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Groundwater Management Plan for Construction

Proposed Warehouse and Distribution Centre Development

238-258 Captain Cook Drive, Kurnell NSW

Prepared for Dicker Data Pty Ltd

3 May 2019

Version 1

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Groundwater Management Plan for Construction
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Prepared for Dicker Data Pty Ltd

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Revisions and Distribution

Document Control

The Principal Contractor is responsible for ensuring that this plan is reviewed and approved during the course of the construction works. The Environmental Manager and appointed environmental/groundwater consultant for the construction works are responsible for updating this plan to reflect changes to the project, legal and other requirements, as required.

Amendments

Any revisions or amendments must be approved by the Principal Contractor, groundwater consultant and relevant stakeholders before being distributed/implemented.

Revision Details

Revision	Details

Distribution and Authorisation

The Principal Contractor and Environmental Manager are responsible for the distribution of the Groundwater Management Plan (GMP) for construction. The controlled master version of this document should be made available for distribution as appropriate. All circulated hard copies of this document are deemed to be uncontrolled.

The implementation of the Groundwater Management Plan for construction is under the authority of the Principal Contractor. All personnel employed on the Project will perform their duties in accordance with the requirements of the Groundwater Management Plan for Construction, supporting management plans, and related procedures.

1. Introduction

Reditus Consulting Pty Ltd (Reditus) was engaged by Dicker Data Pty Ltd to prepare a Groundwater Management Plan (GMP) for the construction of the proposed warehouse and distribution centre development at 238-258 Captain Cook Drive, Kurnell NSW (the site). The site location is provided in Figure 1 below.

Figure 1: Site Location

1.1. Purpose of the Construction Groundwater Management Plan

In accordance with the Development Consent Conditions (dated 12 April 2019), issued under the Environmental Planning and Assessment Act 1979 by the Minister for Planning, a GMP must be prepared prior to the commencement of construction. The GMP must be prepared to the satisfaction of the Planning Secretary and form part of the Construction Environmental Management Plan (CEMP).

This GMP covers groundwater management for the construction phase of the development project. After completion of the construction phase, the Long-Term Environmental Management Plan (LTEMP) will cover the ongoing management of groundwater during the operational phase of the development.

This GMP outlines the processes and measures that Dicker Data Pty Ltd will use on the project to ensure that groundwater related effects of the construction activities are understood, managed and mitigated, minimising impacts to groundwater and the environment.

As per the Development Consent Conditions, the GMP must be prepared by a suitably qualified and experienced person(s) whose appointment has been endorsed by the Planning Secretary and provide the following:

- baseline data on groundwater levels and quality;
- details of construction or excavation work that may impact on groundwater; and
- a program to monitor groundwater levels and quality, groundwater impact assessment criteria and a protocol for the investigation and mitigation of identified exceedances of criteria, if potential impacts to groundwater are identified.

Implementation of this GMP will:

- Identify the project groundwater obligations and the potential hazards and risks associated with the works;
- Assist in the prevention of environmental and groundwater harm;
- Fulfil Dicker Data Pty Ltd Groundwater Management requirements as defined in the Development Consent Conditions, including complying with any relevant permits and approvals;
- Comply with all relevant environmental and groundwater legislation;
- Minimise negative impacts on the community that relate to the development's environmental and groundwater impacts during construction; and
- Identify and implement feasible opportunities to reduce the impact of the Project on groundwater to acceptable levels.

1.2. Structure of the Construction Groundwater Management Plan

The GMP is a sub-plan of the CEMP, which provides further details regarding the management of interrelated environmental aspects such as contaminated soil, acid sulphate soils, water management and waste management.

The GMP has the following structure:

- **Section 1:** Introduction
- **Section 2:** Project Overview
- **Section 3:** Groundwater Baseline Conditions
- **Section 4:** Conceptual Hydrogeological Model
- **Section 5:** Groundwater Monitoring Plan
- **Section 6:** Groundwater Trigger Values
- **Section 7:** Groundwater Impact Mitigation Measures
- **Section 8:** Legislation, Regulation and Relevant Endorsed Guidelines
- **Section 9:** Roles and Responsibilities

- **Section 10:** Reporting
- **Section 11:** Continuous Improvement

2. Project Overview

2.1. Proposed Development Description

The proposed development includes the construction and operation of a warehouse and distribution centre with associated office, carparking, landscaping, services and site subdivision.

The entire site is approximately 17ha. The building structures (including the warehouse and offices) are proposed to occupy approximately 4ha in the centre of the site. Concrete hardstand is proposed to surround the building structures (for driveways and car parking), with the remaining areas in the north and south of the site dedicated as vegetation zones and landscaped areas. The proposed development layout is presented in Figure 2 below.

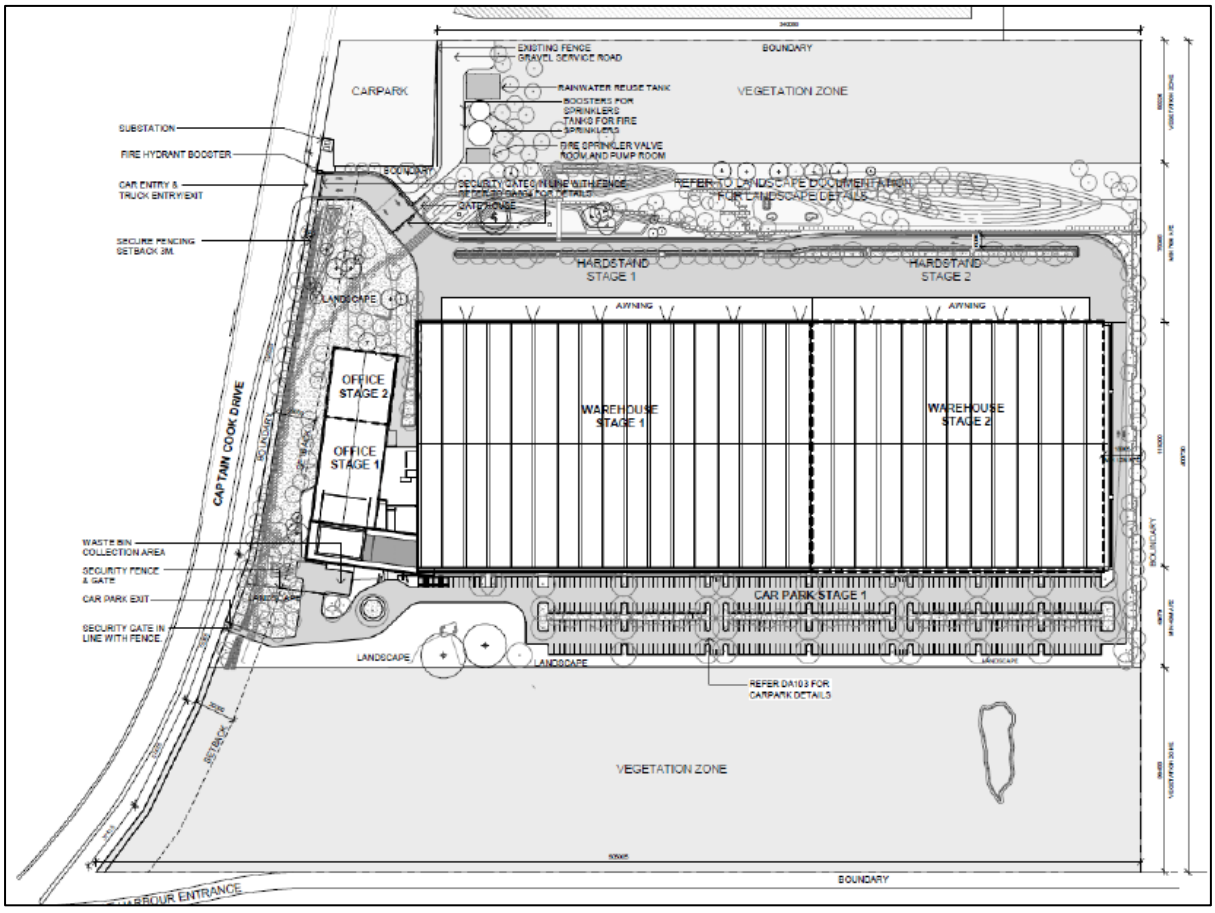

Figure 2: Proposed Development Layout

The proposed buildings are understood to be slab on grade, supported by piles socketed into Sandstone. According to the site survey plan, the site surface elevation generally ranges between approximately RL 2.9 and 3.2m Australian Height Datum (AHD). The proposed finished floor level of the warehouse, office and surrounding hardstand is RL 3.7m AHD. Therefore, no bulk excavation below the current ground surface is anticipated for the construction of the proposed development.

It is understood that the site will need to be raised approximately 0.5m-1.0m to reach an RL of 3.7m for the proposed building designs. Fill material will be required to be imported to the site to achieve the proposed development levels. The Development Consent Conditions require that only Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) or other material approved in writing by EPA is brought onto the site for filling purposes.

Driven Piles are proposed for the building construction. A pile driver will be used to drive piles through the sand and socketed into Sandstone bedrock to provide foundation support for buildings or other structures. This piling method does not require excavation of soil or dewatering of groundwater. In the event driven piles can not be completed, grout injected piles will be adopted.

Services may require some minor excavation, however, it is understood that all excavation will not extend into or below the groundwater table (i.e. below the maximum groundwater RL of 1.3m AHD).

Remediation works to be completed as part of the development construction are understood to be limited to the near surface and not expected to extend below 0.5m below the current ground surface.

The proposed early works and construction works is anticipated to occur over a 21 month period.

2.2. Overview of Groundwater Risks

Considering that groundwater is unlikely to be intercepted or required to be dewatered during the construction phase of the development works, potential risks will be limited to the items listed in Table 1 below.

Table 1: Potential Risk to Groundwater During Construction

Construction Activity	Groundwater Risk
Use of chemicals, lubricants, hydraulic fluids, paints and fuel	Spills and/or use of chemicals, fuels, paints and lubricants during construction leading to changes in groundwater quality and adverse impacts on waterways, groundwater dependent ecosystems and groundwater beneficial uses.
Importation of fill material	Leaching of potential contaminants or natural constituents from any imported fill, which may adversely change or alter the groundwater quality, potentially resulting in adverse impact on waterways, groundwater dependent ecosystems and groundwater beneficial uses.

This GMP considers and addresses these key hydrogeological risks (in addition to addressing areas of lower risk). Management and mitigation measures to be implemented to minimise potential impacts from these risks are described in detail in Section 7.

The monitoring and management measures currently proposed in this GMP are based upon information available to date. They are likely to change and be refined upon the review of the results of the further site investigations carried out during the completion of further environmental investigation and remediation works that will be undertaken during the construction phase.

2.3. Objectives and Targets

Specific objectives that have been set for managing groundwater during the development construction are listed below:

- To minimise, manage and mitigate any adverse impacts as a result of the migration of groundwater contamination.
- To minimise groundwater contamination over and above any such contamination that may already be present within or adjacent to the site.
- To protect beneficial uses of groundwater.
- To minimise changes to groundwater levels during construction and operation to manage potential impacts.
- To minimise impact on existing and future groundwater users.
- To achieve no enforcement notices or penalties issued by regulators and/or client related to groundwater.

2.4. Further Development of the Plan

Throughout the duration of the construction phase of the development, this document will be updated / amended at six-monthly intervals and will undergo further development to address:

- Any changes to the proposed development design (specifically where groundwater may be intercepted and require dewatering).
- Any changes in the project management process.
- Comments and feedback by the Client and/or other stakeholders.
- Changes to statutory requirements.
- Changes in technology and work methods to improve processes.
- Changes identified by the continuous improvement of processes.

3. Groundwater Baseline Conditions

3.1. Objective of Baseline and Derivation of Trigger Values

A key aspect of this GMP is the requirement to establish a baseline condition for groundwater, including groundwater levels, groundwater quality and beneficial uses. This baseline information is important because:

- The construction activities should minimise groundwater contamination over and above any such contamination that may already be present within or adjacent to the site; and
- The construction activities should mitigate and minimise any adverse impacts, as a result of the impact to and/or migration of groundwater contamination, on any existing or future beneficial users and/or potential environmental receptors.

The baseline conditions are established from the results of the historical groundwater monitoring information collected across the site prior to the start of significant excavation works.

Baseline conditions to be established include groundwater levels, groundwater quality and conditions at particular receptors. The duration over which the baseline monitoring should allow the identification of the existing trends in groundwater and trends in changes of the levels of contamination present at each location across the site.

Trigger values will be based on a specified change from the baseline conditions. The trigger values will vary between locations and receptors; for example:

- More sensitive locations or receptors will be given a lower tolerance to change (i.e. trigger values will be set relatively closer to the baseline value).
- Greater uncertainty in background conditions will similarly be given a lower tolerance to change.
- Reversibility of change will be an important consideration – e.g. a change in groundwater level can be relatively quickly restored, but a change in groundwater quality is much more difficult to reverse.

The 'alert' and 'action' trigger values are based on Reditus' philosophy of using proactive 'lead indicators' which support the primary objective of the GMP (i.e. to ensure any construction-related impacts to groundwater are minimised through management and mitigation).

This objective will be achieved if groundwater conditions are kept as close to background levels as possible. Background hydrogeological conditions (e.g. groundwater levels and quality etc.) are not static but fluctuate, both seasonally and in response to longer-term climatic or other trends (and in the case of groundwater, quality changes also occur in response to processes such as biodegradation). It is therefore important to establish a robust hydrogeological baseline which captures variability and trends are recognised.

3.2. Summary of Onsite Baseline Groundwater Conditions

Baseline groundwater conditions have been established using the information reported by WSP (April 2018) Environmental Site Assessment during the following monitoring events:

- 19 October 2017;
- 31 January 2018; and
- 19 February 2018.

Whilst the above data set is considered adequate to represent current baseline conditions, historical groundwater data obtained during 2005 (JBS, Sep 2005) and 2008 (WSP, Feb 2008) is also available if required for further detailed assessment.

3.2.1. Baseline Groundwater Monitoring Network

The baseline groundwater monitoring network consisted of the 12 following monitoring wells as listed Table 2 below.

Table 2: Baseline Groundwater Monitoring Network

October 2017	January 2018	February 2018
MW6	MW171	MW171
MW9	MW172	MW172
MW20	MW173	MW173
MW26	MW174	MW175
MW28	MW175	MWF
JMW2R		MW6
JMW27R		MW9
		MW20
		MW26
		JMW2R
		JMW27R

3.2.2. Baseline Groundwater Levels and Inferred Flow Direction

Over the baseline monitoring period, groundwater elevations ranged between RL 0.691m and 1.298m AHD.

The groundwater level fluctuation observed between sampling events ranged between 0.06m and 0.25m when comparing individual wells.

The groundwater elevations are summarised in Table 3 below.

Table 3: Baseline Groundwater Levels

Groundwater Monitoring Well	October 2017 (RL mAHD)	January 2018 (RL mAHD)	February 2018 (RL mAHD)
MW171	-	1.126	1.052
MW172	-	1.197	1.137
MW173	-	0.951	0.867
MW174	-	1.052	-
MW175	-	1.102	1.018
MWF	-	-	-
MW6	0.984	-	0.737
MW9	1.298	-	1.118
MW20	-	-	-
MW26	1.051	-	0.847
MW28	1.108	-	-
MW2R	1.018	-	0.818
MW27R	0.91	-	0.691

The inferred groundwater flow direction was to the west, towards botany bay. Groundwater elevation contours are presented in Figure 3 (Oct 2017), Figure 4 (Jan 2018) and Figure 5 (Feb 2018) below.

Figure 3: October 2017 Groundwater Elevation Contours

Figure 4: January 2018 Groundwater Elevation Contours

Figure 5: February 2018 Groundwater Elevation Contours

3.2.3. Baseline Groundwater Physicochemical Quality

A summary of the reported physicochemical quality data is presented in Table 4 below.

Table 4: Baseline Groundwater Physicochemical Quality Data

Groundwater Monitoring Well	pH	Dissolved Oxygen (mg/L)	Electrical Conductivity (µS/cm)	Oxidative Reduction Potential (mV)
MW171	6.89	2.39	479	-214
MW172	7.17	3.57	631	-162
MW173	7.33	1.8	589	-166
MW174	7.4	1.5	446	-170
MW175	7.46	1.59	361	-190
MW6	7.15	2.12	569	-101

MW9	7.18	3.8	563	-80
MW20	7.4	4.12	539	28
MW26	7.35	3.26	563	-194
MW2R	7.22	3.28	587	36.6
MW27R	7.34	1.94	549	-177
Min	**6.89**	**1.5**	**361**	**-214**
Max	**7.46**	**4.12**	**631**	**36.6**
Average	**7.26**	**2.97**	**534**	**-126.3**

3.2.4. Baseline Groundwater Chemical Quality

Groundwater samples were collected during the October 2017 and January 2018 monitoring events. All 11 groundwater samples collected from the above monitoring wells were analysed for the following:

- Total Recoverable Hydrocarbons (TRH);
- Benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN);
- USEPA Eight Priority Heavy Metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc);
- Selenium;
- Polycyclic Aromatic Hydrocarbons (PAHs); and
- Phenols

Four select samples from the groundwater monitoring network (JMW2R, MW27R, MW9 and MW171) were also analysed for the following:

- Nutrients (including Ammonia, total nitrogen, nitrate/nitrite and total phosphorous);
- Perfluorooctanesulfonic acid (PFOS) & Perfluorooctanoic acid (PFOA);
- Explosives;
- Organochlorine Pesticides and Organophosphorus Pesticides (OCPs/OPPs);
- Volatile Organic Compounds (VOCs); and
- Polychlorinated Biphenyls (PCBs)

Copies of the groundwater result summary tables are provided in **Appendix B**.

A summary of the reported water quality results is provided below:

- Concentrations of heavy metals were reported either below laboratory limit of reporting (LOR) or below the relevant site criteria, with the exception of arsenic, chromium, zinc and/or copper. Whilst there were reported marginal exceedances of arsenic, chromium, zinc and/or copper, they were considered to be representative of background conditions and within one order of magnitude from the adopted site criteria.
- Concentrations of TRH (>C_{10}-C_{40}) were reported in samples collected from MW28, MW171 and MW172, ranging between 410mg/L and 1,690mg/L.
- Concentrations of toluene (MW28 at 2ug/L and MW173 at 1.9ug/L) were reported to marginally exceed the laboratory LOR.
- The concentration of 6:2 Fluorotelomer sulfonate (0.02ug/L) was detected marginally above the LOR in well MW171 located in the central portion of the site. There was no adopted site criteria for this per- and polyfluoroalkyl substances (PFAS) compound.
- Concentrations of ammonia were reported below the adopted site criteria, however the total nitrogen and phosphorus concentrations at MW171 exceeded the physical and chemical stressor criteria for the protection of marine ecosystems.
- Concentrations of PFOS/PFOA, VOCs, PAHs, Phenols, OCPs, OPPs and PCBs were reported below the laboratory LOR.

As reported by WSP (April 2018), the groundwater quality results suggest that a widespread groundwater contaminant plume is not present beneath the former operational portion of the site. The site ceased operation as a pharmaceutical plant in 2003 and hence any residual groundwater contamination is likely to be over 15 years old.

All contaminant concentrations were below the laboratory LOR or site assessment criteria in wells located downgradient of all former site infrastructure (MW6, MW26, JMW27R and MW173) indicating that it is unlikely that contamination originating from the site is migrating offsite. Therefore, there is no unacceptable risk to potential offsite receptors.

4. Conceptual Hydrogeological Model

A conceptual hydrogeological model is a descriptive representation of a groundwater system that incorporates an interpretation of the geological and hydrological conditions. It consolidates the current understanding of the key processes of the groundwater system, including the influence of stresses, and assists in the understanding of possible future changes. The conceptual hydrogeological model is used as the basis for the development and implementation of the groundwater management measures during the construction phase.

The conceptual hydrogeological model will continue to evolve and be updated during all phases of the development. For example, as further field data is gathered during additional assessment (if any) or remediation works (if any) or monitoring during construction the model will be updated.

4.1. Summary of Conceptual Hydrogeological Model

The current site surface elevation ranges between approximately RL 2.9 and 3.2m AHD. The proposed finished floor level of the warehouse, office and surrounding hardstand is RL 3.7m AHD. Therefore, no bulk excavation below the current ground surface is anticipated for the construction of the proposed development.

The site is located on alluvium, gravel, swamp deposits and sand dunes from the quaternary period. Previous reports indicate the site is typically underlain by fill (uniform yellow sand containing sandy lenses of various hues and textures and rubble of varying sizes), black sandy organic soil primarily in the northern portion of the site and brown grey sand extending to groundwater.

An acid sulfate soil (ASS) investigation was completed across the site, which confirmed that there are no potential or actual ASS within 2m from the site surface.

The first groundwater zone is present within an unconfined aquifer, consisting of both alluvium and aeolian (sand dune) sand sequences. Groundwater is also likely to be present and connected to a deeper aquifer system within fractured sandstone, however, no groundwater investigation has been completed within the deeper sandstone unit.

The groundwater table was measured during 2017-2018 at elevations ranging between RL 0.691m in the south-eastern section of the site and RL 1.298m in the north-western section of the site. The inferred groundwater flow direction was to the west, towards Botany Bay.

Unconfined sand aquifers generally respond rapidly to rainfall recharge, with temporally fluctuations in groundwater levels are likely to be in the order of ±1m. Therefore, the maximum expected groundwater elevation during the construction period would be in the order of RL 2.3m AHD.

Considering that no bulk excavation below the current ground surface is anticipated for the construction of the proposed development, groundwater will not be intercepted and will not require dewatering during construction works.

No information of site specific hydrogeological properties (such as hydraulic conductivity or specific yield) of the sand aquifer have been reported in the information provided to Reditus. Based on representative literature values and

professional experience of the region, the hydraulic conductivity[1] may range between 1 and 50 m/day, with a specific yield[2] ranging between 0.1 and 0.3.

Given an approximate hydraulic gradient of 0.002 (based on MW9 and JMW27R) and an assumed porosity of 0.3, the groundwater flow velocity was estimated to be between 2.6m/year and 130m/year.

Given no groundwater is anticipated to be intercepted or dewatered, the key identified potential risks to groundwater are limited to:

- Spills and leaks of chemicals, fuels, paints, hydraulic fluids and lubricants from use, plant and equipment during construction works. If spills and leaks occur during construction, these are likely to be limited in volume and localised in area. These liquids have the potential to leach downwards through the soil and into the saturated groundwater zone. The contaminants have the potential to adversely change the baseline groundwater quality and migrate towards environmental receptors. If not appropriately mitigated / monitored / managed / remediated, the spills and leaks of chemicals may result in an adverse impact on waterways, groundwater dependent ecosystems and groundwater beneficial uses. There is also the potential that they may also render the site unsuitable for the proposed development from a human health perspective, requiring further assessment and/or remediation.
- Leaching of potential contaminants or natural constituents from any imported fill, which may adversely change or alter the groundwater quality and migrate offsite, potentially resulting in adverse impact on waterways, groundwater dependent ecosystems and potentially impact both onsite/offsite groundwater beneficial uses. Significant volumes of imported fill will be required to raise the site by up to 1m, estimated to be in the order of 50,000m^3. Infiltration of rain, during both construction and post construction, through the imported material has the potential to leach chemical compounds into the groundwater.
  The Development Consent Conditions require that only Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) or other material approved in writing by EPA is brought onto the site for filling purposes. The source and geochemical quality of this proposed imported fill will need to be well understood to mitigate against potential groundwater impact (regardless of waste classification status). This should include an ASLP neutral leaching test.

[1] Heath, R.C., 1983. Basic ground-water hydrology, U.S. Geological Survey Water-Supply Paper 2220, 86p.
[2] Morris, D.A. and A.I. Johnson, 1967. Summary of hydrologic and physical properties of rock and soil materials as analyzed by the Hydrologic Laboratory of the U.S. Geological Survey, U.S. Geological Survey Water-Supply Paper 1839-D, 42p.

5. Groundwater Monitoring Plan

Given no groundwater is anticipated to be intercepted or dewatered during construction works, the GMP has been developed to focus on the key groundwater risks associated with chemical spills and leaching from imported fill materials.

5.1. Monitoring Locations

It is anticipated that the majority of the current groundwater monitoring well network will be decommissioned/destroyed during the proposed Early Works (including the importation of fill material to raise the site and associated civil works) and subsequent construction works. Efforts should be made to retained existing groundwater monitoring wells where possible.

Following completion of the Early Works, re-installation of selected key monitoring wells (at similar locations) must be completed to allow adequate groundwater quality assessment against baseline conditions. The groundwater monitoring well network for construction monitoring purposes is presented in Figure 6 below.

Figure 6: Proposed Construction Groundwater Monitoring Network

In the event of any reported chemical/fuel spills and leaks, additional groundwater monitoring wells will be required to adequately delineate vertical and lateral extent of the potential impact at the spill/leak location.

Where required, the monitoring wells must surveyed to RL mAHD to allow assessment of relative levels and determine groundwater flow direction.

5.2. Groundwater Monitoring Frequency

Groundwater monitoring should be conducted on a six-monthly basis, including a post construction event. Based on the anticipated early works and construction works program of 21 months, a total of four groundwater monitoring events are anticipated.

5.3. Groundwater Monitoring and Sampling Methodology

Each groundwater monitoring event must be completed by a suitably qualified hydrogeologist or environmental scientist. Groundwater quality monitoring must be undertaken in accordance with the National Environmental Protection Measures (NEPM) 1999 (as amended in 2013).

All wells must be gauged with an oil-water interface probe to measure (metres below top of casing) standing groundwater levels, well depth and allow detection of the presence of Non-Aqueous Phase Liquids (NAPL). The interface probe must be decontaminated prior to use at each well by rinsing with a phosphate free detergent (Decon-90) and potable water.

All monitoring wells, where LNAPL is not observed, must then be purged using low flow pumping techniques (e.g. peristaltic pump) to ensure minimal losses of potential VOCs. Dedicated tubing should be used on each sampling location, otherwise, must be decontaminated prior to re-use at each well by rinsing with a phosphate free detergent (Decon-90) and potable water.

During purging, water quality physicochemical parameters including pH, temperature, dissolved oxygen (DO), electrical conductivity (EC) and oxidative reduction potential (ORP) must be measured and recorded using a calibrated water quality meter. All groundwater monitoring wells must be purged until groundwater parameters stabilised to suitable stable tolerances. Stabilisation criteria are as follows: DO ±10%; EC ±3%; pH ±0.05; Redox ±10 mV.

Once stabilised, samples must be placed directly into appropriately preserved laboratory supplied sampling containers. The sample for heavy metals analysis must be filtered in the field using a 0.45micron millipore filter unit prior to transfer into the laboratory bottles.

Groundwater samples which are collected in laboratory supplied sample bottles must be labelled with the project identification, sample name/location, sample date and samplers initials.

All groundwater samples must be stored and transported in an ice cooled Esky to the laboratory under a chain-of-custody (CoC).

5.4. Groundwater Laboratory Analysis

All groundwater sample must be analysed for the follow potential contaminants of concern:

- US EPA Eight Priority Heavy Metals (including arsenic, cadmium, chromium, copper, lead, mercury, nickel and zinc) and selenium
- TRH
- BTEXN
- VOCs

In the event of any reported chemical/fuel spills and leaks, additional analytes may be required for laboratory analysis.

5.5. Groundwater Sampling Quality Analysis & Quality Control

Groundwater monitoring and sampling must be completed by a suitably qualified hydrogeologist or environmental scientist.

All reusable monitoring and sampling equipment must be decontaminated by rinsing with a phosphate free detergent (Decon-90) and potable water.

Groundwater samples must be transported to the laboratory under a signed chain of custody (CoC). Information on the CoC included the sampler, sample identifier, sample matrix, collection date, analyses to be performed, sample preservation method, sample release date and sample received date

All groundwater samples must be submitted to a NATA accredited laboratory for analysis.

As part of each monitoring/sampling event, the following QA/QC samples must be collected and analysed:

- One intra-laboratory duplicate sample;
- One inter-laboratory duplicate sample;
- One equipment blank sample (rinstate);
- One field blank sample (trip blank); and
- One trip spike sample (trip spike).

The acceptable tolerable limits for samples are as follows:

- Relative percent difference (RPD) for laboratory duplicates for CoPC analysis is less than 60%; and
- Recovery of matrix spikes and surrogate spikes is as per the laboratory's Quality Assurance targets accepted under their NATA accreditation.

Precision is measured using the standard deviation 'SD' or RPD. Replicate data for field duplicates of organics is expected to be as follows:

- RPD criteria of 50% or less, for concentrations > or = 10 times PQL;
- RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and
- RPD criteria of 100% or less, for concentrations < 5 times PQL.

Replicate data for field duplicates for inorganics, including metals is expected to be as follows:

- RPD criteria of 30% or less, for concentrations > or = 10 times PQL;
- RPD criteria of 75% or less, for concentrations between 5 and 10 times the EQL; and
- RPD criteria of 100% or less, for concentrations < 5 times PQL.

5.6. Inspection Activities and Reporting Requirements

Inspection of monitoring wells should be contacted on a monthly basis by the principal contractor. Where a groundwater well is destroyed, damaged beyond repair or otherwise deemed to be lost, an evaluation will be undertaken to determine whether an existing well can be assigned to monitor the risk profile in the area relevant to the well that is deemed to be lost. If a suitable existing well cannot be identified to act as an alternative to the lost well, then the installation of a replacement well will be considered in consultation with the principal contractor.

Any chemical/fuel spills and leaks must be reported and notified to the appointed environmental consultant or hydrogeologist responsible for the implementation of this GMP within 24 hours.

In the event of any reported chemical/fuel spills and leaks, critical information should be provided to the person responsible for the implementation and revision of this GMP. This information should include chemical/product name and information (including MSDS), spill/leak location, volume lost to the environment, emergency response measures implemented, estimates of recovered chemical/product and reason how the spill/leak occurred.

6. Groundwater Tigger Values

6.1. Approach to Determining Trigger Values

The overall approach to managing, mitigating and minimising any impacts to groundwater, and in particular contaminated groundwater, is based on defining both 'Alert Values' and 'Action Values'.

Depending on the level of risk, the 'Alert Values' represent an increase in monitoring and reporting is triggered. An action value is also defined which, if exceeded, would result in specific mitigation actions. This two-step approach allows time for consideration and review of:

- Verification of the monitoring results;
- The appropriate monitoring frequency, and adjustment of this frequency as necessary;
- Potential need for new monitoring locations (e.g. a new monitoring well);
- Monitoring analytical suite (in case of water quality monitoring);
- The confidence in the appropriateness of the action values;
- Technical and practical evaluation of the possible mitigation responses;
- Likelihood of continued trend without further action;
- Preparing to enact mitigation measures; and
- Informing management, client and regulatory authorities.

This process will allow different risks to be assessed on a case-by-case basis, allowing for the tailoring of responses that are tailored to the specific scenarios.

6.2. Trigger Values

The Alert and Action Values in the table below are based on experience and information reviewed to date.

Alert Values	Action Values
Results will be initially compared with screening criteria for each monitoring parameter. **Screening Criteria for this GMP are defined as:** ▪ **the reported baseline values listed in Section 3.2; and** ▪ **the ANZG (2018) Default Guideline Values (DGVs) and NEPC (2013) NEPM HSL/GIL.** For a result that exceeds the screening criteria, an assessment of the contaminant concentration against previous monitoring results will be	Results that trigger an alert will then be assessed on a case-by-case basis to determine whether the change may result in potentially unacceptable risk. The identification of an unacceptable risk will be considered an action value requiring the implementation of additional risk mitigation measures.

undertaken to identify potentially increasing contaminant concentration trends. An increasing contaminant concentration trend would occur if a monitoring result is greater than the mean plus two standard deviations (SD) of the previous results for that location (where < limit of reporting (LOR) is treated as zero in the calculation). An increasing concentration trend will trigger an alert. An alert will also be triggered if a contaminant is detected above the adopted screening criteria for the first time.	Action values will not be triggered if there is no unacceptable risk.

A summary of the supplementary Screening Criteria (in addition to the baseline quality data) is provided in Table 5 below for the water quality parameters and chemicals of concern, which have been selected on the basis of site operational history, regional setting and site groundwater quality.

A detailed list of ANZG (2018) Marine Water Quality Criteria is proved in **Appendix A** for completeness.

Table 5: Adopted Water Quality Criteria

Analyte Group	Analyte	ANZG (2018) Marine Water Quality Guidelines (µg/L)	Recreational Water Quality Criteria (µg/L)
BTEX	Benzene	500	1,000
	Ethylbenzene	5	3,000
	Toluene	180	8,000
	Xylene (m)	75	6,000
	Xylene (p)	200	
	Xylene (o)	350	
Heavy Metals/metalloids PAHs	Arsenic	24	50
	Cadmium	0.7	5
	Chromium	27.4	50
	Copper	1.3	1,000
	Nickel	7	200
	Lead	4.4	50
	Zinc	15	5,000
	Mercury	0.1	10
	Selenium (total)	5 [d]	10
PAHs	Phenanthrene	0.6	-
	Anthracene	0.1	-
	Flouranthane	1	-
	Benzo(a)Pyrene	0.1	0.1
	Naphthalene	70	-
VOCs	1,1-DCA	90	-

	1,2-DCA	1,900	30
	1,1,1-TCA	270	-
	1,1,2-TCA	1,900	-
	1,1,2,2-TCA	400	-
	PCA	80	-
	DCM	4,000	40
	Chloroform	370	30
	Carbon Tetrachloride	240	30
	Vinyl Chloride	100	3
	DCE	700	600
	TCE	330	-
	PCE	70	500
	CB	55	100
	1,2-DCB	160	10
	1,3-DCB	260	200
	1,4-DCB	60	3
	1,2,3-TCB	3	50
	1,2,4-TCB	20	
	1,3,4-TCB	8	
	1,2,3,4-PCB	2	-
	1,2,3,5-PCB	3	-
	1,2,4,5-PCB	5	-
Total Petroleum Hydrocarbons	TPH/TRH	2 (mg/L) [a]	-
Total Nitrogen	Total Nitrogen	300 [b]	-
Nitrate	Nitrate	7200 [c]	500,000
Total Phosphorus	Total Phosphorus	30 [b]	-
Ammonia	Ammonia	910 (pH dependant)	5,000
pH	pH	7.0-8.5 [b]	6.5-8.5
Total Suspended Solids	TSS	50,000	-
Turbidity	Turbidity	10 NTU	5 NTU
Temperature	Temperature	15-30˚C	-
Sheens/Odours	Sheens/Odours	No Observable Sheen or Odour	-

a - Recommended water quality criteria (NSW EPA).

b - ANZECC (2000) Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems for Estuaries (Table 3.3.2 Chapter 3 Aquatic Ecosystems).

c - Errata document has been issued which details that Nitrate values in Table 3.4.1 (page 3.4-5) are deleted and replaced with "Under Review" (http://www.agriculture.gov.au/SiteCollectionDocuments/water/nwqms-guidelines-4-vol1-errata.pdf). The Nitrate guidelines values in ANZECC 2000 have been reviewed and recalculated (http://www.mfe.govt.nz/publications/fresh-water/anzecc-nitrate-correction-sep02). With values for 95% level of protection reported at 31.9mg/L for Nitrate and 7.2mg/L for Nitrate-N.

d – guideline for freshwater adopted in the absence of published marine water quality guidelines.

7. Groundwater Impact Mitigation Measures

The primary controls for mitigating high risk impacts to the groundwater regime during construction are inherently implemented through the following construction methods:

- No bulk excavation or excavation works are anticipated below the groundwater table. The site levels are required to be raised by approximately 1m from current levels and all building structures are slab on grade;
- This achieved through the adoption of driven pile foundations to negate the need of excavations below the existing groundwater level associated with bored pile methods; and
- Adoption of shallow pile cap or integrated pile cap and above ground structure designs to negate excavations for foundations below the existing groundwater level.

The proposed environmental management control measures to address the identified potential groundwater risks during construction (listed in Table 1, Section 2.2), are presented below.

7.1. Hazardous Chemical Spills/Leaks

The following environmental management control measures must be adopted to minimise potential risk to groundwater from chemical spills and leaks:

- Prior to bringing new chemicals to site, the principal contractor must be provided with the current (Material Safety Data Sheet) (MSDS).
- Storage and handling of hazardous substances must be in strict accordance with the applicable Standards and MSDS.
- Hazardous substances must be stored in a bunded area with a minimum holding capacity of 110% of the largest container within the bund or 25% of the total capacity of all containers within it, whichever is the greatest.
- Spill kits must be located adjacent to all hazardous substance storage units, in refuelling and maintenance areas and at designated locations as per the CEMP.
- Type and size of spill kits must be selected based on the type and volume of materials stored. Marine spill kits will be available at worksites in close proximity to waterways.
- Training in the use of spill kits must be provided.
- Refuelling must not occur within 30m of a waterway.
- Washing of concrete and concrete slurry from trucks and items will be collected onsite and not enter soil, drains or waterways.
- Wet concrete cutting and other activities that may produce a concrete slurry will include containment devices so that all slurry is collected onsite and does not enter soil, drains or waterways.

- Management of hazardous materials will be covered in the site induction. Relevant workers will undergo spill response training, as well as safe handling and storage training.
- Containment devices, including bunds, separators and catch trays, will be used where ever there is a risk of spillage.
- Inspections will be carried out [weekly] to assess the storage and handling of hazardous materials as a part of the CEMP/HSE inspection program.
- Routine maintenance of plant and equipment will be undertaken for prevention of fuel leaks, visible exhaust emissions or other maintenance issues.
- The extent of the spill will be controlled/contained by placing absorbent material and other spill kit equipment around the spill (where safe to do so). For spills onto water bodies, floating absorbent booms will be deployed (where safe to do so).
- Once the site is secure, the source has ceased, and the spill contained, the principal contract and/or Environment Team can give the all-clear to site personnel for the absorbent material to be removed and disposed of.
- A dangerous goods register will be maintained.
- Any hazardous materials will be disposed of in accordance with Waste Management Policies, regulation and relevant guidelines.

Any chemical/fuel spills and leaks must be reported and notified to the appointed environmental consultant or hydrogeologist responsible for the implementation of this GMP within 24 hours.

When an instance arises requiring contingency measures to be implemented, the principal contractor will adopt the groundwater incident response procedure detailed below.

Initial Response

The immediate response is to make the area safe and undertake measures to prevent further environmental harm. An assessment will be made in consultation with the Environmental Consultant / Hydrogeologist to ensure that responses do not result in further harm.

Initial Notification

The Principal Contractor and appointed Environmental Manager are to be notified immediately following identified exceedance of 'Action' trigger thresholds or unexpected conditions or events being encountered. The Principal Contractor will then notify the designated representatives. As required by any local, State and Federal government regulations relevant authorities will also be notified.

Classification and Reporting

Any instance of an 'Action' trigger threshold being exceeded is deemed to be an incident and will be reported within three calendar days.

Investigations

All 'Action' trigger incidents as detailed above will be investigated. Corrective actions, including those required to help prevent future incident occurrences, are a key outcome of incident investigations.

Corrective and Preventive Actions

Following exceedance of 'Action' trigger thresholds or unexpected conditions or events being encountered, corrective and preventive actions will be identified, assigned to the appropriate person or persons and closed out according to set timeframes. Timeframes are set to ensure impacts are minimised and any chance of recurrence is eliminated as soon as practicable.

7.2. Leaching of Imported Fill Material

The following environmental management control measures must be adopted to minimise potential risk to groundwater from leaching of contaminants from imported fill materials:

- The Development Consent Conditions require that only Virgin Excavated Natural Material (VENM), Excavated Natural Material (ENM) or other material approved in writing by EPA is brought onto the site for filling purposes.
- Prior to the importation of any imported fill material, regardless of waste classification status, the material must be demonstrated through laboratory testing as not to leach contaminants (including natural constituents and physicochemical qualities) at unacceptable concentrations that would alter the existing baseline groundwater quality. This should include ASLP neutral leach testing to simulate leaching from rainfall infiltration.

8. Legislation, Regulation and Relevant Endorsed Guidelines

The following legislation, regulation and NSW endorsed guidelines are applicable to the groundwater related activities.

8.1. Protection of the Environment Operations (POEO) Act 1997

The POEO Act 1997 and its associated schedules and regulations are directly relevant to the impact of groundwaters and dewatering operations (if required). In particular, the POEO Act includes requirements prohibiting the pollution of waters, preventing or minimising air and noise pollution, regarding maintenance and operation plant in a proper and efficient condition/manner, and for minimising and managing wastes.

The POEO Act also requires notification to the Environmental Protection Authority (EPA), when a pollution incident occurs that causes or threatens material harm to the environment.

8.2. Environmental Planning and Assessment Act 1979

Conditions of consent (dated 12 April 2019) in relation to groundwater were provided by the Minister of Planning issued under the Environmental Planning and Assessment Act (1979).

8.3. Water Act 1912 and Water Management Act 2000

Temporary dewatering for construction purposes is classified as an aquifer interference activity under the NSW Aquifer Interference Policy 2012. Department of Industry Water (formerly known as WaterNSW & NSW Office of Water) enforces the provisions of the Water Management Act 2000 (WMA) which includes regulation of all aquifer interference activities.

While minor aquifer interference activities works are generally exempt from the full extent of the WMA, an application for "Approval for Water Supply Works and/or Water Use" (previously known as a Temporary Dewatering Licence) is required, regardless if the total volume of groundwater extracted is expected to exceed <3 ML per year. The license (or written approval from DoI Water if no licence is required) must be obtained prior to commencement.

Reditus notes that DoI Water require "a copy of the written authorisation for the disposal of the extracted groundwater" before assessment of the approval application can proceed.

Further information on the aquifer interference policy and licencing requirements are available from the DoI Water website.

Once approval has been provided from DoI Water, an application for a "new water access licence with a zero share component" may be required and a suitable groundwater entitlement may also need to be obtained from the market to

account for the groundwater take within the same groundwater source. This will need to be obtained within three months of granting of the Zero Access Licence.

8.3.1. Water Sharing Plans

Water Sharing Plans are being progressively developed for rivers and groundwater systems across NSW following the introduction of the *Water Management* Act 2000. Water Sharing Plan made under the WMA are being prepared as Minister's plans under Section 50 of the Act. These plans protect the health of our rivers and groundwater while also providing water users with perpetual access licences, equitable conditions, and increased opportunities to trade water through separation of land and water.

Water Sharing Plans provide a legislative basis for sharing water between the environment and consumptive purposes. Under the WMA, a plan for the sharing of water must protect each water source and its dependent ecosystems and must protect basic landholder rights.

8.3.2. NSW Aquifer Interference Policy (2012)

The purpose of the *NSW Aquifer Interference Policy 2012* is to explain the role and requirements of the Minister administering the WMA in the water licensing and assessment processes for aquifer interference activities under the WMA and other relevant legislative frameworks. The *NSW Aquifer Interference Policy 2012*:

1. clarifies the requirements for obtaining water licences for aquifer interference activities under NSW water legislation; and
2. establishes and objectively defines considerations in assessing and providing advice on whether more than minimal impacts might occur to a key water-dependent asset.

The development will not result in aquifer interference under the NSW Aquifer Interference Policy (2012) as groundwater will not be removed from an aquifer. Accordingly, no groundwater licensing may be required (as detailed above).

8.4. Relevant National and NSW EPA Endorsed Guidelines

The adopted water quality guidelines for discharge waters are the:

- Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG 2018);
- ANZECC/ARMCANZ (2000) Default Trigger Values for Physical and Chemical Stressors (used in the absence of ANZG 2018); and
- Guidelines for Managing Risks in recreational Water (NHMRC 2008) / Drinking Water Criteria (NHMRC 2017).

Use of the 95% protection level (for the ANZG 2018 Guidelines) is based on an assumption that the surrounding watercourses are moderately disturbed ecosystems (as receiving road and stormwater runoff from adjacent highly urbanised environment). In the absence of ANZG (2018) DGVs, the ANZECC (2000) trigger values (TVs) were adopted.

Botany Bay is understood to be used or potentially used for recreational purposes. Therefore, recreational use criteria are appropriate to adopt for the protection of recreational users on Botany Bay. The greater of the health-based criteria multiplied by ten or the aesthetic criteria have been chosen to address the secondary contact recreational uses of water.

9. Roles and Responsibilities

The management of groundwater is the responsibility of the Principal Contractor throughout the construction phase of the development.

This management responsibility will pass to Dicker Data Pty Ltd during development occupation under the Long-Term Environmental Management Plan (LTEMP).

All monitoring and mitigation measures required to be undertaken and implemented during construction to manage and mitigate impacts to groundwater are the responsibility of Principal Contractor.

This GMP must be reviewed by a suitability qualified professional on an annual basis at minimum to ensure compliance with relevant environmental legislation and guidelines. This will form part of the annual compliance reporting with the ongoing CEMP.

The key personnel responsible for the management of groundwater impacts during construction are listed below.

Table 6: Key Personnel and Responsibilities Relating To Managing Groundwater Impacts

Role	Contact Information	Responsibilities
Development Manager	**Company: Dicker Data** **Name:** Brad Begley **Title:** Property Manager **Phone:** 0487 503 557	Manage the delivery of the development including ultimate responsibility for the implementation of GMP.
Principal Contractor	**Company:** **Name:** TBA **Title:** TBA **Phone:** TBA	Manage the delivery of the construction process in relation to groundwater management across all sites in conjunction with the Environment Manager. Oversee the implementation of groundwater management strategies.
Site Manager	**Company:** **Name:** TBA **Title:** Site Manager **Phone:** TBA	Ensure on-ground implementation of and adherence to groundwater management requirements
Environmental Consultant / Hydrogeologist	**Company:** Reditus Consulting **Name:** Lee Douglass **Title:** Principal Hydrogeologist EIANZ Certified Environmental Practitioner - Site Contamination Specialist, SC40974 **Phone:** 0412 625 989	Ensure relevant groundwater management requirements are addressed in development. Environmental reporting and monitoring Manage the on-ground application of groundwater management measures during construction (e.g. wastewater treatment, disposal and monitoring). Monitor and report on groundwater management during construction.

10. Reporting

The Responsible Parties (including Principal Contractor) shall maintain a record of all water quality monitoring data, along with details of corrective and preventative actions implemented in relation to the GMP.

All reports must be completed by a suitability qualified and certified environmental consultant. The following reports shall be prepared:

- Six-monthly Groundwater Monitoring Reports:
    - These reports will present the six-monthly monitoring data, water quality analytical results, establishment of any water quality trends, assessment of compliance with the water quality objectives and trigger levels, determine if the implemented management procedures are preventing adverse environmental impacts groundwaters or identification of water quality impacts that require immediate action, and other recommended preventive/corrective actions.
- GMP Completion Report:
    - Following completion of the development construction works and final groundwater monitoring event, a Completion Report must be prepared.
    - This report must include all groundwater monitoring data obtained during the construction phase and an assessment to determine if GMP objectives have been achieved, or if additional works are required to achieve the objectives.
- Annual GMP review:
    - This GMP review must be completed by a certified suitability qualified professional on an annual basis to ensure compliance with relevant environmental legislation and guidelines. The GMP should be updated where required to comply with any changes to relevant environmental legislation and guidelines.

11. Continuous Improvement

Dicker Data Pty Ltd and Reditus are committed to continuous improvement in the approach to groundwater management.

During construction and groundwater observations will result in the periodic updating of the conceptual model and hence an optimised groundwater management strategy.

As part of the six-monthly reporting of the groundwater conditions during construction, it is proposed that a revised conceptual model will be issued.

As the construction progresses, technical advancements may occur in industry that have the potential to benefit the development. These advancements could include the emergence of more efficient and less labour-intensive groundwater monitoring techniques, or the development of contamination management techniques that provide more effective, sustainable or efficient methods of managing contamination risks.

The key to capturing these opportunities will be the ability to identify, assess and respond to emergent issues, science and technologies. To achieve this, Reditus will adopt the following actions during the construction:

- Regular and routine interrogation of the scientific literature to remain abreast of scientific Australian and international developments;
- Peer review available information to ensure it is scientifically sound and consistent with the recognised Australian framework, including the National Environment Protection (Assessment of Site Contamination) Measure 1999, as updated 2013 (ASC NEPM);
- Continue to organise and participate in industry forums on new and emergent risks, assessment methods and management technologies, sharing lessons learnt and learn the information gathered within the team;
- Interrogate scientific documents and new technologies to understand the potential effectiveness, sustainability and efficiencies, and present the likely opportunities presented by these advancements in plain English so they can be understood by other stakeholders;
- Provide an honest opinion of uncertainty of the science and technology presented and the conclusions reached.

12. Limitations

The report or document does not purport to provide legal advice and any conclusions or recommendations made should not be relied upon as a substitute for such advice.

The report does not constitute a recommendation by Reditus for the client or any other party to engage in any commercial or financial transaction and any decision by the client or other party to engage in such activities is strictly a matter for the client.

The report relies upon data, surveys, measurements and results taken at or under the site at particular times and conditions specified herein. Any findings, conclusions or recommendations only apply to the aforementioned circumstances and no greater reliance should be assumed or drawn by the client. Furthermore, the report has been prepared solely for use by the client and Reditus accepts no responsibility for its use by other parties. The client agrees that Reditus' report or associated correspondence will not be used or reproduced in full or in part for promotional purposes and cannot be used or relied upon by any other individual, party, group or company in any prospectus or offering. Any individual, party, group or company seeking to rely this report cannot do so and should seek their own independent advice.

No warranties, express or implied, are made. Subject to the scope of work undertaken, Reditus assessment is limited strictly to identifying typical environmental conditions associated with the subject property based on the scope of work and testing undertaken and does not include and evaluation of the structural conditions of any buildings on the subject property or any other issues that relate to the operation of the site and operational compliance of the site with state or federal laws, guidelines, standards or other industry recommendations or best practice. Scope of work undertaken for assessments are agreed in advance with the client and may not necessarily comply with state or federal laws or industry guidelines for the type of assessment conducted.

Additionally, unless otherwise stated Reditus did not conduct soil, air or wastewater analyses including asbestos or perform contaminated sampling of any kind. Nor did Reditus investigate any waste material from the property that may have been disposed off the site, or undertake and assessment or review of related site waste management practices.

The results of this assessment are based upon (if undertaken as part of the scope work) a site inspection conducted by Reditus personnel and/or information from interviews with people who have knowledge of site conditions and/or information provided by regulatory agencies. All conclusions and recommendations regarding the property are the professional opinions of the Reditus personnel involved with the project, subject to the qualifications made above.

While normal assessments of data reliability have been made, Reditus assumes no responsibility or liability for errors in any data obtained from regulatory agencies, statements from sources outside of Reditus, or developments resulting from situations outside the scope of this project/assessment.

Reditus is not engaged in environmental auditing and/or reporting of any kind for the purpose of advertising sales promoting, or endorsement of any client's interests,

including raising investment capital, recommending investment decisions, or other publicity purposes.

Information relating to soil, groundwater, waste, air or other matrix conditions in this document is considered to be accurate at the date of issue. Surface, subsurface and atmospheric conditions can vary across a particular site or region, which cannot be wholly defined by investigation. As a result, it is unlikely that the results and estimations presented in this report will represent the extremes of conditions within the site that may exist. Subsurface conditions including contaminant concentrations can change in a limited period of time and typically have a high level of spatial heterogeneity.

From a technical perspective, there is a high degree of uncertainty associated with the assessment of subsurface, aquatic and atmospheric environments. They are prone to be heterogeneous, complex environments, in which small subsurface features or changes in geologic conditions or other environmental anomalies can have substantial impact on water, air and chemical movement.

Major uncertainties can also occur with source characterisation, assessment of chemical fate and transport in the environment, assessment of exposure risks and health effects, and remedial action performance. These factors make uncertainty an inherent feature of potentially impacted sites. Technical uncertainties are characteristically several orders of magnitude greater at impacted sites than for other kinds of projects.

In relation the conduct of Asbestos inspections or the preparation of hazardous materials reports Reditus has conducted inspections and the identification of hazardous material within the constraints presented by the property. Whist efforts are made to access areas not normally accessed during normal use of the site to identify the presence of asbestos or other hazardous material, unless explicitly tested no guarantee can be provided that such material is or is not present.

Reditus' professional opinions are based upon its professional judgment, experience, and training. These opinions are also based upon data derived from the limited testing and analysis described in this report or reports reviewed. It is possible that additional testing and analysis might produce different results and/or different opinions or other opinions. Reditus has limited its investigation(s) to the scope agreed upon with its client. Reditus believes that its opinions are reasonably supported by the testing and analysis that has been undertaken (if any), and that those opinions have been developed according to the professional standard of care for the environmental consulting profession in this area at this time. Other opinions and interpretations may be possible. That standard of care may change and new methods and practices of exploration, testing and analysis may develop in the future, which might produce different results.

Appendix A – Default Guideline Values (DGVs) ANZG 2018

Chemical Group	Chemical	95% DGV (µg/L)
Anilines	2,4-Dichloroaniline	7
	2,5-Dichloroaniline	3
	3,4-Dichloroaniline	150
	Aniline	8
Aromatic hydrocarbons	Benzene	700
	Cumene (isopropylbenzene)	30
	Ethylbenzene	5
	m-Xylene	75
	o-Xylene	350
	p-Xylene	200
	Toluene	180
Bypyridilium herbicides	Diquat	1.4
	Paraquat	0.5
Carbamate & other pesticides	Carbofuran	0.06
	Methomyl	3.5
	S-Methoprene	20
Chlorinated alkenes	1,1,2,2-Tetrachloroethylene	70
	1,1,2-Trichloroethylene	330
	1,1-Dichloroethylene	700
	1,3-Dichloropropene	0.8
	3-Chloropropene	3
	Chloroethylene	100
Chlorobenzenes and chloronaphthalenes	1,2,3,4-Tetrachlorobenzene	2
	1,2,3,5-Tetrachlorobenzene	3
	1,2,3-Trichlorobenzene	3
	1,2,4,5-Tetrachlorobenzene	5
	1,2,4-Trichlorobenzene	80
	1,2-Dichlorobenzene	160
	1,3,5-Trichlorobenzene	8
	1,3-Dichlorobenzene	260
	1,4-Dichlorobenzene	60
	1-Chloronaphthalene	0.7
	Hexachlorobenzene	0.05
	Monochlorobenzene	55
	Pentachlorobenzene	1.5
Chloroethanes	1,1,1-Trichloroethane	270
	1,1,2-Trichloroethane	1900
	1,2-Dichloroethane	1900
	Hexachloroethane	290
	Pentachloroethane	80
Chloromethanes	Carbon tetrachloride	240
	Chloroform	370
	Dichloromethane	4000

Chloropropanes	1,1-Dichloropropane	500
	1,2-Dichloropropane	900
	1,3-Dichloropropane	1100
Metals and metalloids	Antimony	270
	Cadmium	5.5
	Chromium (CrIII)	27.4
	Chromium (CrVI)	4.4
	Cobalt	1
	Copper	1.3
	Lead	4.4
	Manganese	80
	Mercury (inorganic)	0.4
	Nickel	70
	Silver	1.4
	Thallium	17
	Tributyltin (as µg Sn/L)	0.006
	Vanadium	100
	Zinc	15
Miscellaneous herbicides	Bromacil	180
Miscellaneous industrial chemicals	1,2-Diphenylhydrazine	2
	Acetonitrile	160
	Acrylonitrile	8
	Dimethylformamide	1000
	Diphenylnitrosamine	6
	Hexachlorocyclopentadiene	0.05
	Isophorone	130
	Poly(acrylonitrile-co-butadiene-co-styrene)	250
Nitrobenzenes	1,2,4,5-Tetrachloro-3-nitrobenzene	0.3
	1,2-Dichloro-3-nitrobenzene	15
	1,2-Dinitrobenzene	0.6
	1,3,5-Trichloro-2,4-dinitrobenzene	0.2
	1,3,5-Trinitrobenzene	4
	1,3-Dichloro-5-nitrobenzene	3
	1,3-Dinitrobenzene	13
	1,4-Dichloro-2-nitrobenzene	10
	1,4-Dinitrobenzene	0.6
	1,5-Dichloro-2,4-dinitrobenzene	0.03
	1-Chloro-2,4-dinitrobenzene	4
	1-Chloro-2-nitrobenzene	15
	1-Chloro-3-nitrobenzene	12
	1-Chloro-4-nitrobenzene	1
	1-Fluoro-4-nitrobenzene	28
	1-Methoxy-2-nitrobenzene	130
	1-Methoxy-4-nitrobenzene	16
	2,4-Dichloro-2-nitrobenzene	12
	Nitrobenzene	550

Nitrophenols	2,4,6-Trinitrophenol	250
	2,4-Dinitrophenol	45
	2-Nitrophenol	2
	3-Nitrophenol	1
	4-Nitrophenol	58
Nitrotoluenes	1,2-Dimethyl-3-nitrobenzene	4
	1,2-Dimethyl-4-nitrobenzene	16
	2,3-Dinitrotoluene	0.4
	2,4,6-Trinitrotoluene	140
	2,4-Dinitrotoluene	16
	2-Nitrotoluene	110
	3-Nitrotoluene	75
	4-Chloro-3-nitrotoluene	1.5
	4-Nitrotoluene	120
Non-metallic inorganics	Ammonia	910 (pH dependant)
	Cyanide	4
Organic alcohols	Ethanol	1400
	Ethylene glycol	50000
Organic sulfur compounds	Bis(diethylthiocarbamyl)disulfide	1
	Bis(dimethylthiocarbamyl)sulfide	10
	Carbon disulfide	20
Organochlorine pesticides	Aldrin	0.003
	Chlordane	0.001
	DDE	0.0005
	DDT	0.0004
	Dicofol	0.1
	Dieldrin	0.01
	Endosulfan	0.01
	Endrin	0.008
	Heptachlor	0.0004
	Lindane	0.007
	Methoxychlor	0.004
	Mirex	0.04
	Toxaphene	0.0006
Organophosphorus pesticides	Azinphos methyl	0.01
	Chlorpyrifos	0.009
	Demeton-S	0.3
	Demeton-S-methyl	4
	Diazinon	0.01
	Dimethoate	0.15
	Fenitrothion	0.001
	Malathion	0.05
	Parathion	0.004
	Profenofos	0.002
	Temephos	0.05
Phenols & xylenols	2,3,4,5-Tetrachlorophenol	2

	2,3,4,6-Tetrachlorophenol	10
	2,3,4-Trichlorophenol	4
	2,3,5,6-Tetrachlorophenol	1.4
	2,3,5-Trichlorophenol	2
	2,3,6-Trichlorophenol	2
	2,3-Dichlorophenol	31
	2,4,5-Trichlorophenol	4
	2,4,6-Trichlorophenol	3
	2,4-Dichlorophenol	120
	2,4-Dimethylphenol	2
	2,5-Dichlorophenol	3
	2,6-Dichlorophenol	34
	2-Chlorophenol	340
	4-Chlorophenol	220
	Pentachlorophenol	22
	Phenol	400
Phenoxyacetic acid herbicides	2,4,5-T	36
	MCPA	1.4
Phthalates	Di(2-ethylhexyl)phthalate	1
Polychlorinated biphenyls (PCBs) & dioxins	Aroclor 1242	0.3
	Aroclor 1254	0.01
Polycyclic aromatic hydrocarbons	Anthracene	0.1
	Benzo(a)pyrene	0.1
	Fluoranthene	1
	Naphthalene	70
	Phenanthrene	0.6
Pyrethroids	Deltamethrin	0.0001
	Esfenvalerate	0.001
Thiocarbamate herbicides	Molinate	3.4
	Thiobencarb	2.8
	Thiram	0.01
Triazine herbicides	Amitrole	22
	Atrazine	13
Urea herbicides	Diuron	1.8
	Tebuthiuron	2.2
Total Petroleum Hydrocarbons	TPH/TRH	2,000 [a]
Total Nitrogen	Total Nitrogen	300 [b]
Nitrate (as N)	Nitrate	7,200 [c]
Total Phosphorus	Total Phosphorus	30 [b]
pH	pH	7.0-8.5 [b]
Total Suspended Solids	TSS	50,000
Turbidity	Turbidity	10 NTU
Temperature	Temperature	15-30˚C
Sheens/Odours	Sheens/Odours	No Observable Sheen or Odour

a - Recommended water quality criteria (NSW EPA).

b - ANZECC (2000) Default trigger values for physical and chemical stressors for south-east Australia for slightly disturbed ecosystems for Estuaries (Table 3.3.2 Chapter 3 Aquatic Ecosystems).

c - Errata document has been issued which details that Nitrate values in Table 3.4.1 (page 3.4-5) are deleted and replaced with "Under Review" (http://www.agriculture.gov.au/SiteCollectionDocuments/water/nwqms-guidelines-4-vol1-errata.pdf). The Nitrate guidelines values in ANZECC 2000 have been reviewed and recalculated (http://www.mfe.govt.nz/publications/fresh-water/anzecc-nitrate-correction-sep02). With values for 95% level of protection reported at 31.9mg/L for Nitrate and 7.2mg/L for Nitrate-N.

Appendix B – Baseline Groundwater Results Summary Tables

Well	Sampling Date	Depth to water	Well depth	Top of casing elevation	Water elevation
		mBTOC	mBTOC	mAHD	mAHD
MW20	19/10/2017	2.321	2.886	-	-
MW24R	19/10/2017	2.595	4.315	-	-
MW26	19/10/2017	2.579	4.409	3.63	1.051
JMW2R	19/10/2017	2.712	4.404	3.73	1.018
JMW27R	19/10/2017	2.679	4.425	3.58	0.901
MW28	19/10/2017	2.682	2.965	3.79	1.108
MW6	19/10/2017	2.486	4.855	3.47	0.984
MW9	19/10/2017	2.302	4.768	3.6	1.298
MWF	19/10/2017	2.552	2.939	-	-
Statistical Summary					
Minimum		2.302	2.886	3.47	0.901
Maximum		2.712	4.855	3.79	1.298
Average		2.5	4	3.6	1.1
Median		2.579	4.404	3.615	1.035
Standard		0.15	0.82	0.11	0.14

Well	Sampling Date	Depth to water	Well depth	Top of casing elevation	Water elevation
		mBTOC	mBTOC	mAHD	mAHD
MW171	31/01/2018	2.164	5.13	3.29	1.126
MW172	31/01/2018	2.823	4.73	4.02	1.197
MW173	31/01/2018	1.909	4.2	2.86	0.951
MW174	31/01/2018	2.368	4.2	3.42	1.052
MW175	31/01/2018	3.028	5.72	4.13	1.102

Statistical Summary

Minimum	1.909	4.2	2.86	0.951
Maximum	3.028	5.72	4.13	1.197
Average	2.5	4.8	3.5	1.1
Median	2.368	4.73	3.42	1.102
Standard	0.46	0.65	0.53	0.092

Well	Sampling Date	Depth to water	Well depth	Top of casing elevation	Water elevation
		mBTOC	mBTOC	mAHD	mAHD
MW171	19/02/2018	2.238	5.13	3.29	1.052
MW172	19/02/2018	2.883	4.74	4.02	1.137
MW173	19/02/2018	1.993	4.2	2.86	0.867
MW175	19/02/2018	3.112	5.72	4.13	1.018
MWF	19/02/2017	2.723	2.91	-	-
MW6	19/02/2018	2.733	4.84	3.47	0.737
MW9	19/02/2018	2.482	4.75	3.6	1.118
MW20	19/02/2018	2.513	2.88	-	-
MW26	19/02/2018	2.783	4.41	3.63	0.847
JMW2R	19/02/2018	2.912	4.4	3.73	0.818
JMW27R	19/02/2018	2.889	4.42	3.58	0.691

Statistical Summary

Minimum	1.993	2.88	2.86	0.691
Maximum	3.112	5.72	4.13	1.137
Average	2.7	4.4	3.6	0.92
Median	2.733	4.42	3.6	0.867
Standard	0.31	0.86	0.38	0.17

		Field				
		Depth to water	DO mg/L (Field)	Electrical conductivity	pH	Redox
		mBTOC	mg/L	uS/cm	pH_Units	mV
Well	**Sampling date**					
JMW2R	19/10/2017	2.712	3.28	587	7.22	36.6
MW20	19/10/2017	2.321	4.12	539	7.4	28
MW24R	19/10/2017	2.595	pipe bent			
MW26	19/10/2017	2.579	3.26	563	7.35	-194
MW27R	19/10/2017	2.679	1.94	549	7.34	-177
MW28	19/10/2017	2.682	-	-	-	-
MW6	19/10/2017	2.486	2.12	569	7.15	-101
MW9	19/10/2017	2.302	3.8	563	7.18	-80
MWF	19/10/2017	2.552	insufficient water			

Statistical Summary

Minimum		2.302	1.94	539	7.15	-194
Maximum		2.712	4.12	587	7.4	36.6
Average		2.5	3.1	562	7.3	-81
Median		2.579	3.27	563	7.28	-90.5
Standard Deviation		0.15	0.88	17	0.1	98

		Field					
		Depth to water	DO mg/L (Field)	Electrical conductivity	pH	Redox	Temp
		mBTOC	mg/L	uS/cm	pH_Units	mV	oC
Well	**Sampled_Date_Time**						
MW171	31/01/2018	2.164	2.39	479	6.89	-214	20.3
MW172	31/01/2018	2.823	3.57	631	7.17	-162	20.8
MW173	31/01/2018	1.909	1.8	589	7.33	-166	20.2
MW174	31/01/2018	2.368	1.5	446	7.4	-170	18.8
MW175	31/01/2018	3.028	1.59	361	7.46	-190	18.3
Pond1	31/01/2018	NA	3.49	1970	7.59	63	21.9

Minimum Concentration	1.909	1.5	361	6.89	-214	18.3
Maximum Concentration	3.028	3.57	1970	7.59	63	21.9
Average Concentration	2.5	2.4	746	7.3	-140	20
Median Concentration	2.368	2.095	534	7.365	-168	20.25
Standard Deviation	0.46	0.94	608	0.25	101	1.3

			Total recoverable hydrocarbons										BTEXN						Metals and nutrients									
			C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29-C36 Fraction	TPH C6-C10	C6 - C10 Fraction minus BTEX (F1)	C10 - C16 Fraction	TRH >C10-C16 less Naphthalene (F2)	C16 - C34 Fraction	C34 - C40 Fraction	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Naphthalene	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc	Ammonia as N
			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			10	50	100	100	10	10	50	50	100	100	0.5	0.5	0.5	0.5	1	0.1	1	0.1	1	1	1	0.05	1	1	1	10
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m								6000		NL			5000	NL	NL			NL										
NEPM 2013 Table 1C GILs, Fresh Waters													950			350	200	16	13	0.2	4.4	1.4	3.4	0.06	11	5	8	1880
NEPM 2013 Table 1C GILs, Marine Waters													500				200	70	4.5	0.7	1	1.3	4.4	0.1	7		15	2840
Field_ID	**Sample Date**	**Lab_Report**																										
JMW2R	19/10/2017	178164	<10	<50	<100	<100	<10	<10	<50	<50	<100	<100	<1	<1	<1	<1	<2	<1	2	<0.1	<1	<1	<1	<0.05	<1	<1	3	430
MW20	19/10/2017	178164	<10	<50	<100	<100	<10	<10	<50	<50	<100	<100	<1	<1	<1	<1	<2	<1	1	<0.1	<1	<1	<1	<0.05	<1	<1	2	-
MW26	19/10/2017	178164	<10	<50	<100	<100	<10	<10	<50	<50	<100	<100	<1	<1	<1	<1	<2	<1	<1	<0.1	<1	<1	<1	<0.05	<1	<1	4	-
MW27R	19/10/2017	178164	<10	<50	<100	<100	<10	<10	<50	<50	<100	<100	<1	<1	<1	<1	<2	<1	<1	<0.1	<1	<1	<1	<0.05	<1	<1	2	30
MW28	19/10/2017	178164	<10	<100	230	1300	<10	<10	<100	-	1300	390	<1	2	<1	<1	<2	<1	1	<0.1	<1	<1	<1	<0.05	<1	1	4	-
MW6	19/10/2017	178164	<10	<50	<100	<100	<10	<10	<50	<50	<100	<100	<1	<1	<1	<1	<2	<1	5	<0.1	<1	<1	<1	<0.05	<1	<1	12	-
MW9	19/10/2017	178164	<10	<50	<100	<100	<10	<10	<50	<50	<100	<100	<1	<1	<1	<1	<2	<1	1	<0.1	1	<1	<1	<0.05	<1	<1	15	120
Statistical Summary																												
Minimum Concentration			<10	<50	<100	<100	<10	<10	<50	<50	<100	<100	<1	<1	<1	<1	<2	<1	<1	<0.1	<1	<1	<1	<0.05	<1	<1	2	30
Minimum Detect			ND	ND	230	1300	ND	ND	ND	ND	1300	390	ND	2	ND	ND	ND	ND	1	ND	1	ND	ND	ND	ND	1	2	30
Maximum Concentration			<10	<100	230	1300	<10	<10	<100	<50	1300	390	<1	2	<1	<1	<2	<1	5	<0.1	1	<1	<1	<0.05	<1	1	15	430
Maximum Detect			ND	ND	230	1300	ND	ND	ND	ND	1300	390	ND	2	ND	ND	ND	ND	5	ND	1	ND	ND	ND	ND	1	15	430
Average Concentration			5	29	76	1300	5	5	29	25	229	99	0.5	0.71	0.5	0.5	1	0.5	1.6	0.05	0.57	0.5	0.5	0.025	0.5	0.57	6	193
Median Concentration			5	25	50	1300	5	5	25	25	50	50	0.5	0.5	0.5	0.5	1	0.5	1	0.05	0.5	0.5	0.5	0.025	0.5	0.5	4	120
Standard Deviation			0	9.4	68	1300	0	0	9.4	0	472	129	0	0.57	0	0	0	0	1.6	0	0.19	0	0	0	0	0.19	5.3	210

			Polycyclic aromatic hydrocarbons																		Phenols
			Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j+k)fluoranthene	Benzo(a) pyrene	Benzo(a)pyrene TEQ	Indeno(1,2,3-c,d)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	2-(acetylamino) fluorene	3-methylcholanthrene	PAHs (Sum of total)	Phenolics Total
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	4	0.1	5	0.1	0.1	0.1	0.5	0.5	1	50
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																					
NEPM 2013 Table 1C GILs, Fresh Waters						2	0.4	1.4					0.2								
NEPM 2013 Table 1C GILs, Marine Waters						2	0.4	1.4					0.2								
Field_ID	**Sample Date**	**Lab_Report**																			
JMW2R	19/10/2017	178164	<1	<1	<1	<1	<1	<1	<1	<1	<1	<4	<1	<5	<1	<1	<1	<2	<2	<2	<50
MW20	19/10/2017	178164	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<5	<1	<1	<1	-	-	<2	<50
MW26	19/10/2017	178164	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<5	<1	<1	<1	-	-	<2	<50
MW27R	19/10/2017	178164	<1	<1	<1	<1	<1	<1	<1	<1	<1	<4	<1	<5	<1	<1	<1	<2	<2	<2	<50
MW28	19/10/2017	178164	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<2	-	-	<2	<50
MW6	19/10/2017	178164	<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<5	<1	<1	<1	-	-	<2	<50
MW9	19/10/2017	178164	<1	<1	<1	<1	<1	<1	<1	<1	<1	<4	<1	<5	<1	<1	<1	<2	<2	<2	<50
Statistical Summary																					
Minimum Concentration			<1	<1	<1	<1	<1	<1	<1	<1	<1	<2	<1	<5	<1	<1	<1	<2	<2	<2	<50
Minimum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration			<2	<2	<2	<2	<2	<2	<2	<2	<2	<4	<2	<10	<2	<2	<2	<2	<2	<2	<50
Maximum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration			0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	1.4	0.57	2.9	0.57	0.57	0.57	1	1	1	25
Median Concentration			0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.5	2.5	0.5	0.5	0.5	1	1	1	25
Standard Deviation			0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.53	0.19	0.94	0.19	0.19	0.19	0	0	0	0

	PFOS and PFOA					Phenols																	Explosives			OPPs							
	Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FtS)	8:2 Fluorotelomer sulfonate	2,3,4,6-tetrachlorophenol	2,4-dinitrophenol	3/4-methyl phenol (m/p-cresol)	4,6-Dinitro-2-methylphenol	4-nitrophenol	Phenol	2-chlorophenol	2-methylphenol	2-nitrophenol	2,4-dimethylphenol	2,4-dichlorophenol	2,6-dichlorophenol	4-chloro-3-methylphenol	2.4.6-Trichlorophenol	2,4,5-trichlorophenol	Pentachlorophenol	Dinoseb	1,3-Dinitrobenzene	2,6-dinitrotoluene	Nitrobenzene	Ethyl methanesulfonate	Safrole	Cyclohexane	4,4-DDE	a-BHC	Aldrin	b-BHC
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/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	0.01	0.01	0.01	0.01	0.01	0.5	20	0.001	20	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	10	1	1	1	1	1	1	0.1	0.1	0.1	0.1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																
NEPM 2013 Table 1C GILs, Fresh Waters		0.13	220			10	45				320	340				120			3		3.6				550							
NEPM 2013 Table 1C GILs, Marine Waters		0.13	220								400										11				550							
Field_ID	**Sample Date**	**Lab_Report**																															
JMW2R	19/10/2017	178164	<0.01	<0.01	<0.01	<0.01	<0.01	<2	<20	<0.004	<20	<20	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<10	<10	<5	<5	<5	<5	<5	<1	<2	<2	<2	<2
MW27R	19/10/2017	178164	<0.01	<0.01	<0.01	<0.01	<0.01	<2	<20	<0.004	<20	<20	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<10	<10	<5	<5	<5	<5	<5	<1	<2	<2	<2	<2
MW9	19/10/2017	178164	<0.01	<0.01	<0.01	<0.01	<0.01	<2	<20	<0.004	<20	<20	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<10	<10	<5	<5	<5	<5	<5	<1	<2	<2	<2	<2
Statistical Summary																																	
Minimum Concentration	<0.01	<0.01	<0.01	<0.01	<0.01	<2	<20	<0.004	<20	<20	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<10	<10	<5	<5	<5	<5	<5	<5	<1	<2	<2	<2	<2
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
Maximum Concentration	<0.01	<0.01	<0.01	<0.01	<0.01	<2	<20	<0.004	<20	<20	<2	<2	<2	<2	<2	<2	<2	<10	<2	<2	<10	<10	<5	<5	<5	<5	<5	<5	<1	<2	<2	<2	<2
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
Average Concentration	0.005	0.005	0.005	0.005	0.005	1	10	0.002	10	10	1	1	1	1	1	1	1	5	1	1	5	5	2.5	2.5	2.5	2.5	2.5	0.5	1	1	1	1
Median Concentration	0.005	0.005	0.005	0.005	0.005	1	10	0.002	10	10	1	1	1	1	1	1	1	5	1	1	5	5	2.5	2.5	2.5	2.5	2.5	0.5	1	1	1	1
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

Table 2
Groundwater analytical results October 2017

					OCP							
	Chlordane (cis)	Chlordane (trans)	d-BHC	DDD	DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin aldehyde	Endrin ketone
	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	0.1	2	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	2	0.1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m												
NEPM 2013 Table 1C GILs, Fresh Waters					0.006					0.01		
NEPM 2013 Table 1C GILs, Marine Waters										0.004		
Field_ID / **Sample Date** / **Lab_Report**												
JMW2R / 19/10/2017 / 178164	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW27R / 19/10/2017 / 178164	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
MW9 / 19/10/2017 / 178164	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Statistical Summary												
Minimum Concentration	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	1	1	1	1	1	1	1	1	1	1	1	1
Median Concentration	1	1	1	1	1	1	1	1	1	1	1	1
Standard Deviation	0	0	0	0	0	0	0	0	0	0	0	0

						VOCs																																	
	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethylbenzene	1,2-dibromo-3-chloropropane	1,2-dibromoethane	1,2-dichlorobenzene	1,2-dichloroethane	1,2-dichloropropane	1,3,5-trimethylbenzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	2,2-dichloropropane	2-chlorotoluene	4-chlorotoluene	Bromobenzene	Bromochloromethane	Bromodichloromethane	Bromoform	Bromomethane	Carbon tetrachloride
	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	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	0.1	0.1	0.1	0.1	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	10	0.5
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																					
NEPM 2013 Table 1C GILs, Fresh Waters	0.2	0.01							6500				3		85				160				260		60												
NEPM 2013 Table 1C GILs, Marine Waters									1900						20																						
Field_ID	**Sample Date**	**Lab_Report**																																					
JMW2R	19/10/2017	178164	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
MW27R	19/10/2017	178164	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
MW9	19/10/2017	178164	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
Statistical Summary																																					
Minimum Concentration	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<2	<2	<2	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<10	<1
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	0.5
Median Concentration	1	1	1	1	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	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	0	0

	Chlorobenzene	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene	Dibromomethane	Dichlorodifluoromethane	Hexachlorobutadiene	Isopropylbenzene	n-butylbenzene	n-propylbenzene	Pentachloroethane	p-isopropyltoluene	sec-butylbenzene	Styrene	TCE	tert-butylbenzene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	Trichlorofluoromethane	Vinyl chloride
	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	0.5	0.5	5	0.5	5	0.5	0.5	0.5	5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	0.3
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																								
NEPM 2013 Table 1C GILs, Fresh Waters																								
NEPM 2013 Table 1C GILs, Marine Waters																								
Field_ID / **Sample Date** / **Lab_Report**																								
JMW2R / 19/10/2017 / 178164	<1	<1	<10	<1	<10	<1	<1	<1	<10	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10
MW27R / 19/10/2017 / 178164	<1	<1	<10	<1	<10	<1	<1	<1	<10	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10
MW9 / 19/10/2017 / 178164	<1	<1	<10	<1	<10	<1	<1	<1	<10	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10
Statistical Summary																								
Minimum Concentration	<1	<1	<10	<1	<10	<1	<1	<1	<10	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<1	<1	<10	<1	<10	<1	<1	<1	<10	<1	<1	<1	<1	<2	<1	<1	<1	<1	<1	<1	<1	<1	<10	<10
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	5	0.5	5	0.5	0.5	0.5	5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	5
Median Concentration	0.5	0.5	5	0.5	5	0.5	0.5	0.5	5	0.5	0.5	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	5	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

																SVOCs																						
																1,2,4,5-tetrachlorobenzene	1-naphthylamine	2-chloronaphthalene	2-methylnaphthalene	2-naphthylamine	2-nitroaniline	3-nitroaniline	4-(dimethylamino) azobenzene	4-bromophenyl phenyl ether	4-chloroaniline	4-chlorophenyl phenyl ether	4-nitroaniline	5-nitro-o-toluidine	7,12-dimethylbenz(a)anthracene	Acetophenone	Aniline	Azobenzene	Benzyl alcohol	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Carbazole	Dibenzofuran	Diethylphthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Diphenylamine	Hexachlorocyclopentadiene	Hexachloroethane	Hexachloropropene	Isophorone
																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	µg/L	µg/L	µg/L
EQL																2	2	2	0.1	2	1	1	1	1	1	1	1	1	0.5	1	5	5	1	1	1	1	10	1	5	1	5	1	10	1	1	2	0.5	0.5	1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																																
NEPM 2013 Table 1C GILs, Fresh Waters																															8										1000	3700	10				290		
NEPM 2013 Table 1C GILs, Marine Waters																																																
Field_ID	**Sample Date**	**Lab_Report**																																														
JMW2R	19/10/2017	178164	<2	<5	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<10	<5	<5	<10	<10	<10	<10	<5	<5	<2	<2	<5
MW27R	19/10/2017	178164	<2	<5	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<10	<5	<5	<10	<10	<10	<10	<5	<5	<2	<2	<5
MW9	19/10/2017	178164	<2	<5	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<10	<5	<5	<10	<10	<10	<10	<5	<5	<2	<2	<5
Statistical Summary																																															
Minimum Concentration			<2	<5	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<10	<5	<5	<10	<10	<10	<10	<5	<5	<2	<2	<5
Minimum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration			<2	<5	<2	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<2	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<5	<10	<10	<5	<5	<10	<10	<10	<10	<5	<5	<2	<2	<5
Maximum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration			1	2.5	1	1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	5	2.5	2.5	5	5	5	5	2.5	2.5	1	1	2.5
Median Concentration			1	2.5	1	1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	1	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	5	5	2.5	2.5	5	5	5	5	2.5	2.5	1	1	2.5
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	0	0	0	0	0	0	0	0	0	0

	Isosafrole	Methapyrilene	N-nitrosodi-n-butylamine	N-nitrosodi-n-propylamine	N-nitrosomorpholine	N-nitrosopiperidine	Pentachlorobenzene	Pentachloronitrobenzene	Phenacetin
	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL	5	10	1	1	1	1	0.5	1	1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m									
NEPM 2013 Table 1C GILs, Fresh Waters									
NEPM 2013 Table 1C GILs, Marine Waters									
Field_ID	**Sample Date**	**Lab_Report**							
JMW2R	19/10/2017	178164	<5	<10	<5	<5	<5	<5	<2	<5	<5
MW27R	19/10/2017	178164	<5	<10	<5	<5	<5	<5	<2	<5	<5
MW9	19/10/2017	178164	<5	<10	<5	<5	<5	<5	<2	<5	<5

Statistical Summary

Minimum Concentration	<5	<10	<5	<5	<5	<5	<2	<5	<5
Minimum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND
Maximum Concentration	<5	<10	<5	<5	<5	<5	<2	<5	<5
Maximum Detect	ND	ND	ND	ND	ND	ND	ND	ND	ND
Average Concentration	2.5	5	2.5	2.5	2.5	2.5	1	2.5	2.5
Median Concentration	2.5	5	2.5	2.5	2.5	2.5	1	2.5	2.5
Standard Deviation	0	0	0	0	0	0	0	0	0

	Total recoverable hydrocarbons													BTEXN							Metals								
	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29-C36 Fraction	+C10 - C36 (Sum of total)	TPH C6-C10	C6 - C10 Fraction minus BTEX (F1)	C10 - C16 Fraction	TRH >C10-C16 less Naphthalene (F2)	C16 - C34 Fraction	C34 - C40 Fraction	TRH C37-C40	C10 - C40 Fraction (Sum)	Benzene	Toluene	Ethylbenzene	Xylene (o)	Xylene (m & p)	Xylene Total	Naphthalene	Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Nickel	Selenium	Zinc
	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
EQL	10	50	100	100	450	10	10	50	50	100	100	200	650	0.5	0.5	0.5	0.5	1	1.5	0.1	1	0.1	1	1	1	0.05	1	1	1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m							6000		NL					5000	NL	NL			NL	NL									
NEPM 2013 Table 1C GILs, Fresh Waters														950			350	200		16	13	0.2	4.4	1.4	3.4	0.06	11	5	8
NEPM 2013 Table 1C GILs, Marine Waters														500				200		70	4.5	0.7	1	1.3	4.4	0.1	7		15
Field_ID	**Sample Date**	**Lab_Report**																												
MW171	31/01/2018	SE174895	<40	74	730	490	1300	<50	<50	70	70	1100	<500	<200	1300	<0.5	<0.5	<0.5	<0.5	<1	<1.5	<0.1	3	<0.1	<1	<1	<1	<0.1	<1	<1	<5
MW172	31/01/2018	SE174895	<40	<50	410	<200	<450	<50	<50	68	68	<500	<500	<200	<650	<0.5	<0.5	<0.5	<0.5	<1	<1.5	<0.1	3	0.2	3	<1	<1	<0.1	2	1	6
MW173	31/01/2018	SE174895	<40	<50	<200	<200	<450	<50	<50	<60	<60	<500	<500	<200	<650	<0.5	1.9	<0.5	<0.5	<1	<1.5	<0.1	9	<0.1	<1	<1	<1	<0.1	<1	<1	<5
MW174	31/01/2018	SE174895	<40	<50	<200	<200	<450	<50	<50	<60	<60	<500	<500	<200	<650	<0.5	<0.5	<0.5	<0.5	<1	<1.5	<0.1	6	<0.1	<1	<1	<1	<0.1	<1	<1	<5
MW175	31/01/2018	SE174895	<40	<50	<200	<200	<450	<50	<50	<60	<60	<500	<500	<200	<650	<0.5	<0.5	<0.5	<0.5	<1	<1.5	<0.1	3	<0.1	<1	<1	<1	<0.1	<1	<1	<5
Statistical Summary																														
Minimum Concentration			<40	<50	<200	<200	<450	<50	<50	<60	<60	<500	<500	<200	<650	<0.5	<0.5	<0.5	<0.5	<1	<1.5	<0.1	3	<0.1	<1	<1	<1	<0.1	<1	<1	<5
Minimum Detect			ND	74	410	490	1300	ND	ND	68	68	1100	ND	ND	1300	ND	1.9	ND	ND	ND	ND	ND	3	0.2	3	ND	ND	ND	2	1	6
Maximum Concentration			<40	74	730	490	1300	<50	<50	70	70	1100	<500	<200	1300	<0.5	1.9	<0.5	<0.5	<1	<1.5	<0.1	9	0.2	3	<1	<1	<0.1	2	1	6
Maximum Detect			ND	74	730	ND	1300	ND	ND	70	70	1100	ND	ND	1300	ND	1.9	ND	ND	ND	ND	ND	9	0.2	3	ND	ND	ND	2	1	6
Average Concentration			20	35	288	490	440	25	25	46	46	420	250	100	520	0.25	0.58	0.25	0.25	0.5	0.75	0.05	4.8	0.08	1	0.5	0.5	0.05	0.8	0.6	3.2
Median Concentration			20	25	100	490	225	25	25	30	30	250	250	100	325	0.25	0.25	0.25	0.25	0.5	0.75	0.05	3	0.05	0.5	0.5	0.5	0.05	0.5	0.5	2.5
Standard Deviation			0	22	281	490	481	0	0	21	21	380	0	0	436	0	0.74	0	0	0	0	0	2.7	0.067	1.1	0	0	0	0.67	0.22	1.6

			Polycyclic aromatic hydrocarbons																			Nutrients and micro-organisms						
			Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(k)fluoranthene	Benzo(b&j)fluoranthene	Benzo(a) pyrene	Indeno(1,2,3-c,d)pyrene	Dibenz(a,h)anthracene	Benzo(g,h,i)perylene	2-(acetylamino) fluorene	1-Methylnaphthalene	2-methylnaphthalene	3-methylcholanthrene	PAHs (Sum of total)	Kjeldahl Nitrogen Total	Ammonia as N	Nitrite (as N)	Nitrate (as N)	Nitrogen (Total)	Phosphorus	Thermotolerant coliforms
			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	mg/L	µg/L	mg/L	mg/L	mg/L	mg/L	CFU/ 100 mL
EQL			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	0.5	0.1	0.1	0.5	1	0.05	10	0.005	0.005	0.05	0.02	0.05
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																													
NEPM 2013 Table 1C GILs, Fresh Waters						2	0.4	1.4						0.2										1880		158	0.12	0.01	
NEPM 2013 Table 1C GILs, Marine Waters						2	0.4	1.4						0.2										2840		158	0.35	0.03	
Field_ID	**Sample Date**	**Lab_Report**																											
MW171	31/01/2018	SE174895	<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	<0.5	<0.1	<0.1	<0.5	<1	1.9	1000	<0.005	<0.005	1.9	0.04	<1
MW172	31/01/2018	SE174895	<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	<0.1	-	<1	-	-	-	-	-	-	-
MW173	31/01/2018	SE174895	<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	<0.1	-	<1	-	-	-	-	-	-	-
MW174	31/01/2018	SE174895	<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	<0.1	-	<1	-	-	-	-	-	-	-
MW175	31/01/2018	SE174895	<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	<0.1	-	<1	-	-	-	-	-	-	-
Statistical Summary																													
Minimum Concentration			<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	<0.5	<0.1	<0.1	<0.5	<1	1.9	1000	<0.005	<0.005	1.9	0.04	<1
Minimum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	1000	ND	ND	1.9	0.04	ND
Maximum Concentration			<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	<0.5	<0.1	<0.1	<0.5	<1	1.9	1000	<0.005	<0.005	1.9	0.04	<1
Maximum Detect			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.9	1000	ND	ND	1.9	0.04	ND
Average Concentration			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	0.05		0.5							
Median Concentration			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	0.25	0.05	0.05	0.25	0.5	1.9	1000	0.0025	0.0025	1.9	0.04	0.5
Standard Deviation			0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	0		0							

			PFOS and PFOA					Phenols														PCBs								Carbamates		Explosives			
			Perfluorohexane sulfonic acid (PFHxS)	Perfluorooctane sulfonic acid (PFOS)	Perfluorooctanoic acid (PFOA)	6:2 Fluorotelomer Sulfonate (6:2 FtS)	8:2 Fluorotelomer sulfonate	2,3,4,6-tetrachlorophenol	3/4-methyl phenol (m/p-cresol)	4-nitrophenol	Phenol	2-chlorophenol	2-methylphenol	2-nitrophenol	2,4-dimethylphenol	2,4-dichlorophenol	2,6-dichlorophenol	4-chloro-3-methylphenol	2.4.6-Trichlorophenol	2,4,5-trichlorophenol	Pentachlorophenol	Phenolics Total	PCB 101	PCB 118	PCB 138	PCB 153	PCB 180	PCB 28	PCB 52	Carbaryl	Carbofuran	1,3-Dinitrobenzene	2,4-Dinitrotoluene	2,6-dinitrotoluene	Nitrobenzene
			µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	mg/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			0.01	0.01	0.01	0.01	0.01	0.5	0.001	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	2	0.5	0.5	0.5	50	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.5	0.5	1	1	1	1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																			
NEPM 2013 Table 1C GILs, Fresh Waters				0.13	220			10			320	340				120			3		3.6										0.06				550
NEPM 2013 Table 1C GILs, Marine Waters				0.13	220						400										11														550
Field_ID	**Sample Date**	**Lab_Report**																																	
MW171	31/01/2018	SE174895	<0.01	<0.01	<0.01	0.02	<0.01	<0.5	<0.001	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<2	<0.5	<0.5	<0.5	20	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.5	<0.5	<1	<1	<1	<1

			OCP																				
			4,4-DDE	a-BHC	Aldrin	b-BHC	Chlordane (cis)	Chlordane (gamma)	d-BHC	DDD	DDT	Dieldrin	Endosulfan I	Endosulfan II	Endosulfan sulphate	Endrin	Endrin ketone	g-BHC (Lindane)	Heptachlor	Heptachlor epoxide	Hexachlorobenzene	Methoxychlor	Mirex
			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			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	0.1	0.1	0.1	0.1	0.1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																							
NEPM 2013 Table 1C GILs, Fresh Waters											0.006					0.01		0.2	0.01				
NEPM 2013 Table 1C GILs, Marine Waters																0.004							
Field_ID	**Sample Date**	**Lab_Report**																					
MW171	31/01/2018	SE174895	<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	<0.1	<0.1	<0.1	<0.1	<0.1

																	OPP																											
					Azinophos methyl	Bromophos-ethyl	Carbophenothion	Chlorfenvinphos E	Chlorpyrifos	Chlorpyrifos-methyl	Demeton-S-methyl	Diazinon	Dichlorvos	Dimethoate	Disulfoton	Ethion	Ethyl methanesulfonate	Fenamiphos	Fenitrothion	Fenthion	Isosafrole (cis)	Isosafrole (trans)	Malathion	Methyl methanesulfonate	Methyl parathion	Parathion	Phorate	Pirimphos-ethyl	Prothiofos	Ronnel	Safrole	Stiriophos	1,4-Naphthoquinone	1/2-Chloronaphthalene	Di(2-ethylhexyl)adipate	Famphur	Isodrin	Methidathion
			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	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			0.2	0.2	0.5	0.5	0.2	0.5	0.5	0.5	0.5	0.5	0.5	0.2	1	0.5	0.2	0.5	1	1	0.2	1	0.5	0.2	0.5	0.5	0.5	0.5	1	0.5	1	1	1	0.5	0.1	0.5
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																											
NEPM 2013 Table 1C GILs, Fresh Waters									0.01			0.01		0.15					0.2				0.05		0.004																		
NEPM 2013 Table 1C GILs, Marine Waters									0.009																																		
Field_ID	**Sample Date**	**Lab_Report**																																									
MW171	31/01/2018	SE174895	<0.2	<0.2	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<1	<0.5	<0.2	<0.5	<1	<1	<0.2	<1	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<1	<0.5	<1	<1	<1	<0.5	<0.1	<0.5

	O,O,O-Triethylphosphorothioate	Pirimiphos-methyl	Thionazin	1,1,1,2-tetrachloroethane	1,1,1-trichloroethane	1,1,2,2-tetrachloroethane	1,1,2-trichloroethane	1,1-dichloroethane	1,1-dichloroethene	1,1-dichloropropene	1,2,3-trichlorobenzene	1,2,3-trichloropropane	1,2,4-trichlorobenzene	1,2,4-trimethylbenzene	1,2-dibromo-3-chloropropane	1,2-dibromoethane	1,2-dichlorobenzene	1,2-dichloroethane	1,2-dichloropropane	1,3,5-trimethylbenzene	1,3-dichlorobenzene	1,3-dichloropropane	1,4-dichlorobenzene	2,2-dichloropropane	2-butanone (MEK)	2-chlorotoluene	2-hexanone (MBK)	4-chlorotoluene	4-methyl-2-pentanone (MIBK)	Acetone	Acrylonitrile	Allyl chloride	Bromobenzene	Bromochloromethane
	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	µg/L	µg/L	µg/L	µg/L
EQL	0.5	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.3	0.5	10	0.5	5	0.5	5	10	0.5	2	0.5	0.5
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																		
NEPM 2013 Table 1C GILs, Fresh Waters							6500				3		85				160				260		60											
NEPM 2013 Table 1C GILs, Marine Waters							1900						20																					

Field_ID	Sample Date	Lab_Report																																
MW171	31/01/2018	SE174895	<0.5	<0.5	<1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.3	<0.5	<10	<0.5	<5	<0.5	<5	<10	<0.5	<2	<0.5	<0.5

Table 3
Groundwater analytical results January 2018

				VOC											
				Bromodichloromethane	Bromoform	Bromomethane	Carbon disulfide	Carbon tetrachloride	Chlorobenzene	Chlorodibromomethane	Chloroethane	Chloroform	Chloromethane	cis-1,2-dichloroethene	cis-1,3-dichloropropene
				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				0.5	0.5	10	2	0.5	0.5	0.5	5	0.5	5	0.5	0.5
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m															
NEPM 2013 Table 1C GILs, Fresh Waters															
NEPM 2013 Table 1C GILs, Marine Waters															
Field_ID	**Sample Date**	**Lab_Report**													
MW171	31/01/2018	SE174895		<0.5	<0.5	<10	<2	<0.5	<0.5	<0.5	<5	<0.5	<5	<0.5	<0.5

	cis-1,4-Dichloro-2-butene	Dibromomethane	Dichlorodifluoromethane	Dichloromethane	Hexachlorobutadiene	Iodomethane	Isopropylbenzene	Methyltributyl Ether	n-butylbenzene	n-propylbenzene	Pentachloroethane	p-isopropyltoluene	sec-butylbenzene	Styrene	TCE	tert-butylbenzene	Tetrachloroethene	trans-1,2-dichloroethene	trans-1,3-dichloropropene	trans-1,4-Dichloro-2-butene	Trichlorofluoromethane	Vinyl acetate	Vinyl chloride	1,2,3,4-tetrachlorobenzene	1-naphthylamine	2-naphthylamine	2-nitroaniline	3-nitroaniline	4-(dimethylamino) azobenzene	4-aminobiphenyl	4-bromophenyl phenyl ether	4-chloroaniline	4-chlorophenyl phenyl ether	4-nitroaniline
	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	µg/L	µg/L	µg/L	µg/L
EQL	1	0.5	5	5	0.5	5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	1	1	10	0.3	0.5	2	2	1	1	1	1	1	1	1	1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																		
NEPM 2013 Table 1C GILs, Fresh Waters																																		
NEPM 2013 Table 1C GILs, Marine Waters																																		
Field_ID	**Sample Date**	**Lab_Report**																																
MW171	31/01/2018	SE174895	<1	<0.5	<5	<5	<0.5	<5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<1	<1	<10	<0.3	<0.5	<2	<2	<1	<1	<1	<1	<1	<1	<1	<1

			SVOC																																				
			5-nitro-o-toluidine	7,12-dimethylbenz(a)anthracene	Acetophenone	Aniline	Benzyl alcohol	Bis(2-chloroethoxy) methane	Bis(2-chloroethyl)ether	Bis(2-chloroisopropyl) ether	Bis(2-ethylhexyl) phthalate	Butyl benzyl phthalate	Coumaphos	Dibenzofuran	Diethylphthalate	Dimethyl phthalate	Di-n-butyl phthalate	Di-n-octyl phthalate	Diphenylamine	EPN	Ethoprop	Hexachlorocyclopentadiene	Hexachloroethane	Hexachloropropene	Isophorone	Mevinphos (Phosdrin)	N-nitrosodiethylamine	N-nitrosodi-n-butylamine	N-nitrosodi-n-propylamine	N-nitrosomorpholine	N-nitrosopiperidine	N-nitrosopyrrolidine	o-toluidine	Pentachlorobenzene	Pentachloronitrobenzene	Phenacetin
			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	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
EQL			1	0.5	1	5	1	1	1	1	10	1	0.5	1	5	1	10	1	1	0.5	0.5	2	0.5	0.5	1	1	1	1	1	1	1	1	1	0.5	1	1	1	1
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m																																							
NEPM 2013 Table 1C GILs, Fresh Waters						8									1000	3700	10						290																
NEPM 2013 Table 1C GILs, Marine Waters																																							
Field_ID	**Sample Date**	**Lab_Report**																																					
MW171	31/01/2018	SE174895	<1	<0.5	<1	<5	<1	<1	<1	<1	<10	<1	<0.5	<1	<5	<1	<10	<1	<1	<0.5	<0.5	<2	<0.5	<0.5	<1	<1	<1	<1	<1	<1	<1	<1	<1	<0.5	<1	<1	<1	<1

Table 3
Groundwater analytical results January 2018

				Profenofos	Sulfotepp	Trifluralin
				µg/L	µg/L	µg/L
EQL				0.5	0.5	0.5
NEPM 2013 Table 1A(4) Comm/Ind HSL D GW for Vapour Intrusion, Sand, 2-4m						
NEPM 2013 Table 1C GILs, Fresh Waters						2.6
NEPM 2013 Table 1C GILs, Marine Waters						
Field_ID	**Sample Date**	**Lab_Report**				
MW171	31/01/2018	SE174895		<0.5	<0.5	<0.5