dam02

SITE PHOTOGRAPHS

Project: Dam Decommissioning Strategy

Client: Mirvac

Project Number: 10035157

Location: Lots 54-58 DP259135, Mamre Road, Kemps Creek

Photo 3 **Date: 16/10/2019**

Dam03

Photo 4 **Date: 16/10/2019**

Dam03

SITE PHOTOGRAPHS

Project: Dam Decommissioning Strategy

Client: Mirvac

Project Number: 10035157

Location: Lots 54-58 DP259135, Mamre Road, Kemps Creek

Photo 5

Date: 16/10/2019

Dam05

ARCADIS Design & Consultancy for natural and built assets