NOWA NOWA IRON PROJECT

ATTACHMENT 5 :

SURFACE AND GROUNDWATER BASELINE AND ASSESSMENT

Prepared for Eastern Iron Limited by Earth Systems

REVISION 3

EARTH SYSTEMS
Environment | Water | Sustainability

EASTERN IRON LIMITED

October 2013

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East Gippsland, Victoria

Surface and Ground Water Baseline and Assessment

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DOCUMENT REVISION LIST

Revision Status / Number	Revision Date	Description of Revision	Approved By
Rev0	October 2013	Draft	Nigel Murphy
Rev1	October 2013	Draft	Nigel Murphy
Rev2	October 2013	Draft	Nigel Murphy
Rev3	October 2013	Final	Nigel Murphy

Contents

Appendices

Executive Summary

Eastern Iron Limited ('Eastern Iron'), through its wholly owned subsidiary Gippsland Iron Pty Ltd, proposes to develop the Nowa Nowa Iron Project ('the Project'). The Project is a greenfield development of a high grade magnetite/hematite deposit generally referred to as '5 Mile'. It is located approximately 7 km north of the township of Nowa Nowa, which is situated on the Princes Highway between Bairnsdale and Orbost in East Gippsland, Victoria.

Earth Systems has been commissioned by Eastern Iron to prepare this *Surface and Groundwater Baseline and Assessment* to support a referral to the Minister for Planning for advice as to whether an Environment Effects Statement is required for the Project pursuant to the *Environment Effects Act* 1978 ('EES Referral').

This report provides an evaluation of baseline hydrology, baseline hydrogeology and management strategies for potential hydrological, hydrogeological and downstream surface water and local groundwater quality impacts associated with the Project.

Baseline Groundwater

The baseline groundwater assessment is based on a review of existing literature and field data (groundwater levels and quality) collected by Earth Systems between April and July 2013. Groundwater levels in the Project area range from approximately 40-50 m below ground level. Groundwater contribution to local stream flows appears negligible in the Project area. An assessment of groundwater levels in the proposed Project area indicates that local groundwater flow is towards the north-west. Regionally, groundwater flow is generally from the recharge areas in the north and northwest, offshore to the south (DSE, 2010). Discharge for aquifer units closer to the surface are likely to occur as baseflow to the lower reaches of the rivers and smaller creeks flowing over the coastal plains. However, such areas do not occur in the direct vicinity of the Project. Additional groundwater discharge will also occur to the Gippsland Lakes and other estuarine bodies (eg. Lake Tyers) (DSE, 2010).

Groundwater quality in the proposed Project area indicates near neutral (6.48-7.58) and moderate conductivity (2,010-4,050 µS/cm). Groundwater salinity is dominated by chloride (437-1,120 mg/L), sodium (183-402 mg/L) and bicarbonate alkalinity (118–386 mg/L). Dissolved metal concentrations in the groundwater were very low and mostly within the SEPP Waters of Victoria water quality environmental objectives (2003).

Baseline Surface Water

A number of creeks (permanent and ephemeral) exist in the vicinity of the Project area, including Boggy Creek, most of which drain into Lake Tyers. The proposed Project is located on Gap Creek and Tomato Creek, which both drain into Harris Creek. Harris Creek flows into Yellow Waterholes Creek, upstream of Boggy Creek which flows into Lake Tyers near the township of Nowa Nowa.

Lake Tyers is situated to the east of the Gippsland Lakes system and Lakes Entrance and, whilst part of the Ramsar site, it is not connected to the Gippsland Lakes. Lake Tyers is an estuary consisting of a main lake connected to two main riverine arms: Nowa Nowa and Toorloo. Boggy Creek and Ironstone Creek (which does not drain the proposed Project) discharge into the Nowa Nowa arm of Lake Tyers. The estuary entrance is intermittently blocked from Bass Strait by a sand bar.

As the catchments draining the proposed Project area are ungauged, no long term surface water flow data are available. From observations made during site visits and stream flow rate estimates, the creeks

draining the Project area are ephemeral with little to no flow during low rainfall periods and high flow / energy events during high rainfall events.

Surface water flow estimates were developed for the proposed Project area and receiving surface water catchments. Surface water flow rate estimates at Harris Creek, approximately 0.5 km downstream of the proposed Project, are highly variable ranging from no flow up to approximately 5 m^3/s. The highest flow periods occur during the winter months associated with higher rainfall, while the lowest flow periods are expected to occur in late summer and early autumn. Similar flow regimes are expected to occur in the receiving catchments downstream of the Project. Estimated surface water flow rates in the downstream catchments are highly variable including:

- Yellow Waterholes Creek, approximately 2.5 km downstream of the Project, estimated flow rates are expected to range from little to no flow up to approximately 95 m^3/s.
- Boggy Creek, downstream of the confluence with Yellow Waterholes Creek (approximately 5 km downstream of the Project), are expected to range from little to no flow up to approximately 170 m^3/s.
- Boggy Creek, near the township of Nowa Nowa (approximately 15 km downstream of the Project), are expected to range from little to no flow up to approximately 185 m^3/s.

Water quality draining the proposed Project area in Harris and Boggy Creeks was generally of good quality, near neutral (6.16-8.11) with moderate salinity (259-1,040 µS/cm). Salinity in the waters draining the Project is dominated by chloride (57-282 mg/L) and sodium (30-118 mg/L). Dissolved metal concentrations in the Harris and Boggy Creeks were mostly within the SEPP Waters of Victoria environmental objectives (2003).

Ironstone Creek is an ephemeral creek located to the south of the proposed Project area that flows into Lake Tyers. The proposed Project area does not drain to Ironstone Creek but surface water runoff from the decommissioned Nowa Nowa quarry (not associated with the proposed Project) flows into Ironstone Creek. Some sulfidic minerals are present in the wallrock and waste rock at the Nowa Nowa quarry. Water quality in Ironstone Creek, downstream of the Nowa Nowa quarry, is characterised by an acidic pH (3.79-5.19) and elevated sulfate (21-265 mg/L) concentrations with respect to other local creeks (eg. Harris, Boggy and Yellow Waterholes Creeks). Some dissolved metal concentrations in the surface waters draining Ironstone Creek were elevated with respect to baseline levels monitored in other local creeks and SEPP Waters of Victoria environmental water quality objectives (2003).

Water quality in Lake Tyers is generally of good quality. The water is near neutral (6.46-7.54) and salinity (895-57,200 µS/cm) ranges between freshwater and that of seawater (~50,000 µS/cm) depending on the site location (eg. upper / lower reaches of the Nowa Nowa arm) and whether the surrounding fresh water creeks are discharging fresh water to Lake Tyers (eg. during periods of high rainfall) or not (during late summer and early autumn). Dissolved metal concentrations in Lake Tyers were mostly within the Victorian Riverine Estuaries (EPA, 2011) and nutrient concentrations in Lake Tyers were within the Victorian Riverine Estuaries (EPA, 2011).

Project Design and Water Management

The development of any mining project has the potential to influence downstream hydrology, hydrogeology and water quality including turbidity, acidity / alkalinity, salinity and metals, nutrients, pathogens and other hazardous materials. However, the Project has been designed to minimise potential downstream impacts to surface water hydrology, hydrogeology and surface water and groundwater quality.

Project water management and design features include:

- Use of a dry Low Intensity Magnetic Separation (LIMS) process for processing of ore. The dry and reagent-free process will significantly reduce the Project's water requirements during operations.
- Constraining the Project footprint to the Boggy Creek catchment (only) to limit potential hydrology/water quality impacts to this catchment alone (ie. avoiding potential impacts to the Hospital Creek catchment).
- Location of the waste rock dump upstream of the pit to allow drainage to be captured in the pit post-closure, providing opportunity for passive water treatment (in the pit lake) and minimising possible requirements for active water treatment.
- Location of the temporary low grade ore stockpile upstream of the pit to allow drainage to be captured during operations, with excess drainage associated with extreme storm events allowed to discharge into the open pit.
- Backfilling of the open pit with potentially sulfidic waste rock and low grade ore (if unsold) post-closure to allow for a permanent water cover (minimum of 2 m depth) to prevent sulfide oxidation.
- Filling of the open pit with water post-closure and allowing the pit lake to overflow into Tomato Creek with a positive water balance. The spill level of the open pit lake is above the pre-mining groundwater table. This means that wallrock material exposed post-closure, once the pit lake reaches the spill level, will not experience a change in geochemical environment as the material is already above the groundwater table with potential exposure to oxidation.
- Construction of three water storages to capture site surface water runoff and facilitate mine water supply during operations. The three water storages are as follows:
    - Operations Water Storage, located immediately downstream of the open pit on Tomato Creek.
    - Sediment Control Dam, located downstream of the open pit and mine industrial area (MIA) on Gap Creek.
    - Clean Water Storage, located downstream of the Operations Water Storage and MIA on Tomato Creek, upstream of the confluence with Harris/Gap Creek.
- The Operations Water Storage will be used to hold drainage from the waste rock dump, temporary low grade ore stockpile, open pit, ROM pad and stockyard and groundwater from pit dewatering (eg. water with potentially elevated salinity, dissolved metals and/or acidity) during operations by pumping from sumps at each drainage collection location.
- During operations, the Operations Water Storage will be managed as follows:
    - Water for operational use will be preferentially abstracted from the Operations Water Storage to keep the water level as low as possible (to provide maximum capacity for high rainfall events).
    - Apart from a small direct catchment area, all inflows into the Operations Water Storage are pumped from sumps around the mine site. Pumping from the various sumps will be managed so as to ensure that the Operations Water Storage does not exceed capacity.
    - During extreme storm events, pumping from the various sumps will need to be managed so as to ensure that the Operations Water Storage cannot exceed capacity. Excess drainage at the sumps upstream of the open pit (upper Tomato Creek and upper Gap creek) will be allowed to discharge into the open pit, if required.
    - Surface seepage under the dam wall will be collected in a sump and pumped back into the Operations Water Storage.

  - Groundwater extracted for pit dewatering may be diverted to the Sediment Control Dam (to maintain environmental flows and offset up-stream capture of surface water) if operations water supply from the Operations Water Storage is sufficient.
- Post-closure, the Operations Water Storage will be partially decommissioned as a polishing wetland to passively treat overflow from the pit lake.
- The Sediment Control Dam will be used to hold drainage from the proposed Project facilities (excluding the pit, waste rock dump, temporary low grade ore stockpile, ROM pad and stockyard) located in the Gap Creek catchment and allow settlement of suspended sediments, before release.
- All Project facilities will be arranged such that all drainage (excluding the pit, waste rock dump, temporary low grade ore stockpile and ROM pad) will be directed into Gap Creek upstream of the Sediment Control Dam.
- During operations, the Sediment Control Dam will need to be managed as follows:
  - Water will be required from the Sediment Control Dam for mine water use if the Operations Water Storage is dry.
  - Excess water in the Sediment Control will be allowed to overflow via the spillway to release environmental flows to the downstream receiving environment, where possible.
- Post-closure, the Sediment Control Dam is to be decommissioned and the site rehabilitated if no alternative use for the dam is identified.
- The Clean Water Storage will be used to capture clean water to supplement site water resources. It will also provide another level of protection for the downstream environment in the extremely unlikely event of a failure in the Operations Water Storage.
- During operations, the Clean Water Storage will need to be managed as follows:
  - Water will be required from the Clean Water Storage for mine water use if the Operations Water Storage and Sediment Control Dam are dry.
  - Water in the dam will be allowed to overflow via the spillway to release environmental flows to the downstream receiving environment, where possible.
- Post-closure, the Clean Water Storage is to be partially decommissioned as a polishing wetland (in addition to the decommissioned Operations Water Storage) to passively enhance water quality from the flooded open pit.
- Post-closure, if groundwater inflows are not determined to be sufficient, one or all three water storage dams will be used to provide water to assist with the rapid filling of the open pit so as to minimise the period that any sulfidic wallrock and backfilled mine materials are exposed.
- During construction, sewage will be removed from the Project by vacuum truck and transported to a waste water treatment plant.
- A waste water treatment plant will be used to treat sewage during operations, and treated waste water will be recycled for use onsite via the Operations Water Storage.

Incorporation of water management in the Project design and implementation of the management measures outlined in this report will result in a low residual impact to downstream hydrology and surface water quality and local hydrogeology (including groundwater levels and quality).

Further Requirements

The following measures will be required prior to construction in order to validate / refine hydrology and hydrogeology baseline estimates and water balance modelling:

- Hydrology monitoring within the catchment of the proposed Project and Boggy Creek to allow for the refinement / validation of the baseline hydrology estimates and conceptual site water balance.
- Further baseline surface water quality monitoring at key monitoring sites within and downstream of the proposed Project.
- Further investigations into the local groundwater characteristics of the proposed Project site including:
    - Ongoing groundwater level monitoring.
    - Pumping tests in newly established piezometers in the proposed Project area.
    - Groundwater quality monitoring and sampling.

It is not anticipated that the outcomes of these works will influence the management and mitigation measures proposed by this report, but simply provide increased confidence in the baseline evaluation and water balance model.

1 Introduction

1.1 Background

Eastern Iron Limited ('Eastern Iron'), through its wholly owned subsidiary Gippsland Iron Pty Ltd, proposes to develop the Nowa Nowa Iron Project ('the Project'). The Project is a greenfield development of a high grade magnetite/hematite deposit generally referred to as '5 Mile'. It is located approximately 7 km north of the township of Nowa Nowa, which is situated on the Princes Highway between Bairnsdale and Orbost in East Gippsland, Victoria (Figure 1.1).

Earth Systems has been commissioned by Eastern Iron to prepare this *Surface and Groundwater Baseline and Assessment* to support a referral to the Minister for Planning for advice as to whether an Environment Effects Statement is required for the Project pursuant to the *Environment Effects Act* 1978 ('EES Referral').

This report provides an evaluation of baseline hydrology, baseline hydrogeology and management strategies for potential hydrological, hydrogeological and downstream surface water and local groundwater quality impacts associated with the Project.

1.2 Objectives

The objectives of this report are to:

- Characterise the baseline hydrology and water quality of major streams and tributaries draining the Project area.
- Characterise the baseline hydrogeology in the proposed Project area and down hydraulic gradient of proposed Project facilities.
- Identify appropriate mitigation and management measures to minimise potential hydrology, hydrogeology and water quality impacts associated with the Project during construction, operations and post closure.
- Assess the likely residual hydrology, hydrogeology and water quality impacts from the Project in the event that the proposed mitigation and management measures are implemented.

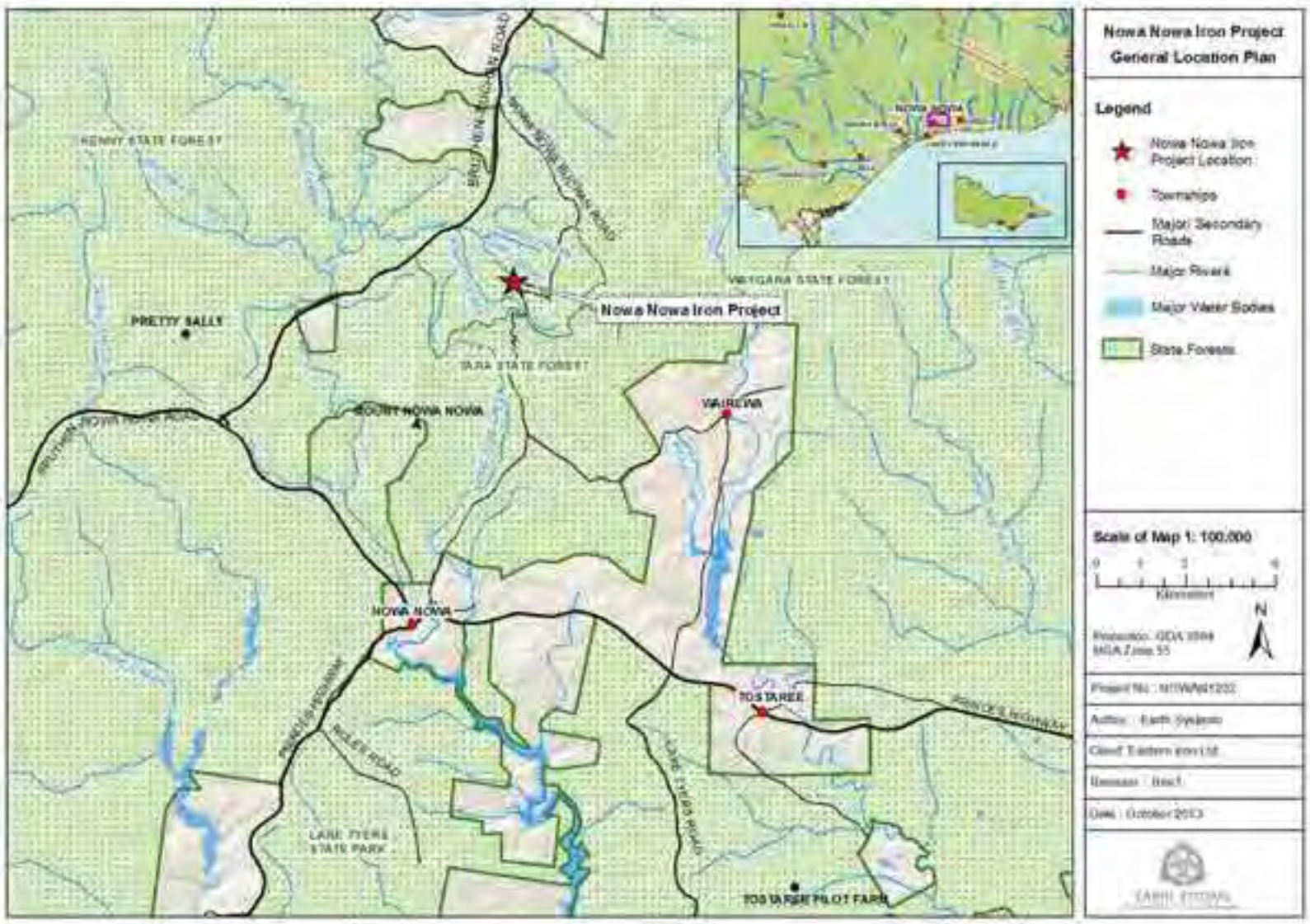

Figure 1.1: Project location.

1.3 Scope of Works

The scope of works is summarised as follows:

- Review available data and literature relating to surface water and groundwater in the region of the proposed Project.
- Conduct baseline surface water quality monitoring in the region of the proposed Project.
- Conduct baseline groundwater monitoring in the Project area.
- Estimate Project area and local hydrology.
- Develop a site water management strategy and model for the proposed Project.
- Develop a conceptual site water balance for the proposed Project.
- Assessment of potential issues relating to hydrology, hydrogeology and water quality over the Project life, including construction, operations and post-closure.
- Development of management strategies to minimise potential issues relating to hydrology, hydrogeology and water quality over the Project life, including construction, operations and post-closure.

1.4 Brief Project Description

The Project involves an open cut mining operation from a single pit with dry processing at the site to upgrade the material to a saleable product. It is anticipated that the Project will produce up to 1Mt of ore per annum, over an initial mine life of 8-10 years. The mine will be operated using a local mining contractor and local employees (i.e. no FIFO workforce).

It is proposed to transport the processed ore by road to the existing South East Fibre Exports (SEFE) wharf at the Port of Eden in Edrom, NSW. The majority of the transport route between the mine and the Port is via the Princes Highway. The material will be temporarily stockpiled before being loaded onto 50-60,000 t vessels and exported to international markets.

The main components of the Project at the mine site will include:

- Open Pit;
- Mine Infrastructure (includes the Run of Mine (ROM) pad, processing plant and Mine Operations Centre);
- Waste Rock Dump;
- Temporary Low Grade Ore Stockpile;
- Water Storage Infrastructure;
- Mine Access and Haul Roads; and
- Ancillary Infrastructure.

These components are depicted in Figure 1.2, whilst further details of the Project are provided by the *Project Description and Proposed Work Plan* (EES Referral Attachment 1).

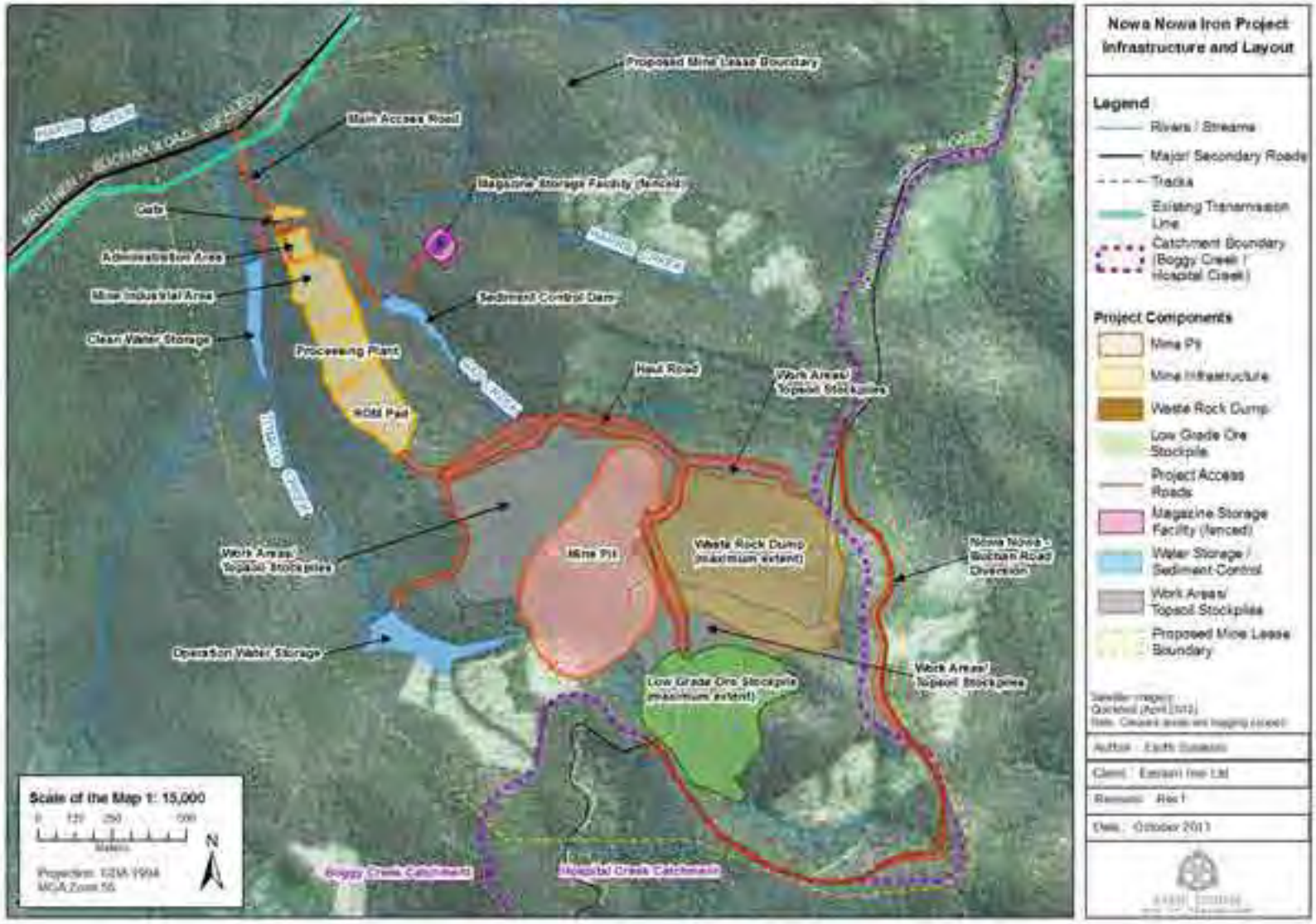

Figure 1.2: Proposed Project Arrangement.

1.5 Regulatory Context

A range of Commonwealth and State legislation is applicable to the Project, including policies and strategies that have been established for the protection of surface and groundwaters. These are outlined in Table 1.1.

Table 1.1: Australian federal and Victorian state legislation, policies and strategies relevant to surface water and groundwater.

Document	Date	Relevance to Water Management
Commonwealth		
Environment Protection and Biodiversity Conservation Act	1999	Triggers for the EPBC Act include Ramsar wetlands of international importance as well as threatened and endangered species and ecological communities.
Wetland Policy of the Commonwealth Government of Australia	1997	The Gippsland Lakes are designated as wetlands of international significance under the Ramsar convention. The proposed Project ultimately drains through Harris and Boggy Creeks into the Gippsland lakes at Lake Tyers.
Convention on Wetlands of International Importance (RAMSAR Convention)	1971	An international convention aiming to halt the loss / reduction in value of wetlands through use and management.
State of Victoria		
Mineral Resources (Sustainable Development) Act	1990	Aim to encourage mineral extraction in a way that is compatible with the environmental objectives of the State. Operators are required to prepare and seek approval for a Work Plan, which includes management of water, monitoring and auditing requirements, discharge of water and that may have conditions imposed on the work plan that relate to the management of water.
Mineral Resources Development (Mining) Amendment Regulations	2010	Amendment to Mineral Resources Development Regulations (2002) to include the management of groundwater, with particular reference to mine stability.
Environmental Protection Act	1970	The legislative framework for the protection of the environment in Victoria. The Act covers development of environmental objectives and control and licensing of discharges. Environmental impacts and discharges are subject to works approvals and licences. State Environment Protection Policies (SEPP) have been established under the Environment Protection Act.
State Environment Protection Policies (SEPP) Waters of Victoria	2003	The SEPP sets a statutory framework for the protection of the uses and values of Victoria's fresh and marine water environments including: • The uses and values of the water environment that the community and government want to protect- these are known as beneficial uses. • The objectives and indicators which describe the environmental quality required to protect beneficial uses. • Guidance to catchment management authorities, coastal boards, water authorities, communities, businesses and local government and state government agencies to protect and rehabilitate water environments to a level where environmental objectives are met and beneficial uses are protected – this is known as the attainment program.

Document	Date	Relevance to Water Management
SEPP Groundwaters of Victoria	1997	A policy to maintain and where necessary improve groundwater quality sufficient to protect existing and beneficial uses of groundwaters throughout Victoria.
Water Act	1989	Applies to surface waters and groundwaters in Victoria, encompassing river management, water supply, irrigation and wastewater management. The act covers licensing requirements for water extraction / permits for construction works on waterways.
Water Act (Irrigation Farm Dams)	2002	Addresses all irrigation and commercial use of water from waterways, springs, soaks and dams. A dam required for commercial use requires a surface water ("take and use") licence, as well as licences for construction, operation and maintenance of a dam. Surface water licences are subject to availability of water entitlements within a specific river catchment. If surface water entitlements are fully allocated, a licence may be traded from an existing licence holder. Dams that to not require a "take and use licence" but fall within other legislation include tailings storage facilities (TSF), settling ponds, and process dams (containing water recycled from processing).
Catchment and Land Protection Act	1994	Establish a framework for the integrated management and protection of land and water resources within catchments. The Project is within the East Gippsland Catchment Management Authority (CMA). Schedule 5 of the Act includes the Boggy Creek (Nowa Nowa) within a list of 124 proclaimed Special Water Supply Catchment Areas, although the Nowa Nowa town water supply is now pumped from the Mitchell River catchment, Toorloo Storage Basin near Lakes Entrance.
Coastal Management Act	1995	The objectives of the act include planning and management of the use of Victoria's coastal resources and to maintain and improve coastal water quality.
Planning and Environment Act	1987	Planning decision made by local government in Victoria are done so within the framework established under the Planning and Environment Act. The Nowa Nowa Project falls within the boundaries of the East Gippsland Shire Council.
Safe Drinking Water Act (Vic)	2003	Requires suppliers of water and water storage managers to establish and implement plans to manage risks in relation to potable water.
Scheduled Premises and Exemptions Regulations	2007	Works approval and licensing will be required for any off-site discharges, although these are unlikely to be required.
Strategies		
Draft Victorian Waterway Management Strategy	2012	Outlines principles and management approach for rivers, estuaries, wetlands and approach to address climate change, drought, and flooding.
Gippsland Region Sustainable Water Strategy	2011	Evaluates regions water requirements over the next 50 years under a range of future climate scenarios. Outlines water resource management actions and priorities to guide local water and catchment authorities.
East Gippsland Regional Catchment Strategy	2012	Regional planning tool for land water and biodiversity addressing all matters affecting land and water management in East Gippsland.
East Gippsland Regional River Health Strategy	2005	Includes five major programs: • Protecting rivers that are of high community value from decline and maintaining the condiction of ecologically healthy rivers. • Protecting rivers that do not have current impacts from

Document	Date	Relevance to Water Management
		widespread and invasive threats, but would decline if these threats were to appear. • Achieving targeted improvements in the environmental condition of some of the other rivers in the region. • Preventing damage from future activities. • A community and agency education, consultation and involvement program.
Streamflow Management Plans	-	No Streamflow Management Plans have been prepared for the waterways draining or downstream of the proposed Project.
Management of Victoria's Ramsar Wetlands	2002	Includes a strategic directions statement with the purpose of: • Establishing a management framework for the RAMSAR sites in a Victorian context. • Addressing Australia's obligations under the RAMSAR convention, particularly in relation to the maintenance of ecological character and the wide use of Victoria's RAMSAR wetlands. • Address the requirements of Government legislation, policy and planning in relation to the management of Victoria's RAMSAR wetland sites. • Set out the responsibilities of RAMSAR site managers and agencies.
Gippsland Lakes Ramsar Site: Strategic Management Plan	2003	Addresses the management of risks to the values of the Gippsland lakes RAMSAR wetlands including altered water regimes, salinity, pollution, pest plants and animals, resource utilisation, dredging, recreation and tourism, fire, and erosion.

2 Method

2.1 Data Review

The following information was reviewed in the preparation of the current study:

- Meteorology data for Mount Nowa Nowa, Nowa Nowa, Wairewa, Buchan South, and Orbost (Sourced from the Bureau of Meteorology (BoM)).
- East Gippsland CMA Groundwater Model – Transient Model Development Report (GHD, 2008).
- Protecting and Improving Our River Health: The East Gippsland Regional River Health Strategy (2005-2010).
- Hydrogeological Mapping of Southern Victoria (SRW, 2010).
- Gippsland Lakes Ramsar Site – Strategic Management Plan (DSE, 2008).
- Gippsland Lakes Blue-Green Algae Monitoring Program (EPA, 2008).

2.2 Baseline Hydrology

The Project catchment and downstream water courses are ungauged. Baseline surface water flows at various points within the Project area catchment and the downstream receiving water courses have been estimated. Stream flow was estimated at the following locations in the proposed Project area and the surface water drainages downstream (Figure 2.1):

- Harris Creek at Bruthen-Buchan Road;
- Yellow Waterholes Creek downstream of confluence with Harris Creek;
- Boggy Creek, downstream of confluence with Yellow Waterholes Creek; and
- Boggy Creek, upstream of Lake Tyers.

Catchment areas for the surface water flow estimates were determined using 1 m LIDAR data over the proposed Project area and ASTER digital elevation model (DEM) layers over the region surrounding the proposed Project area. AECOM (2013) used the RORB software program to develop an initial hydrological model for the catchment area. In the absence of any flow gauging data for the catchment, AECOM's model was calibrated using the Rational Method for runoff calculation, using the method set out in the *Australian Rainfall and Runoff (AR &R) guidelines* (AECOM, 2013).

Estimates for flows in various sub-catchments of the proposed Project area, as well as the receiving catchments upstream and downstream of the proposed Project area were then developed. Source Catchments modelling software (developed by eWater CRC with Australian Water Balance Model (AWBM)) was used to provide estimates of historic stream flow in the proposed Project area and receiving surface water catchments. Flow estimates were developed using the following input parameters / assumptions:

- Daily BoM long term rainfall data at Nowa Nowa between 1949 and 2012. Note: Rainfall from the Nowa Nowa BoM site was used instead of from Mt Nowa Nowa BoM site as long term rainfall data was only available from the Nowa Nowa BoM site.

- Mean daily evaporation data at Orbost (comparison site) between 1994 and 2011.
- Default input parameters values were used and adjusted for representative values for south-eastern Australia (Boughton, 2009) including:
    - Baseflow index (BFI): 0.32-0.33.
    - Baseflow recession constant (K_{base}): 0.966-0.980.
    - Surface runoff recession constant (K_{surf}): 0.35.
    - Surface storage values (C-values) were adjusted to match the flow estimates from AECOM's RORB model.
- No contribution of groundwater to stream baseflow.
- Uniform properties run-off and storage properties over the entire catchment areas.
- That the rainfall and evaporation input data are representative of the catchments.

Flow gauging will need to be conducted in the Project catchment area and the Boggy Creek catchment, prior to the proposed Project construction, to validate / refine the surface water flow estimates. It is not anticipated that the results of the flow gauging will impact on the management and mitigation measures proposed given that the Project is located in the upper reaches of the catchment.

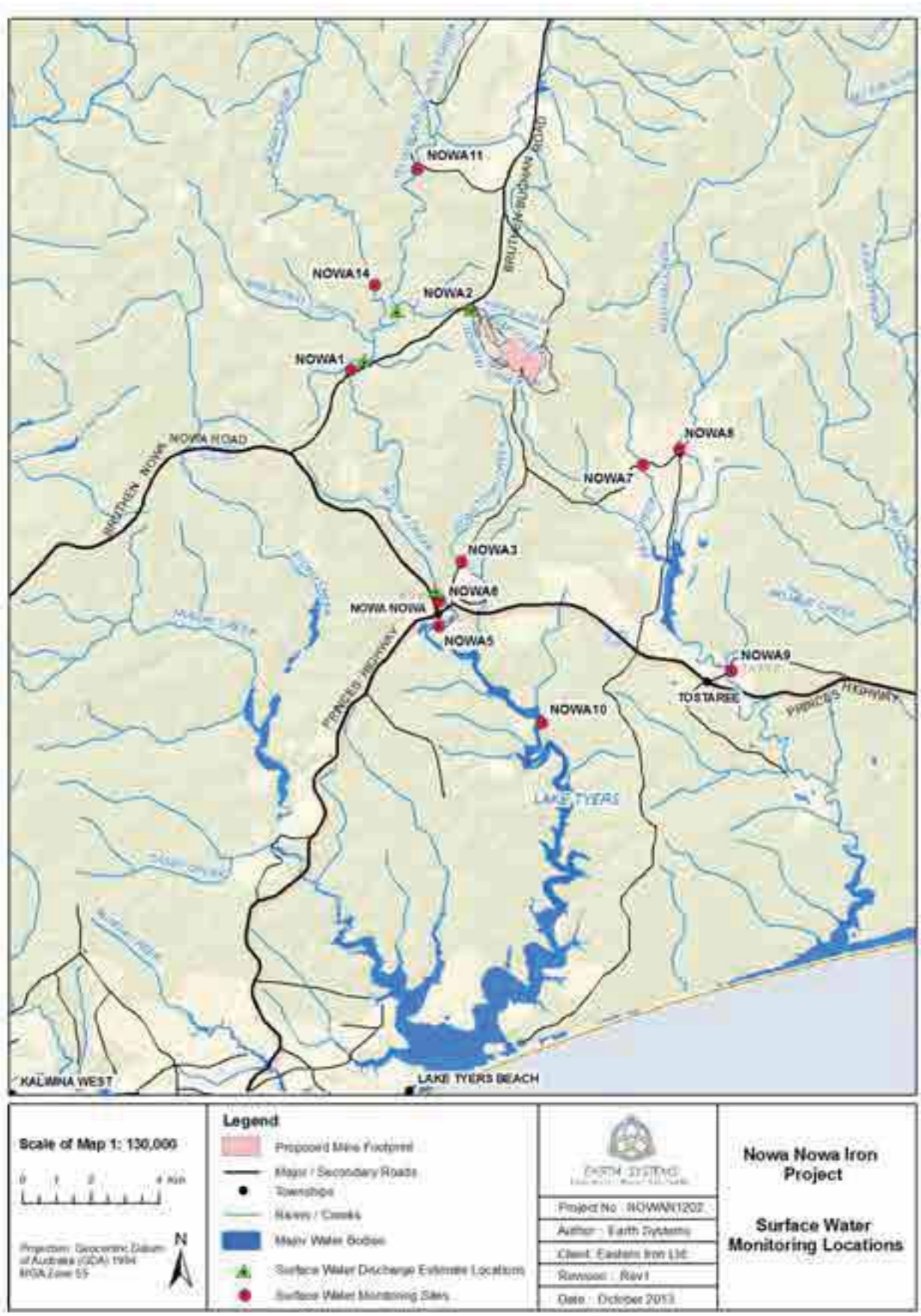

Figure 2.1: Local drainage map showing the locations for stream flow estimates and water quality monitoring and sampling sites.

2.3 Baseline Water Monitoring Program

2.3.1 Groundwater

Groundwater levels were monitored in three exploration holes (NRC22, NRC27 and NRC30) (Figure 3.7). Water level loggers were installed in the three monitoring wells on the 4th of April 2013 and groundwater levels in the three wells have been logged every 30 minutes, with levels confirmed approximately monthly by manually dipping the wells to determine the depth to groundwater. Groundwater levels were also measured in three new piezometers installed within the proposed Project area (NNPBH1, NNPBH2 and NNPBH3) (Figure 3.8). Indicative local groundwater flow directions were determined from groundwater levels in the three exploration holes and two of the three new piezometers (NNPBH1 and NNPBH2). Groundwater levels from NNPBH3 were not included in the groundwater flow direction assessment as the piezometer is located on the other side of Tomato Creek.

One set of groundwater quality samples was collected in June 2013 from the three groundwater monitoring wells within the proposed Project area. The holes were purged of their full volume once prior to analysis. Water quality parameters analysed in the field, using a multi-parameter water quality instrument (AquaRead GPS Aquameter), included:

- pH;
- Water temperature;
- Electrical conductivity (EC);
- Total dissolved solids (TDS);
- Oxidation reduction potential (ORP);
- Dissolved oxygen (DO); and
- Turbidity.

Water samples were collected for submission to ALS analytical laboratory (National Association of Testing Authorities (NATA) accredited) in Springvale. Water quality samples were preserved in laboratory supplied sample bottles and chilled in ice during transport to the laboratory. Dissolved metals samples were field filtered through a 0.45 µm filter prior to preservation in the sample bottle. Laboratory analytical parameters included (detection limits provided in brackets):

- General parameters including pH, EC, total dissolved solids (TDS).
- Total hardness (1 mg/L as $CaCO_3$), total alkalinity (1 mg/L as $CaCO_3$), bicarbonate alkalinity (1 mg/L as $CaCO_3$), carbonate alkalinity (1 mg/L as $CaCO_3$) and hydroxide alkalinity (1 mg/L as $CaCO_3$).
- Major cations and anions including calcium (Ca; 1 mg/L); magnesium (Mg, 1 mg/L), sodium (Na, 1 mg/L), potassium (K, 1 mg/L), sulfate (SO_4, 1 mg/L), chloride (Cl, 1 mg/L) and fluoride (F, 1 mg/L).
- Nutrients including ammonia as N (NH_3-N, 0.01 mg/L), nitrite as N (NO_2-N, 0.01 mg/L), nitrate as N (NO_3-N, 0.01 mg/L), total Kjeldahl nitrogen (TKN, 0.1 mg/L), total nitrogen (N, 0.1 mg/L), total phosphorus (P, 0.01 mg/L) and reactive phosphorus (0.01 mg/L).
- Total cyanide (0.004 mg/L).
- Dissolved metals (full scan) analysed by inductively coupled plasma mass spectrometry (ICP-MS).

Groundwater quality results have been compared with surface water quality guidelines, as groundwater will need to be extracted from the pit, given that mining of the open pit is to proceed below the water table. The water quality objectives used for comparison with groundwater quality were State Environment Protection Policy (SEPP) Waters of Victoria (State Government of Victoria, 2003) environmental quality objectives for the segment – Cleared Hills and Coastal Plains: Lowlands of Yarra, Western Port, Latrobe, Mitchell, Tambo, Snowy, Thomson and Macalister catchments, which also define the relevant toxicants thresholds applied to the catchment from the ANZECC/ARMCANZ water quality guidelines (2000). Beneficial use and water quality objectives have been developed for the Gippsland Lakes (Schedule F3, SEPP Waters of Victoria); however these objectives do not encompass the Boggy Creek and Lake Tyers catchments.

2.3.2 Surface Water

Surface water quality monitoring sites were identified within the Project area, surface water catchments upstream and downstream of the Project area, and adjacent catchments to the proposed Project area. Surface water quality monitoring sites are shown in Figure 2.1 and are described in Table 2.1 below.

Selected water quality monitoring sites were first visited and sampled in August 2012 during the Initial Environmental Evaluation (IEE) undertaken by Earth Systems (2012). Water quality monitoring for the EES referral commenced in February 2013. Monitoring / sampling events were also conducted in April, May and July of 2013. As a large proportion of sites were located on ephemeral streams, which only flow after significant rain events, monitoring / sampling events were timed to coincide with rain events, where possible. Water quality parameters analysed in the field, using a multi-parameter water quality instrument (AquaRead GPS Aquameter), included:

- pH;
- Water temperature;
- EC;
- TDS;
- ORP;
- DO; and
- Turbidity.

Water quality sampling was conducted in the middle of creeks and from the banks of Lake Tyers, approximately 10 cm below the surface of the water, with the exception of oil and grease samples which were collected at the surface of the water body.

Water quality samples were submitted to ALS. Water quality samples were preserved in laboratory supplied sample bottles and chilled in ice during transport to the laboratory. Dissolved metals samples were field filtered through a 0.45 µm filter prior to preservation in the sample bottle. Laboratory analytical parameters included (detection limits provided in brackets):

- General parameters including pH, EC (1 µS/cm), total dissolved solids (TDS, 10 mg/L), total suspended solids (TSS, 5 mg/L).
- Total hardness (1 mg/L as $CaCO_3$), total alkalinity (1 mg/L as $CaCO_3$), bicarbonate alkalinity (1 mg/L as $CaCO_3$), carbonate alkalinity (1 mg/L as $CaCO_3$) and hydroxide alkalinity (1 mg/L as $CaCO_3$).

- Major cations and anions including calcium (Ca; 1 mg/L); magnesium (Mg, 1 mg/L), sodium (Na, 1 mg/L), potassium (K, 1 mg/L), sulfate (SO_4, 1 mg/L), chloride (Cl, 1 mg/L) and fluoride (F, 1 mg/L).
- Nutrients including ammonia as N (NH_3-N, 0.01 mg/L), nitrite as N (NO_2-N, 0.01 mg/L), nitrate as N (NO_3-N, 0.01 mg/L), total Kjeldahl nitrogen (TKN, 0.1 mg/L), total nitrogen (N, 0.1 mg/L), total phosphorus (P, 0.01 mg/L) and reactive phosphorus (0.01 mg/L).
- Total cyanide (0.004 mg/L).
- Dissolved (all monitoring events) and total (maximum of two monitoring events) metals (full scan) analysed by ICP-MS.
- Total recoverable and dissolved mercury (Hg, 0.0001 mg/L) by flow injection mercury system (FIMS).
- Oil and grease (5 mg/L).
- Faecal (1 orgs/100 mL) and total (1 orgs/100 mL) coliforms.

As many as five sampling events have been conducted at selected sites, whereas at other sites only one sample has been collected if the site was not flowing during previous site visits. Where mean, minimum and maximum values are presented, a minimum of two samples have been collected.

Surface water quality results for freshwater creeks were compared with SEPP Waters of Victoria (State Government of Victoria, 2003) environmental quality objectives for the segment – Cleared Hills and Coastal Plains: Lowlands of Yarra, Western Port, Latrobe, Mitchell, Tambo, Snowy, Thomson and Macalister catchments, which also define the relevant toxicants thresholds applied to the catchment from the ANZECC/ARMCANZ (2000) water quality guidelines.

Surface water quality results from Lake Tyers have been compared with the following water quality guidelines:

- Water quality guidelines for Victorian Riverine Estuaries (EPA, 2011).
- Water quality guidelines for protection of aquatic ecosystems – Estuaries (ANZECC/ARMCANZ, 2000).

Surface water quality monitoring will continue to be undertaken prior to the construction of the proposed Project at key monitoring sites downstream of the proposed Project to further refine the baseline water quality results.

Table 2.1: Baseline surface water quality monitoring and sampling sites.

Site ID	Stream	Description	Rationale	Photo	Easting*	Northing*
NOWA1	Boggy Creek	Downstream of confluence with Yellow Waterholes Creek, upstream of Bruthen-Buchan Road.	Primary monitoring point on Boggy Creek, downstream of the proposed Project area. Characterise baseline water quality in Boggy Creek downstream of the propose Project.		593565	5830462
NOWA2	Harris Creek	Downstream of confluence with Gap and Tomato Creeks, upstream of Bruthen-Buchan Road.	Primary monitoring point downstream of the proposed Project area on Harris Creek. Characterise baseline water quality in Harris Creek.		597041	5832246

Site ID	Stream	Description	Rationale	Photo	Easting*	Northing*
NOWA3	Ironstone Creek	Downstream of decommissioned Nowa Nowa quarry, upstream Nowa Nowa-Buchan Road.	Determine potential existing AMD impacts (acidity, sulfate and dissolved metal loads) reporting to Lake Tyers.		596799	5824850
NOWA5	Lake Tyers	Lake Tyers at Nowa Nowa	Primary monitoring point on Lake Tyers, downstream of discharge from Boggy Creek.		596145	5822974

Site ID	Stream	Description	Rationale	Photo	Easting*	Northing*
NOWA6	Boggy Creek	Boggy Creek at Nowa Nowa, upstream of entrance to Lake Tyers	Secondary monitoring point for Boggy Creek, prior to discharge into Lake Tyers.		596157	5823709
NOWA7	Bill Creek	Bill Creek, upstream confluence with Hospital Creek	Primary monitoring point on Bill Creek.		602097	5827684

Site ID	Stream	Description	Rationale	Photo	Easting*	Northing*
NOWA8	Hospital Creek	Hospital Creek, upstream Wairewa	Primary monitoring point on Hospital Creek.		603160	5828140
NOWA9	Hospital Creek	Hospital Creek, downstream confluence with Bill Creek.	Secondary monitoring point on Hospital Creek.		604666	5821664

Site ID	Stream	Description	Rationale	Photo	Easting*	Northing*
NOWA10	Lake Tyers	Lake Tyers, below discharge from Ironstone Creek.	Secondary monitoring point on Lake Tyers		599147	5820127
NOWA11	Yellow Waterholes Creek	Yellow Waterholes Creek upstream of confluence with Harris Creek	Primary monitoring point on Yellow Waterholes Creek, upstream of potential influence from the proposed Project.		595514	5836327

Site ID	Stream	Description	Rationale	Photo	Easting*	Northing*
NOWA14	Boggy Creek	Boggy Creek, upstream of confluence with Yellow Waterholes Creek	Primary monitoring point on Boggy Creek, upstream of potential influence from the proposed Project.		594268	5832937

* Grid coordinates refer to WGS 1984 Datum, UTM Zone 55S.

2.4 Conceptual Site Water Balance

A conceptual site water balance was developed for the proposed Project. The method and conceptual site water balance are provided in Annex A of this Report.

2.5 Management of Project Water

A site water management strategy has been developed in order to minimise potential impacts to downstream hydrology, local hydrogeology and surface water and groundwater quality during construction, operations and post-closure. Residual impacts associated with hydrology, hydrogeology and water quality (surface water and groundwater) were also identified.

3 Baseline Data

3.1 Geology and Geomorphology

Most of the regional area is composed of Neogene (late Tertiary) alluvial sediments. These alluvial sediments form terraces and fan out from the uplands. The lowlands are sandy loams overlying clays. There has been some structural movement with early deposits being dissected with sediment composed of organic matter and iron, and volcanic intrusions.

The area is dominated by Palaeozoic acid volcanics, with lithosol soils (Bell, 1959). The iron deposits are situated in the north-south trending Buchan Rift basin filled with felsic Thorkidaan Volcanics (lavas, ignimbrites and sediments), and the overlying Buchan Group of silurian limestones, calcareous mudstone and very minor volcanogenic clastics.

Upper Ordovician graptolites are located at Gap Creek. Ordovician slates also occur in Boggy Creek and Ironstone Creek. Where the effect of regional stress-metamorphism and shearing has been strongest, the slates have been chloritized while sandy facies have been converted to quartzite.

Intense faulting and shearing has been observed at the Five Mile outcrop. A prominent belt of shearing, about 1 km wide, passes from Nowa Nowa, crosses Ironstone Creek, through the Five Mile outcrop and Iron Mask (iron and manganese outcrops north-east of Seven Mile outcrop) flanking the western edge of a narrow belt of Ordovician. The iron-ore bodies, chloritized shales and Silurian limestones are associated with this wide shear zone.

Some sulfides are present in the geologic materials in the area. Secondary pyrite is present throughout the ore-body and there are regions of chloritic material and large pyrite crystals, where nearly half the material may be pyrite.

The mineralization of the site is characterised by massive magnetite-haematite with lesser chlorite, talc/carbonates, pyrite, quartz with minor chalcopyrite. Magnetite is late stage and replaces specular haematite. The iron mineralisation is quite massive and at the 40 % Fe Cut-off there is little internal waste once the overburden is removed. Chalcopyrite occurs with pyrite in veinlets in the high sulfide zones and is disseminated in magnetite, and as rims around pyrite and magnetite (McGee & Munro 1971). Gold and copper values are anomalous in the mineralised envelopes.

A number of creeks (permanent and ephemeral) occur in the vicinity of the Project area, including Boggy Creek and Hospital Creek, most of which drain into Lake Tyers. Five Mile deposit is located on Gap Creek, which flows into Boggy Creek via Harris Creek.

The Project is located approximately 15 km upstream of the north-eastern extent of Lake Tyers, an estuary which forms part of the Gippsland Lakes Ramsar Wetland Site. Lake Tyers lies to the east of the Gippsland Lakes system, and is not connected to the rest of the Gippsland Lakes system.

3.2 Climate

The climate of East Gippsland is temperate, with a mean annual rainfall of approximately 863.4 mm recorded at the township of Nowa Nowa. Long term (1949-2012) meteorological records from the Nowa

Nowa station (Latitude: 37.73°S; Longitude: 148.10°E; Elevation: 30 m asl) indicate that the mean monthly rainfall varies between approximately 57 mm in February and 90 mm in June, with highest mean rainfall occurring in the months of June, November and December (Figure 3.1).

An additional meteorological station is located at Mount Nowa Nowa (Latitude: 37.69°S; Longitude: 148.09°E; Elevation: 350 m asl), approximately 3.5 km south west of the proposed Project area. Rainfall records are available between 1996 and 2012, with a mean annual rainfall at Mount Nowa Nowa of approximately 826 mm. Meteorological records from the Mount Nowa Nowa station indicate that the mean monthly rainfall varies between approximately 56 mm in March and 94 mm in November, with highest mean rainfall occurring in the months of June, November and December (Figure 3.1).

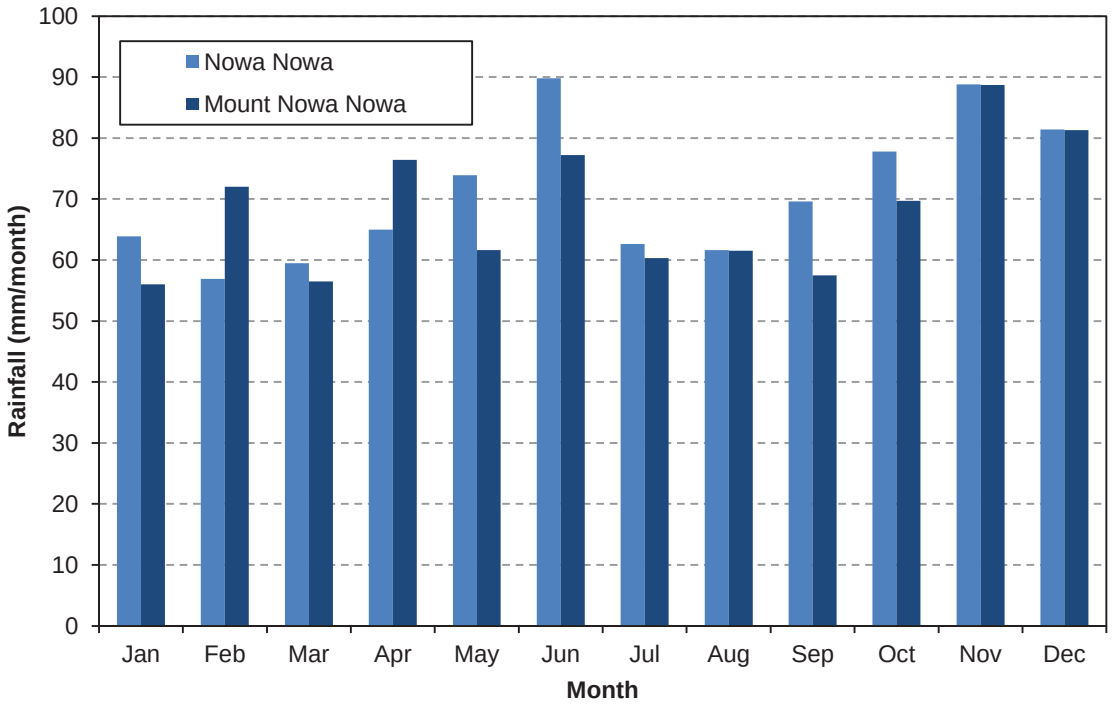

Figure 3.1: Mean monthly rainfall at Nowa Nowa (1949-2012) and Mount Nowa Nowa (1996-2012) (BoM, 2013).

The highest annual rainfall recorded at the Nowa Nowa station was 1,433.4 mm in 1978, with the lowest recorded annual rainfall occurring the following year in 1979. Post-1978, the average annual rainfall recorded at Nowa Nowa (796 mm) is lower than the average annual rainfall recorded between 1949 and 1978 (924 mm) (Figure 3.2). The highest annual rainfall recorded at the Mount Nowa Nowa station was 1,309 mm in 2011. The lowest recorded annual rainfall (566 mm) occurred in 2003 (Figure 3.2).

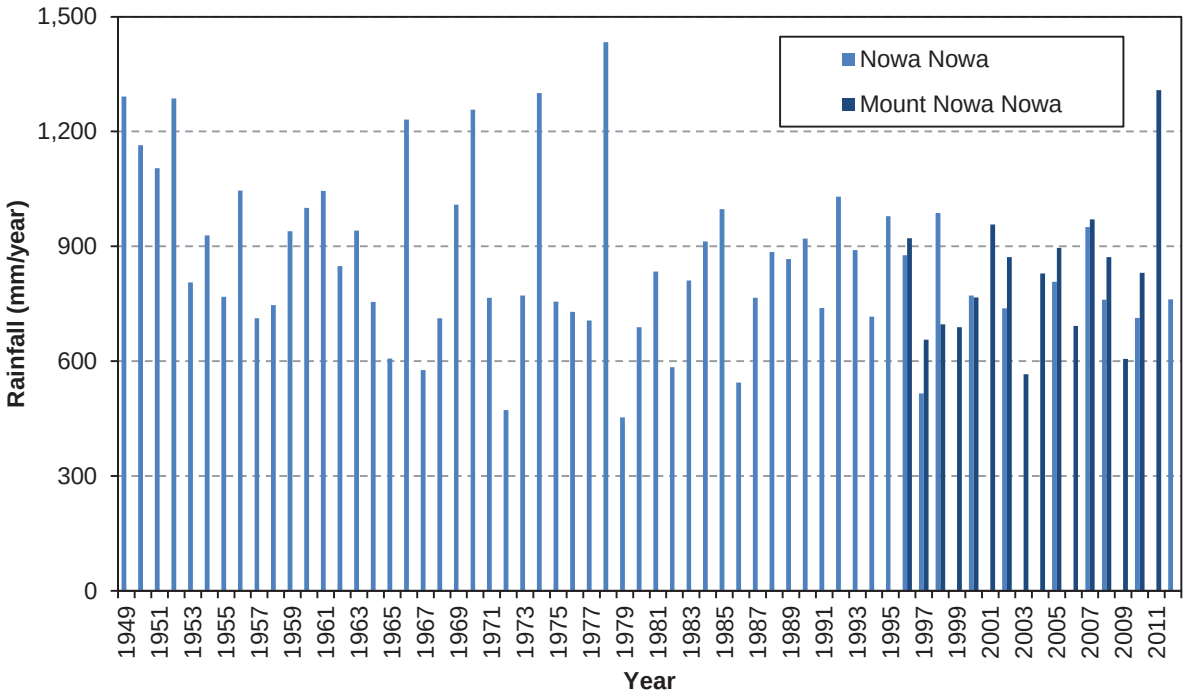

Figure 3.2: Annual rainfall at Nowa Nowa (1949-2012) and Mount Nowa Nowa (1996-2011); annual rainfall data was not available from the Nowa Nowa station for the years 1999, 2001, 2003, 2004, 2006, 2009 and 2011 (BoM, 2013).

The closest meteorological station to the proposed Project area (approximately 30 km east of the proposed Project) that measured evaporation was the BoM station at Orbost (Latitude: 37.69°S; Longitude: 148.46°E; Elevation: 41 m asl). Mean daily pan evaporation records were available from 1994 until 2011. Mean daily pan evaporation was highest in the month of January, 5 mm, and lowest in the month of June, 1.3 mm (Figure 3.3). The mean annual pan evaporation (1,110 mm) at Orbost exceeds mean annual rainfall at Nowa Nowa (863 mm) by approximately 250 mm. The average annual pan evaporation map produced for Australia (BoM, 2013) indicates that Orbost and the proposed Project area fall within the 1,000-1,200 mm average annual pan evaporation range.

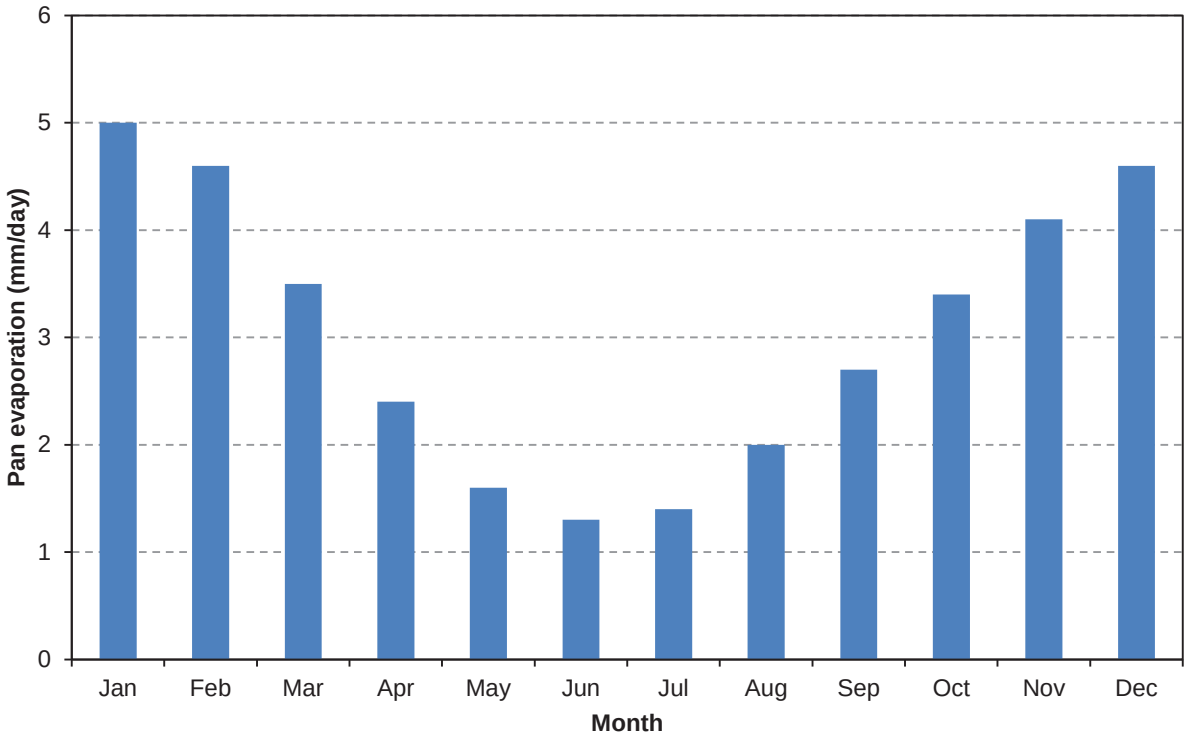

Figure 3.3: Mean daily pan evaporation at Orbost (1994-2011) (BoM, 2013).

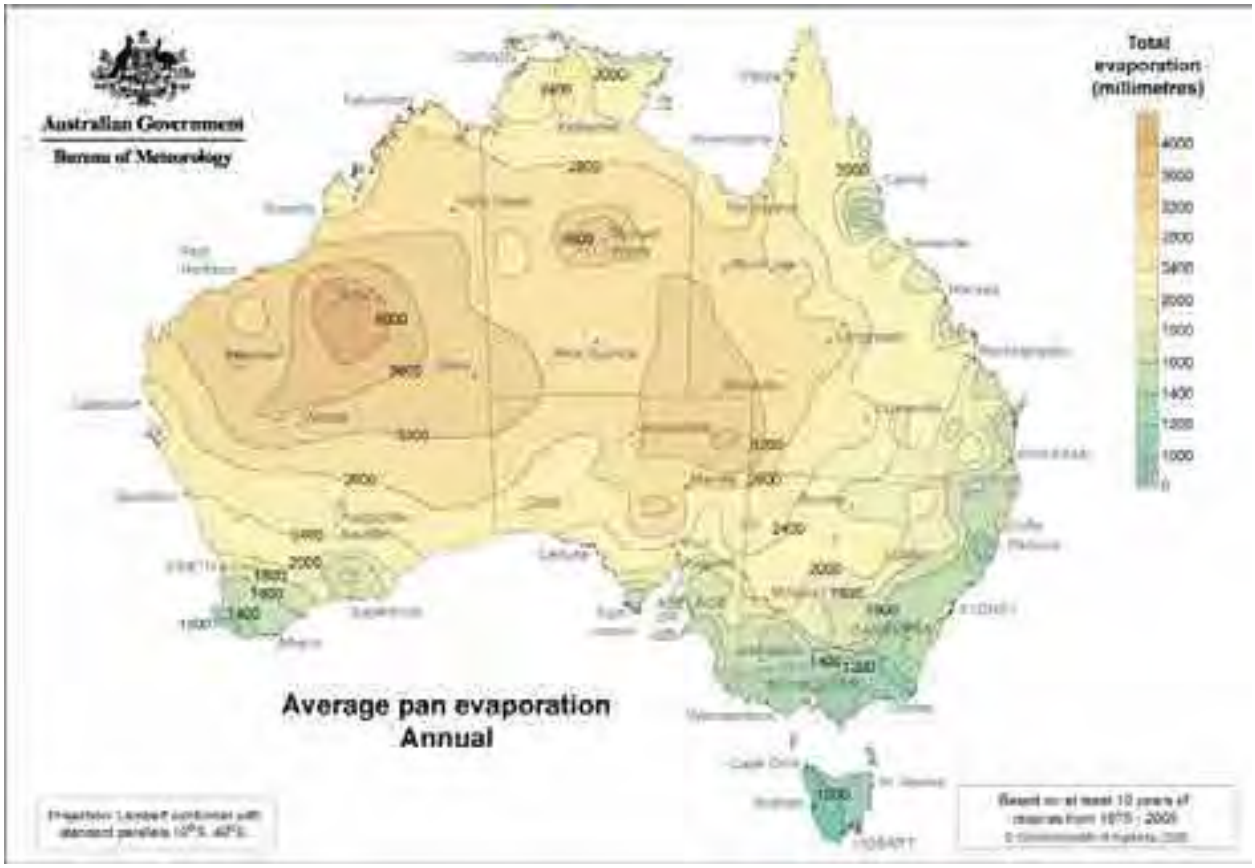

Figure 3.4: Average annual pan evaporation map of Australia (Source: BoM, 2013).

The closest meteorological station to the proposed Project area that measured temperature was the BoM station at Mount Nowa Nowa. Mean daily temperature records were available from 1995 until 2012. Mean maximum daily temperature was highest in the month of January, 24.8 °C, and lowest in the month of July, 12.9 °C (Figure 3.5).

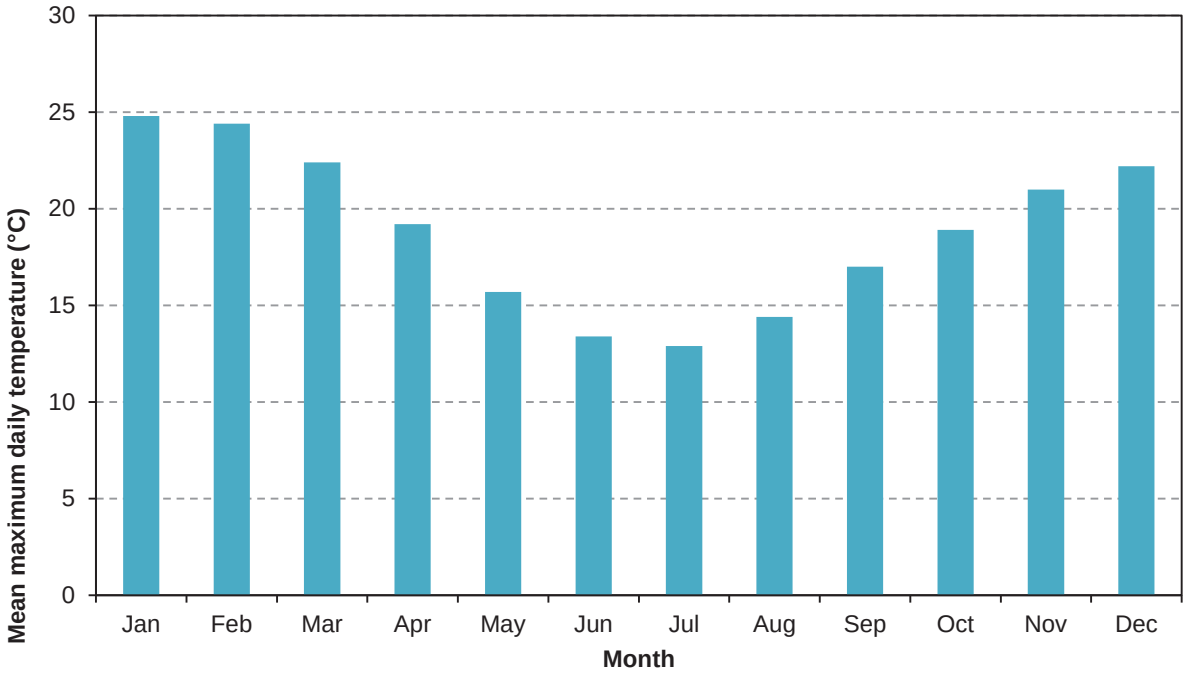

Figure 3.5: Mean maximum daily temperature at Mount Nowa Nowa (1995-2012) (BoM, 2013).

3.3 Groundwater

Regionally, groundwater flow is generally from the recharge areas in the north and northwest to offshore in the south (DSE, 2010). Discharge for aquifer units closer to the surface are likely to occur as baseflow to the lower reaches of the rivers and smaller creeks flowing over the coastal plains. However, such areas do not occur in the direct vicinity of the Project. Additional groundwater discharge will also occur to the Gippsland Lakes and other estuarine bodies (eg. Lake Tyers) (DSE, 2010).

Southern Rural Water (SRW, 2010) have prepared aquifer yield and salinity maps for the groundwater systems in South Eastern Victoria. The aquifer yield and salinity maps include the proposed Project area, however the Project area is located on the margins of the mapped areas (AECOM, 2013b). Aquifer salinity (total dissolved solids (TDS)) maps (SRW, 2010) indicate:

- TDS concentrations between 1,000 - 3,500 mg/L for water table aquifers in the vicinity of the proposed Project area.
- TDS concentrations between 500 – 3,500 mg/L for Lower Tertiary to mid Tertiary aquifers in the vicinity of the proposed Project area.

Theoretical aquifer bore yields were mapped and are based on a number of assumptions; actual bore yields may differ significantly (SRW, 2010). Mapped theoretical aquifer bore yields in the vicinity of the proposed Project area (SRW, 2010) indicate:

- Estimated yields of <1 L/s for water table aquifers.
- Estimated yields of 1-10 L/s for Lower Tertiary to mid Tertiary aquifers.

3.3.1 Groundwater Characteristics

Groundwater levels were relatively constant over the monitoring period (Figure 3.6). Several significant rain events were recorded at Mount Nowa Nowa BoM station in May 2013 during the monitoring period (up to approximately 30 mm/day), however there were negligible changes in the groundwater levels in response to these rainfall events. A significant decrease in the groundwater levels (~0.5 m) in all three bores was observed in mid-June, coinciding with the installation of three new monitoring bores in the proposed Project area and extraction of groundwater inflow to the new monitoring bores during installation.

Water levels ranged between approximately 37 m below ground level (NRC027) and 50 m below ground level (NRC022) during the monitoring period. Groundwater discharge / contribution to local stream flows appear negligible in the Project area.

Groundwater level data indicate localised groundwater flow within the Project area from the south-east to a north-west direction (Figure 3.7); consistent with the local topography. Regionally, groundwater is expected to flow in a southerly direction with some discharge of groundwater potentially occurring in the lower reaches of Boggy Creek or Lake Tyers (DSE, 2010). Groundwater flow directions in the south east of the proposed Project area are not known.

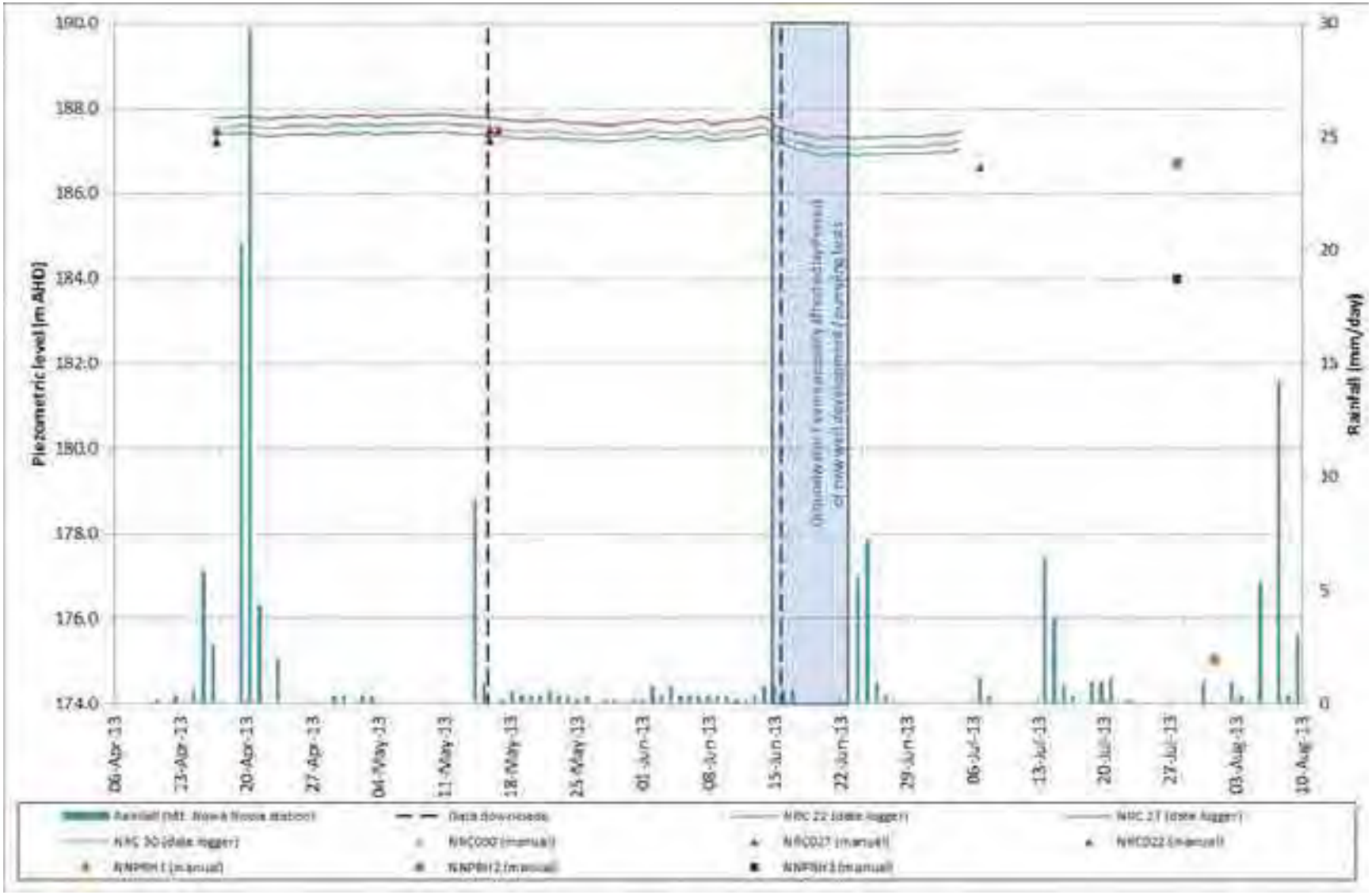

Figure 3.6: Piezometric levels (m AHD), primary y-axis, taken manually using a dipper (represented by points) and groundwater level loggers (represented by lines) between April and July 2013. Daily rainfall (mm/day) recorded over the monitoring period at the Mount Nowa Nowa BoM station is plotted on the secondary y-axis.

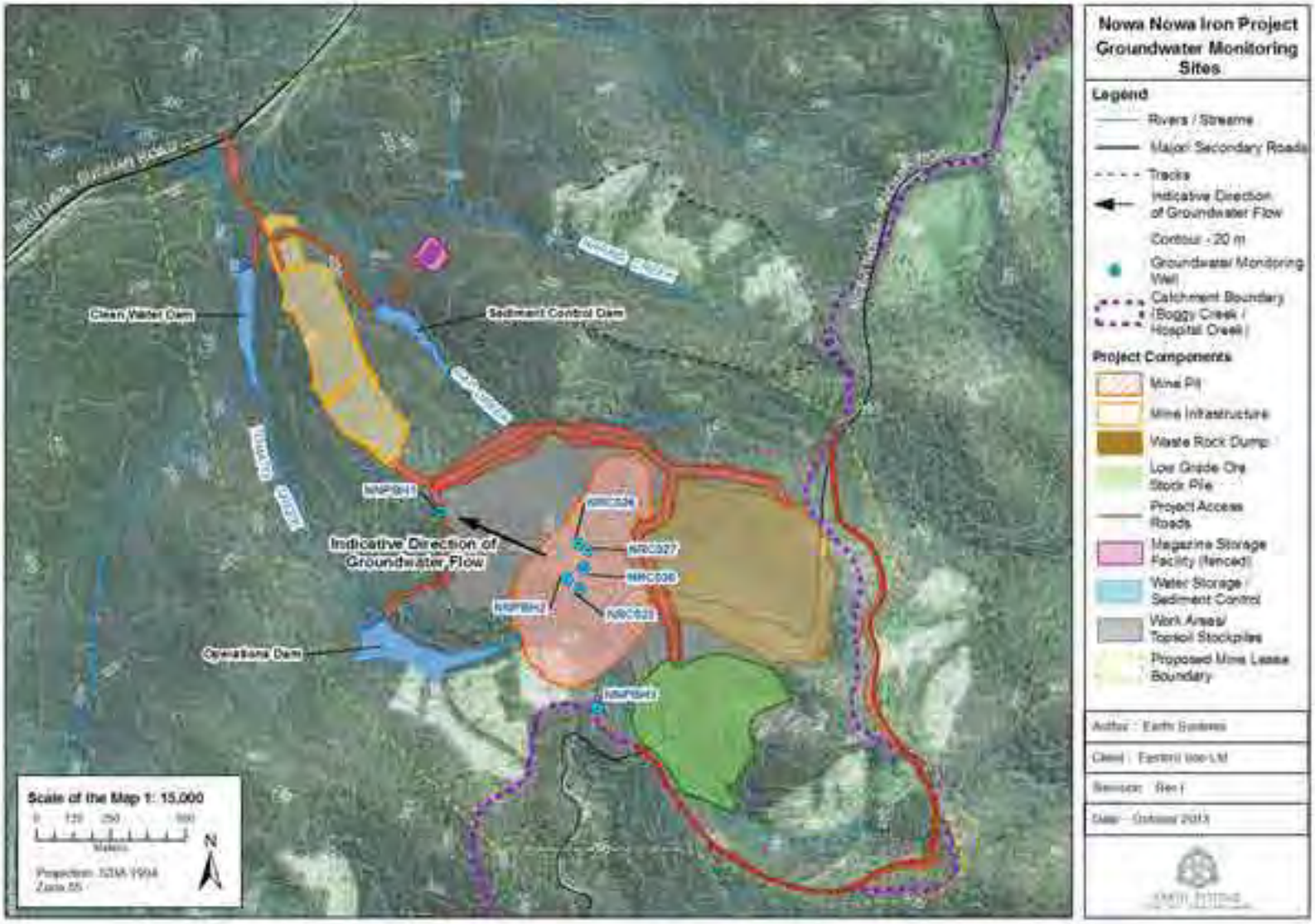

Figure 3.7: Groundwater monitoring bore locations and indicative flow direction within the proposed Project area.

3.3.2 Groundwater Quality

A one-off groundwater monitoring event was conducted in June 2013 in three monitoring wells located within the proposed Project area. Summary tables for groundwater quality are provided in Annex C.

The in-situ water quality parameters are summarised in Table C1 (Annex C). Groundwater quality results have been compared with the relevant surface water quality criteria for the area, given groundwater will need to be extracted during operations in order to de-water the pit area ahead of open-cut mining below the water table.

The key results from the field measurement of groundwater quality (Table C1, Annex C) include:

- Overall the in-situ water quality parameters indicate near neutral pH (6.35 - 7.51) and brackish water (1,965 – 3,974 µS/cm conductivity / 1,275 - 2,582 mg/L TDS).
- pH measurements from two of three monitoring bores (NNPBH1 and NNPBH2) were within ambient surface water quality environmental objectives (6.4-7.7; SEPP, 2003).
- EC measurements from none of the three monitoring bores were within ambient surface water quality environmental objectives (≤500 µS/cm; SEPP, 2003).

The laboratory groundwater quality parameters are summarised in Table C2 (Annex C). The key results from the laboratory analysis of groundwater quality (Table C2, Annex C) include:

- General water quality parameters indicate near neutral pH (6.48 - 7.58) and moderate conductivity (2,010 – 4,050 µS/cm conductivity).
- Salinity in the groundwater is dominated by chloride (437- 1,120 mg/L), sodium (183 – 402 mg/L) and bicarbonate alkalinity (118 – 386 mg/L).
- Dissolved metal concentrations were mostly within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Dissolved copper concentrations (0.001 mg/L) from one of three monitoring bores (NNPBH2) were within the ambient surface water quality environmental objectives (0.0014 mg/L; SEPP, 2003). However, dissolved copper concentrations (0.007 and 0.002 mg/L) in the other two monitoring bores (NNPBH1 and NNBH3) were within the hardness adjusted surface water quality environmental objectives for copper (0.0126 mg/L; ANZECC/ARMCANZ, 2000).
    - Dissolved nickel concentrations (<0.001 and 0.003 mg/L) from two of three monitoring bores (NNPBH1 and NNBH3) were within the ambient surface water quality environmental objectives (0.011 mg/L; SEPP, 2003). However, dissolved nickel concentrations (0.026 mg/L) in the other monitoring bore (NNPBH2) were within the hardness adjusted surface water quality environmental objectives for nickel (0.099 mg/L; ANZECC/ARMCANZ, 2000).
    - Dissolved zinc concentrations (0.017, 0.102 and 0.038 mg/L) in all monitoring bores were above the ambient surface water quality environmental objectives for zinc (0.008 mg/L; SEPP, 2003). However, dissolved zinc concentrations in two of the three monitoring wells (NNPBH1 and NNBH3) were within the hardness adjusted surface water quality environmental objectives for zinc (0.072 mg/L; ANZECC/ARMCANZ, 2000).
- Total phosphorus concentrations (0.04 mg/L) in one of three of the monitoring bores (NNPBH1) were within the ambient water quality environmental objectives (0.045 mg/L; SEPP, 2003).

3.4 Baseline Hydrology

There are a number of creeks (permanent and ephemeral) that are located within the Project area and downstream of the Project area which ultimately drain to Lake Tyers. The Five Mile deposit is located on Gap Creek and Tomato Creek, which drain into Harris Creek. Harris Creek flows into Yellow Waterholes Creek upstream of Boggy Creek which flows into Lake Tyers at the town of Nowa Nowa. Lake Tyers is separate from the other lakes in the Gippsland Lakes system.

As the catchments draining the Project area are ungauged, no long term surface water flow data are available. From observations made during site visits, the creeks draining the Project area are ephemeral with little to no flow during dry periods and high flow / energy events during periods of high rainfall.

Surface water flows were estimated for the catchments draining the proposed Project area using Source Catchments software (eWater CRC). The assumptions used in the development of baseline flow rate estimates are outlined in Section 2.2.

Measurement of creek flow rates within the proposed Project area and downstream surface waters will be required to validate and refine these estimates, prior to Project construction. It is not anticipated that the outcomes of these works will influence the management and mitigation measures proposed by this report, but simply provide increased confidence in the baseline evaluation and water balance model.

3.4.1 Proposed Project Area

Surface water flow, approximately 500 metres downstream of the proposed Project area, was estimated on Harris Creek downstream of the confluence with Gap and Tomato Creeks, with a total catchment area of approximately 7.8 km^2 (Figure 2.1). The location of the Project at the top of the catchment is reflected in a relatively small total catchment area of approximately 4.7 km^2, and represents approximately 60 % of the catchment area for which flow rates have been estimated. Monthly statistics for flow estimates for Harris Creek are presented in Table 3.1.

The theoretical flow rate estimates for Harris Creek, indicate that flow from Harris Creek is highly variable, ranging from no flow up to approximately 5 m^3/s. Highest flows occur in the months of June and July coinciding with the higher winter rainfall periods. The lowest flows in Harris Creek are in late summer and early autumn coinciding with periods of lower rainfall and higher evaporation in these months.

Table 3.1: Theoretical flow rate estimates for Harris Creek (L/s) – monthly statistics based on Nowa Nowa rainfall data between 1949 and 2012 (BoM, 2013).

Parameter	Estimated flow (L/s)				
	Min	25th%ile	50th%ile	75th%ile	Max
Jan	0	0	0	1	1,500
Feb	0	0	0	1	1,500
Mar	0	0	0	1	1,000
Apr	0	0	0	1	1,500
May	0	0	0	5	1,500
Jun	0	0	1	10	4,500
Jul	0	0	5	15	2,500
Aug	0	0	1	10	2,000
Sep	0	0	1	5	2,000
Oct	0	0	1	5	2,000
Nov	0	0	0	5	1,000
Dec	0	0	1	5	2,500

3.4.2 Local Catchments

Theoretical surface water flow rate estimates were calculated for the receiving water catchments, downstream of the propose Project area, at the following locations:

- Yellow Waterholes Creek, downstream of the confluence with Harris Creek.
- Boggy Creek, downstream of the confluence with Yellow Waterholes Creek.
- Boggy Creek at Nowa Nowa, upstream of Lake Tyers.

Monthly statistics for flow rate estimates for Yellow Waterholes Creek, downstream of the confluence with Harris Creek, are presented in Table 3.2. Theoretical flow rates for Yellow Waterholes Creek, indicate that flow from Yellow Waterholes Creek is highly variable ranging from no flow up to approximately 95 m^3/s. Highest flows occur in the winter months of June and July coinciding with the higher winter rainfall periods. The lowest months for flows in Yellow Waterholes Creek are between late summer and early autumn, coinciding with lower rainfall and higher evaporation.

Theoretical estimates of annual flow rates in Boggy Creek, between 1949 and 2012, are highly variable indicating variation by up to a factor of approximately 4-5 above average annual flows and as low as a small fraction of the annual average flow.

Similar patterns for estimated flows are observed for Boggy Creek downstream of the confluence with Yellow Waterholes Creek and at Nowa Nowa, upstream of Lake Tyers. Monthly statistics for theoretical flow rate estimates for Boggy Creek are presented in Table 3.3 and Table 3.4.

Table 3.2: Theoretical flow rate estimates (L/s) for Yellow Waterholes Creek, downstream of the confluence with Harris Creek – monthly statistics based on Nowa Nowa rainfall data between 1949 and 2012 (BoM, 2013).

Parameter	Estimated flow (L/s)				
	Min	25th%ile	50th%ile	75th%ile	Max
Jan	0	1	5	25	22,500
Feb	0	0	5	25	29,500
Mar	0	0	1	15	15,500
Apr	0	0	1	20	29,000
May	0	0	5	60	30,500
Jun	0	0	20	205	93,000
Jul	0	5	55	265	52,500
Aug	0	5	30	165	42,000
Sep	0	1	20	105	43,500
Oct	0	1	10	50	30,500
Nov	0	0	5	65	21,000
Dec	0	1	15	50	53,500

Table 3.3: Theoretical flow rate estimates (L/s) for Boggy Creek, downstream of the confluence with Yellow Waterholes Creek – monthly statistics based on Nowa Nowa rainfall data between 1949 and 2012 (BoM, 2013).

Parameter	Estimated flow (L/s)				
	Min	25th%ile	50th%ile	75th%ile	Max
Jan	0	1	10	45	41,000
Feb	0	1	5	45	53,000
Mar	0	0	5	30	28,500
Apr	0	0	5	40	53,000
May	0	0	10	115	55,000
Jun	0	0	35	375	169,000
Jul	0	5	100	485	95,500
Aug	0	5	50	305	76,000
Sep	0	5	50	190	79,000
Oct	0	1	20	90	55,500
Nov	0	1	10	115	37,500
Dec	0	1	24	90	97,000

Table 3.4: Theoretical flow rate estimates (L/s) for Boggy Creek at Nowa Nowa, upstream of Lake Tyers – monthly statistics based on Nowa Nowa rainfall data between 1949 and 2012 (BoM, 2013).

Parameter	Estimated flow (L/s)				
	Min	25th%ile	50th%ile	75th%ile	Max
Jan	0	1	10	50	45,000
Feb	0	1	5	45	58,500
Mar	0	0	5	35	31,500
Apr	0	0	5	40	58,500
May	0	0	10	125	61,000
Jun	0	0	40	410	186,000
Jul	0	5	105	535	105,000
Aug	0	10	65	335	83,000
Sep	0	5	35	210	87,000
Oct	0	1	20	100	61,000
Nov	0	1	10	125	41,500
Dec	0	1	25	100	107,000

3.4.3 Potential Effects of Climate Change

Potential effects of climate change up to the year 2060 on stream flow in Gippsland are presented in the *Gippsland Region Sustainable Water Strategy* (DSE, 2011). Potential effects to stream flows are provided for a range of potential future climate projections (DSE, 2011):

- Scenario A – Potential low impact scenario: Low end of predictions using CSIRO 2011 estimates – 'Wet' CSIRO projection.
- Scenario B – Potential medium impact scenario: Middle of the set of predictions using CSIRO 2011 estimates – 'Median' CSIRO 2011 projection.

- Scenario C – Potential high impact scenario: High end of predictions using CSIRO 2011 estimates – 'Dry' CSIRO 2011 projection.

The potential impact of each scenario on stream flow within the Tambo River Basin, which the Project is located within, was modelled by CSIRO. The modelling indicates significant reductions in long-term annual average stream flows within the Tambo River Basin under the medium and high potential impact scenarios, with reductions of up to 20 % and 42 % respectively by the year 2060 (DSE, 2011).

3.5 Surface Water Quality

Baseline water quality monitoring sites have been grouped into the following regions:

- Harris and Yellow Waterholes Creeks.
- Boggy Creek.
- Ironstone Creek.
- Bill and Hospital Creeks.
- Lake Tyers.

Water quality monitoring sites and the rationale for each site are described in detail in Section 2.3.2.

Water quality monitoring results, for the various creeks in the proposed Project area and surrounds, are discussed below. Summary tables of the results of the water quality monitoring program are provided in Annex C. The laboratory reports, from ALS Laboratory Springvale, for each monitoring event are provided in Annex D.

3.5.1 Harris Creek and Yellow Waterholes Creek

Harris Creek is an ephemeral creek draining the proposed Project area. Tomato Creek and Gap Creek are the major tributaries and also drain the proposed Project area. The Harris Creek catchment is located within the Tara and Kenny State Forests (Figure 2.1).

The water quality monitoring site NOWA2 is located on Harris Creek directly downstream of the Project area and the confluence with Tomato and Gap Creeks (Plate 3.1). It is located within a forested area, with some sections of the forest recently subjected to logging.

Yellow Waterholes Creek is an ephemeral creek. Harris Creek is a tributary of Yellow Water Holes Creek, and Yellow Waterholes Creek discharges into Boggy Creek.

The water quality monitoring site NOWA 11 is located on Yellow Waterholes Creek, upstream of the Project area and the confluence with Harris Creek (Plate 3.1). The monitoring site is located downstream of agricultural activity including pasture and cattle grazing land.

Plate 3.1: Photos of Harris Creek (top) and Yellow Waterholes Creek (bottom).

Baseline in-situ water quality data for Harris Creek and Yellow Waterholes Creek are summarised in Table C3 (Annex C). The key results include:

- Overall the in-situ water quality parameters indicate near neutral pH (6.18 - 7.12) and low to moderate salinity (238 – 562 µS/cm).
- Maximum pH (7.12 and 6.48) measurements at both monitoring sites (NOWA2 and NOWA11) were within ambient surface water quality environmental objective (6.4-7.7; SEPP, 2003).
- Mean, minimum and maximum EC measurements (390 µS/cm, 238-489 µS/cm) at Harris Creek were within ambient surface water quality environmental objective (≤500 µS/cm; SEPP, 2003).
- Mean and minimum EC measurements (494 and 426 µS/cm) at Yellow Waterholes were within ambient surface water quality environmental objective (≤500 µS/cm; SEPP, 2003).
- The water was very clear with all turbidity measurements recorded as 0 NTU, within the environmental water quality objective (≤10 NTU; SEPP, 2003).
- Dissolved oxygen values at both Harris Creek and Yellow Waterholes Creek were below of ambient surface water quality environmental objective (85-110%; SEPP, 2003).

Baseline laboratory water quality data for Harris Creek and Yellow Waterholes Creek are summarised in Table C4 (Annex C). Overall laboratory results indicate relatively good water quality in Harris Creek and Yellow Waterholes Creek. The key results include:

- General water quality parameters indicate near neutral pH (6.16 – 6.96) and moderate salinity (259 – 477 µS/cm).
- Salinity in the water at Harris Creek and Yellow Waterholes Creek is characterised by high chloride (57- 133 mg/L) and sodium (30 – 61 mg/L) concentrations.
- Dissolved metal concentrations were generally within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Minimum and maximum dissolved aluminium (0.11-0.35 mg/L) concentrations at Harris Creek were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Dissolved aluminium (0.14 mg/L) concentrations at Yellow Waterholes Creek were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Dissolved copper concentrations (0.002 mg/L) at Yellow Waterholes Creek were above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003) but was within the hardness adjusted surface water quality environmental objective for copper (0.027 mg/L; ANZECC/ARMCANZ, 2000).
- Total metal concentrations were generally within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Total aluminium (3.14 and 0.63 mg/L) concentrations at Harris Creek and Yellow Waterholes Creek were above surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Total chromium (0.002 mg/L) concentrations at Harris Creek were slightly above the ambient surface water quality environmental objective for chromium (0.001 mg/L; SEPP, 2003).
    - Total copper concentrations (0.004 mg/L) at Yellow Waterholes Creek were slightly above ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003).
    - Total zinc (0.065 mg/L) concentrations at Yellow Waterholes Creek were above ambient surface water quality environmental objectives for zinc (0.008 mg/L; SEPP, 2003).
- Nutrient concentrations, including total nitrogen (0.6 mg/L) and total phosphorus (0.03 mg/L), at Yellow Waterholes Creek (upstream site) were higher than Harris Creek, however were within ambient surface water quality environmental objectives (0.6 and 0.045 mg/L; SEPP, 2003).

3.5.2 Boggy Creek

Boggy Creek is an ephemeral creek which discharges into the Nowa Nowa Wetlands at the northern end of the Nowa Nowa Arm of Lake Tyers. The Project area drains into Boggy Creek via Harris and Yellow Waterholes Creek (Figure 2.1). Boggy Creek passes through the Kenny and Tara State Forests, where land use includes agriculture and forestry. Three sites were monitored on Boggy Creek (Plate 3.2) including:

- NOWA1 – Boggy Creek, downstream Yellow Waterholes Creek.
- NOWA6 – Boggy Creek at Nowa Nowa, upstream of Lake Tyers.
- NOWA14 – Boggy Creek, upstream of Yellow Waterholes Creek (ie. upstream of potential influence from the proposed Project).

Plate 3.2: Boggy Creek water quality monitoring sites NOWA 1 (top left), NOWA 6 (top right) and NOWA14 (bottom).

Baseline in-situ water quality data for Boggy Creek are summarised in Table C5 (Annex C). The key results include:

- Overall the in-situ water quality parameters indicate near neutral pH (5.54 - 7.91) and low to high salinity (70 – 1,368 µS/cm).
- Mean and maximum pH at NOWA1 (6.57 and 7.25), mean and minimum pH at NOWA6 (7.08 and 6.42) and maximum pH at NOWA14 (7.21) were within ambient surface water quality environmental objectives (6.4-7.7; SEPP, 2003).
- Minimum EC at NOWA1 and NOWA6 (70 and 276 µS/cm) were within ambient surface water quality environmental objectives (≤500 µS/cm; SEPP, 2003). Minimum and mean EC measurements (297 and 450 µS/cm) at NOWA14 were within ambient surface water quality environmental objectives.
- The water was very clear to turbid with turbidity measurements ranging between 0 and 53 NTU, maximum turbidity measurements at NOWA1, NOWA6 and NOWA14 were all above ambient water quality environmental objectives (≤10 NTU; SEPP, 2003).
- Mean and maximum dissolved oxygen concentrations at NOWA6 (86.9 % and 107.9 %) were within ambient water quality environmental objectives (85-110%; SEPP, 2003). Dissolved oxygen values at both NOWA1 and NOWA14 were below of ambient surface water quality environmental objectives (85-110%; SEPP, 2003).

Baseline laboratory water quality data for Boggy Creek are summarised in Table C6 (Annex C). Overall laboratory results indicate relatively good water quality in Boggy Creek. The key results include:

- General water quality parameters indicate near neutral pH (6.29 – 8.11) and moderate to high salinity (281 – 1,040 µS/cm).
- Salinity at NOWA1, NOWA6 and NOWA14 is dominated by chloride (60- 282 mg/L) and sodium (33 – 118 mg/L).
- Dissolved metal concentrations were mostly within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Dissolved aluminium (0.32 mg/L) concentrations at NOWA14 were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Minimum, mean and maximum dissolved aluminium concentrations at NOWA1 (0.08-0.20 mg/L) and mean and minimum dissolved aluminium concentrations at NOWA6 (0.09-0.32 mg/L) were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Maximum dissolved boron concentrations (0.51 mg/L) at NOWA6 were above the surface water environmental objective for boron (0.37 mg/L; SEPP, 2003).
    - Dissolved copper concentrations (0.002 mg/L) at NOWA1 were slightly above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003) but was within the hardness adjusted surface water quality environmental objective for copper (0.0031 mg/L; ANZECC/ARMCANZ, 2000).
    - Mean and maximum dissolved copper concentrations (0.002 mg/L) at NOWA6 were slightly above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003) but within the hardness adjusted surface water quality environmental objective for copper (0.0047 mg/L; ANZECC/ARMCANZ, 2000).
    - Maximum dissolved copper concentrations (0.0032 mg/L) at NOWA14 were slightly above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003) and also the hardness adjusted surface water quality environmental objective for copper (0.002 mg/L; ANZECC/ARMCANZ, 2000).
- Total metal concentrations were mostly within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Total aluminium (1.04 and 2.00 mg/L) concentrations at NOWA1 and NOWA14 were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Mean and maximum total aluminium (0.67 and 1.31 mg/L) concentrations at NOWA6 were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Total copper concentrations (0.003 mg/L) at NOWA1 were slightly above ambient surface water quality environmental objectives (0.0014 mg/L; SEPP, 2003).
    - Total copper concentrations (0.005 mg/L) at NOWA14 were slightly above ambient surface water quality environmental objectives (0.0014 mg/L; SEPP, 2003).
    - Total zinc (0.01 mg/L) concentrations at NOWA1 were slightly above ambient surface water quality environmental objectives for zinc (0.008 mg/L; SEPP, 2003).
    - Total zinc concentrations (0.03 mg/L) at NOWA14 were above ambient surface water quality environmental objectives for zinc (0.008 mg/L; SEPP, 2003).
- Total phosphorus concentrations were within ambient surface water quality environmental objectives at NOWA1 and NOWA14 (0.045 mg/L; SEPP, 2003). Mean and maximum total

phosphorus concentrations at NOWA6 (0.06 and 0.12 mg/L) were above ambient surface water quality environmental objectives.

3.5.3 Ironstone Creek

The source of Ironstone Creek is located to the south of Mount Nowa Nowa, approximately 2 km south of the Project area. The Project area does not drain to Ironstone Creek, however Ironstone Creek does drain into Lake Tyers (Figure 2.1). Runoff from the decommissioned Nowa Nowa quarry, near the town of Nowa Nowa, is released into Ironstone Creek upstream of Nowa Nowa-Buchan Road. Some sulfidic minerals have been observed in the quarry wallrock and waste rock. Iron (red colouring) staining is visible on some of the rocks in the creek and iron (Fe^{3+}) precipitates were observed in the Creek in August 2012.

The water quality monitoring site NOWA3 is located on Ironstone Creek directly downstream of the decommissioned Nowa Nowa quarry (Plate 3.3).

Plate 3.3: Ironstone Creek water quality monitoring site NOWA3 (top) and the decommissioned Nowa Nowa quarry (bottom).

Baseline in-situ water quality data for Ironstone Creek are summarised in Table C7 (Annex C). The key results include:

- Field measurements indicate that the water quality in Ironstone Creek at NOWA3 is influenced by the oxidation of sulfidic minerals from the decommissioned Nowa Nowa quarry.
- Overall the in-situ water quality parameters indicate acidic pH (3.82 - 4.87) and low to high salinity (133 – 1,483 µS/cm).
- Minimum, mean and maximum pH in Ironstone Creek (3.82, 4.18 and 4.87) were lower than the ambient surface water quality environmental objective (6.4-7.7; SEPP, 2003).
- Minimum EC in Ironstone Creek (133 µS/cm) was within the ambient surface water quality environmental objective (≤500 µS/cm; SEPP, 2003). Mean and maximum EC (832 and 1,483 µS/cm) were above the ambient surface water quality environmental objective.
- The water was very clear with turbidity measurements ranging between 0 and 10.5 NTU generally within the ambient water quality environmental objective (≤10 NTU; SEPP, 2003).
- Maximum dissolved oxygen concentrations in Ironstone Creek (86.9 %) was within the ambient water quality environmental objective (85-110%; SEPP, 2003). Mean and minimum dissolved oxygen concentrations were below the ambient water quality environmental objective.

Baseline laboratory water quality data for Ironstone Creek are summarised in Table C8 (Annex C). The key results include:

- Water in Ironstone Creek is likely to be influenced by the oxidation of sulfidic minerals and is characterised by acidic pH, elevated sulfate concentrations (with respect to baseline water quality in other local creeks) and some elevated dissolved metal concentrations with respect to ambient surface water quality environmental objectives (SEPP, 2003) and baseline water quality in other local creeks.
- General water quality parameters indicate acidic pH (3.79 – 5.19) and moderate to high salinity (239 – 1,340 µS/cm).
- Salinity in the water in Ironstone Creek is dominated by sulfate (21 - 265 mg/L), chloride (49 - 248 mg/L) and sodium (28 – 125 mg/L).
- Dissolved metal concentrations were generally within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Minimum, mean and maximum dissolved aluminium concentrations in Ironstone Creek (0.61, 3.37 and 7.42 mg/L) were well above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Maximum dissolved cadmium (0.0003 mg/L) concentrations in Ironstone Creek were slightly above the surface water quality environmental objective for cadmium (0.0002 mg/L; SEPP, 2003) but within the hardness adjusted surface water quality environmental objective for cadmium (0.0014 mg/L; ANZECC/ARMCANZ, 2000).
    - Minimum, mean and maximum dissolved copper concentrations (0.008, 0.059 and 0.133 mg/L) in Ironstone Creek were above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003) and also above their respective hardness adjusted surface water quality environmental objectives (0.0019, 0.0057, 0.009 mg/L; ANZECC/ARMCANZ, 2000).
    - Mean and maximum dissolved nickel concentrations (0.016 and 0.033 mg/L) in Ironstone Creek were slightly above the ambient surface water quality environmental objective for nickel (0.011 mg/L; SEPP, 2003) but within the hardness adjusted surface water quality environmental objectives (0.045 and 0.073 mg/L; ANZECC/ARMCANZ, 2000).
    - Mean and maximum dissolved zinc concentrations (0.017 and 0.033 mg/L) at NOWA3 were above the ambient surface water quality environmental objective for zinc

(0.008 mg/L; SEPP, 2003) but within the hardness adjusted surface water quality environmental objectives for zinc (0.032 and 0.053 mg/L; ANZECC/ARMCANZ, 2000).

- Total metal concentrations were generally within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Minimum, mean and maximum total aluminium (2.10, 5.27 and 8.43 mg/L) concentrations in Ironstone Creek were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Mean and maximum total cadmium (0.0002 and 0.0004 mg/L) concentrations in Ironstone Creek were slightly above the surface water quality environmental objective for cadmium (0.0002 mg/L; SEPP, 2003).
    - Minimum, mean and maximum total copper concentrations (0.008, 0.078 and 0.148 mg/L) were above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003).
    - Mean and maximum dissolved nickel concentrations (0.015 and 0.028 mg/L) were above the ambient surface water quality environmental objective for nickel (0.011 mg/L; SEPP, 2003).
    - Mean and maximum total zinc (0.022 and 0.042 mg/L) concentrations at NOWA3 were above the ambient surface water quality environmental objective for zinc (0.008 mg/L; SEPP, 2003).
- Minimum total phosphorus concentrations were within the ambient surface water quality environmental objective in Ironstone Creek (0.045 mg/L; SEPP, 2003) but mean and maximum total phosphorus concentrations (0.05 and 0.09 mg/L) were above the ambient surface water quality environmental objective.

3.5.4 Hospital Creek Catchment

Hospital Creek flows in a southerly direction, passing approximately 5 km to the east of the proposed Project. Bill Creek is located to the south-east of the proposed Project and flows south through the small township of Wairewa. Bill Creek and Hospital Creek both flow through areas of intense agricultural activity upstream of the town of Tostaree. Bill Creek joins Hospital Creek several kilometres south of the township of Wairewa and Hospital Creek then flows to the south-east towards the coast. The Hospital Creek catchment is not a tributary of Lake Tyers and surface water discharge from the proposed Project is not expected to influence this catchment (Figure 2.1), but was monitored to determine if it may be a suitable reference catchment.

Three sites were monitored in the Hospital Creek catchment including (Plate 3.4):

- NOWA7 – Bill Creek, upstream of confluence with Hospital Creek.
- NOWA8 – Hospital Creek, upstream of Wairewa and confluence with Bill Creek.
- NOWA9 – Hospital Creek at Tostaree, downstream of confluence with Hospital Creek.

Plate 3.4: Bill Creek water quality monitoring site NOWA7 (top left) and Hospital Creek site NOWA8 (top right) and NOWA9 (bottom).

The in-situ water quality parameters for the Hospital Creek catchment are summarised in Table C9 (Annex C). The key results include:

- Overall the in-situ water quality parameters indicate near neutral pH (5.82 – 8.02) and moderate to high salinity (101 – 1,946 µS/cm).
- Mean pH measurements in Hospital Creek at NOWA9 (7.06) was within the ambient surface water quality environmental objective (6.4-7.7; SEPP, 2003).
- Minimum, mean and maximum EC measurements (101, 209 and 317 µS/cm) in Bill Creek at NOWA7 were within the ambient surface water quality environmental objective (≤500 µS/cm; SEPP, 2003).
- Minimum EC measurements (269 and 451 µS/cm) in Hospital Creek at NOWA8 and NOWA9 were within the ambient surface water quality environmental objective (≤500 µS/cm; SEPP, 2003).
- The water in Bill Creek and Hospital Creek ranges from very clear to slightly turbid, with turbidity measurements ranging from 0 up to 28 NTU, above the ambient surface water quality environmental objective (≤10 NTU; SEPP, 2003).
- The maximum dissolved oxygen concentration in Hospital Creek at NOWA9 (94.3) was within the ambient water quality environmental objective (85-110%; SEPP, 2003). All other dissolved

oxygen readings in Hospital Creek, at NOWA8 and NOWA9, were below the ambient water quality environmental objective.

The laboratory water quality parameters are summarised in Table C10 (Annex C). Overall laboratory results indicate relatively good water quality with moderate to high salinity. Overall, baseline water quality results obtained so far indicate that Bill and Hospital Creeks may be a suitable reference for the creeks draining the proposed Project. The key results include:

- General water quality parameters in Bill and Hospital Creeks indicate near neutral pH (6.24–8.02) and moderate to high salinity (294–2,250 µS/cm).
- Salinity in the water at Bill Creek at NOWA7 and Hospital Creek at NOWA9 and NOWA10 are dominated by elevated chloride (69-634 mg/L), sodium (38 – 310 mg/L) and bicarbonate alkalinity (9–245 mg/L).
- Dissolved metal concentrations were mostly within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Dissolved aluminium and maximum dissolved aluminium concentrations in Hospital Creek at NOWA8 (0.32 mg/L) and NOWA9 (0.061 mg/L) were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Dissolved aluminium concentrations in Bill Creek at NOWA7 (0.2 mg/L) were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Maximum dissolved copper concentrations in Hospital Creek at NOWA9 (0.002 mg/L) were slightly above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003) but within the hardness adjusted surface water quality environmental objective for copper (0.0023 mg/L; ANZECC/ARMCANZ, 2000).
- Total metal concentrations were generally within the ambient surface water quality environmental objectives (SEPP, 2003) with the following exceptions:
    - Total aluminium in Hospital Creek at NOWA8 (0.79 mg/L) and mean and maximum total aluminium (0.38 and 0.75 mg/L) at NOWA9 were above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Total aluminium (0.59 mg/L) concentration in Bill Creek at NOWA7 was above the surface water quality environmental objective for aluminium (0.055 mg/L; SEPP, 2003).
    - Total chromium in Hospital Creek at NOWA8 (0.002 mg/L) and mean and maximum total chromium (0.0013 and 0.002 mg/L) concentrations at NOWA9 were slightly above the surface water quality environmental objective for chromium (0.001 mg/L; SEPP, 2003) but dissolved concentrations were within the surface water quality environmental objective.
    - Total copper in Hospital Creek at NOWA8 (0.002 mg/L) and maximum total copper concentrations (0.002 mg/L) at NOWA9 were slightly above the ambient surface water quality environmental objective (0.0014 mg/L; SEPP, 2003).
    - Total copper (0.002 mg/L) concentrations in Bill Creek at NOWA7 were slightly above the surface water quality environmental objective (0.0014 mg/L; SEPP, 2003).
    - Total zinc in Hospital Creek at NOWA8 (0.009 mg/L) and maximum total zinc concentrations (0.013 mg/L) at NOWA9 were slightly above the ambient surface water quality environmental objective (0.008 mg/L; SEPP, 2003) but dissolved concentrations were within the surface water quality environmental objective.
    - Total zinc (0.009 mg/L) concentrations in Bill Creek at NOWA7 were slightly above the ambient surface water quality environmental objective (0.008 mg/L; SEPP, 2003) but dissolved concentrations were within the surface water quality environmental objective.

- Total phosphorus concentrations were within the ambient surface water quality environmental objective in Bill Creek at NOWA7 and Hospital Creek at NOWA8 (0.045 mg/L; SEPP, 2003). However, mean and maximum total phosphorus concentrations (0.05 and 0.07 mg/L) in Hospital Creek at NOWA9 were slightly above the ambient surface water quality environmental objective.

3.5.5 Lake Tyers

Lake Tyers covers approximately 25 km^2, with an average depth of 3-4 m, and is located downstream of the Project area. It is an estuary consisting of a main lake connected to two main riverine arms: Nowa Nowa and Toorloo. Boggy Creek and Ironstone Creek flow into the Nowa Nowa arm of Lake Tyers (Figure 2.1). The estuary is intermittently blocked from Bass Strait by a sand bar which leads to variations in water quality (particularly salinity levels, dissolved oxygen concentrations, aquatic vegetation growth and turbidity levels), however, the waters are generally well-mixed as a result of wind driven circulation (DPI, 2007). Lake Tyers is not connected to the other lakes in the Gippsland Lakes system.

Two sites were monitored by Earth Systems on the Nowa Nowa arm of Lake Tyers including (Plate 3.5):

- NOWA5 – Lake Tyers, at Nowa Nowa.
- NOWA10 – Lake Tyers, below Ironstone Creek.

Plate 3.5: Lake Tyers water quality monitoring site NOWA5 (top) and NOWA10 (bottom).

The in-situ water quality parameters for the Lake Tyers are summarised in Table C11 (Annex C). The in-situ parameters indicate good water quality with highly variable salinity ranging from freshwater, in the upper reaches of the lake during periods of high surface water flow in Boggy and Ironstone Creeks, up to seawater (approximately 50,000 µS/cm) during periods where the fresh water creeks are dry. The key results from the field measurement of water quality (Table C11, Annex C) include:

- Overall the in-situ water quality parameters indicate near neutral pH (6.05 – 7.64) and moderate to high salinity (894 – 57,200 µS/cm).
- Mean and maximum pH measurements in Lake Tyers at NOWA5 (7.05 and 7.64) and NOWA10 (7.13 and 7.48) were within the ambient estuary surface water quality guideline (6.9-8.3; EPA, 2011; 7.0-8.5; ANZECC/ARMCANZ, 2000).
- Minimum, mean and maximum EC measurements (894, 41,048 and 56,700 µS/cm) in Lake Tyers at NOWA5 indicated that the salinity of the water approaches that of sea water during the summer and autumn months when minimal freshwater flow from the surrounding creeks occurs. The minimum EC measurement (894 µS/cm) was taken in July 2013, after significant fresh water flows from Boggy Creek.
- Minimum, mean and maximum EC measurements (15,900, 45,550 and 57,200 µS/cm) in Lake Tyers at NOWA10 indicated that the salinity of the water approaches that of sea water during the summer and autumn months when minimal freshwater flow from the surrounding creeks occurs. The minimum EC measurement (15,900 µS/cm) was taken in July 2013, after significant fresh water discharges from Boggy Creek and the other tributaries of the Nowa Nowa arm of Lake Tyers.
- The water in Lake Tyers at NOWA5 and NOWA10 ranged from very clear to slightly turbid, with turbidity measurements ranging between 0 and 55 NTU. Maximum turbidity measurements at NOWA5 (25 NTU) and NOWA10 (55 NTU) were slightly above the ambient estuary surface water quality guidelines (18 NTU; EPA, 2011; 10 NTU; ANZECC/ARMCANZ, 2000). Elevated turbidity was measured during the monitoring event in July 2013 and is likely to be a result of suspended sediment loads from the freshwater creeks flowing into Lake Tyers.
- Mean dissolved oxygen concentrations in Lake Tyers at NOWA5 (81.3 %) and NOWA10 (75.75 %) were within the ambient estuary surface water quality guidelines (70-110%; EPA, 2011).

The laboratory water quality parameters are summarised in Table C12 (Annex C). Overall laboratory results indicate relatively good water quality with slightly elevated nutrient (nitrogen and phosphorus) concentrations likely to be influenced by agricultural activity in the greater catchment area. The key results from the laboratory analysis of water quality (Table C12, Annex C) include:

- General water quality parameters indicate near-neutral pH (6.46–7.54) and highly variable salinities (894–57,200 µS/cm).
- Dissolved metal concentrations were mostly within the ambient estuary surface water quality guidelines (EPA, 2011; ANZECC/ARMCANZ, 2000) with the following exceptions:
    - Maximum dissolved chromium concentrations in Lake Tyers at NOWA5 (0.019 mg/L) and NOWA10 (0.016 mg/L) were slightly above the ambient estuary surface water quality guidelines for chromium (0.0077 (Cr(III)) and 0.00014 mg/L (Cr(VI)); EPA, 2011; ANZECC/ARMCANZ, 2000).
    - Maximum dissolved cobalt concentrations in Lake Tyers at NOWA5 and NOWA 10 (0.001 mg/L) were at the detection limit (for ICP-MS) and above the ambient estuary

surface water quality guideline for cobalt (0.000005 mg/L; EPA, 2011; ANZECC/ARMCANZ, 2000).

- Mean and maximum dissolved copper concentrations in Lake Tyers at NOWA5 (0.004 and 0.007 mg/L) and NOWA10 (0.005 and 0.008 mg/L) were slightly above the ambient estuary surface water quality guideline for copper (0.0003 mg/L; EPA, 2011; ANZECC/ARMCANZ, 2000).
- Maximum dissolved zinc concentration (0.009 mg/L) in Lake Tyers at NOWA10 was slightly above the ambient estuary surface water quality guideline for zinc (0.007 mg/L; EPA, 2011; ANZECC/ARMCANZ, 2000).

- Total metal concentrations were mostly within the ambient estuary surface water quality guidelines (EPA, 2011; ANZECC/ARMCANZ, 2000) with the following exceptions:
  - Minimum, mean and maximum total chromium concentrations in Lake Tyers at NOWA5 (0.002, 0.01 and 0.017 mg/L) and NOWA10 (0.002, 0.011 and 0.019 mg/L) were above the ambient estuary surface water quality guideline for chromium (0.00014 mg/L; EPA, 2011; ANZECC/ARMCANZ, 2000).
  - Minimum, mean and maximum total cobalt concentrations in Lake Tyers at NOWA5 (0.001, 0.0015 and 0.002 mg/L) and NOWA10 (0.001, 0.001 and 0.001 mg/L) were at or slightly above the detection limit (for ICP-MS) and the ambient estuary surface water quality guideline for cobalt (0.000005 mg/L; EPA, 2011; ANZECC/ARMCANZ, 2000).
  - Minimum, mean and maximum total copper concentrations in Lake Tyers at NOWA5 (0.002, 0.005 and 0.008 mg/L) and NOWA10 (0.004, 0.006 and 0.007 mg/L) were above the ambient estuary surface water quality guideline for copper (0.0003 mg/L; EPA, 2011; ANZECC/ARMCANZ, 2000).
  - Maximum total zinc concentrations (0.008 mg/L) in Lake Tyers at NOWA5 and minimum, mean and maximum total zinc concentrations (0.008, 0.0085 and 0.009 mg/L) at NOWA10 were slightly above the ambient estuary surface water quality guideline for zinc (0.007 mg/L; EPA, 2011; ANZECC/ARMCANZ, 2000).
- Ammonia as N (<0.01-0.14 mg/L) concentrations were within the Victorian water quality guideline for riverine estuaries (0.5 mg/L NH_3-N; EPA, 2011).
- Minimum ammonia as N concentrations at NOWA5 and NOWA10 were within the water quality guideline for estuaries of south-east Australia (0.015 mg/L NH_3-N; ANZECC/ARMCANZ, 2000). However, mean and maximum ammonia as N concentrations at NOWA5 (0.07 and 0.12 mg/L) and NOWA10 (0.09 and 0.14 mg/L) were above water quality guidelines for estuaries of south-east Australia (0.015 mg/L NH_3-N; ANZECC/ARMCANZ, 2000).
- Minimum nitrite and nitrate as N concentrations at NOWA5 and NOWA10 were within the water quality guideline for estuaries of south-east Australia (0.015 mg/L NO_x-N; ANZECC/ARMCANZ, 2000). However, mean and maximum nitrite and nitrate as N concentrations at NOWA5 (0.03 and 0.1 mg/L) and NOWA10 (0.02 and 0.06 mg/L) were above the water quality guideline for estuaries of south-east Australia (0.015 mg/L NO_x-N; ANZECC/ARMCANZ, 2000).
- Total phosphorus concentrations (0.03-0.08 mg/L) at NOWA5 and NOWA10 were within the Victorian water quality guideline for riverine estuaries (0.1 mg/L; EPA, 2011).
- Minimum total phosphorus concentrations at NOWA10 (0.03 mg/L) were within the water quality guideline for estuaries of south-east Australia (0.03 mg/L; ANZECC/ARMCANZ, 2000). However, mean and maximum total phosphorus concentrations at NOWA5 (0.06 and 0.08 mg/L) and NOWA10 (0.04 and 0.08 mg/L) were above the water quality guideline for estuaries of south-east Australia (0.03 mg/L; ANZECC/ARMCANZ, 2000).

4 Project Design and Water Management

The Project will require water during the construction and operational phases. Design indicates that approximately 180 ML (Engenium, 2013) of water will be required for construction over 8-10 months. During operations, overall consumption will be approximately 164 ML/year (accounting for recycling onsite) (Engenium, 2013).

It is proposed that water will be sourced from three water storages, described in Table 4.1, including the Operations Water Storage, Sediment Control Dam and Clean Water Storage. Project water supply will also be sourced from groundwater during the dewatering of the open pit.

All water used during operation will need to be recycled where possible, including recycling of vehicle wash down water (80% recycled) and potable water (90% reused in operations) (Engenium, 2013).

In the unlikely event that water supply from the above sources is insufficient during any stage of Project construction and operations, the Project will need to source water from alternative sources. Alternative potential water sources include:

- Increased rate of groundwater abstraction from open pit dewatering bores;
- Groundwater extraction from an alternative borefield site; and
- Water delivered by truck from an alternative location.

Table 4.1: Proposed surface water storages.

Storage	Max. surface area (m^2)	Max. water relative level (m AHD)	Av. depth (m)	Max. volume (ML)	Max. wall height (m)	Max. wall span (m)
Operations Water Storage	35,000	189	4.4	154	12.2	105
Sediment Control Dam	11,200	170	2.7	30	7.3	50
Clean Water Storage	16,900	163	2.9	49	6.8	65

A conceptual Project water balance, accounting for the Project design and water management strategy (refer to Section 4.2), has been developed and is provided in Annex A of this report. The key conclusions from the conceptual Project water balance during operations include:

- Mine water supply is expected to be met by runoff from the waste rock dump, low grade ore and open pit catchments; pit groundwater dewatering and the three water storages.
- The Operations Water Storage (OPS) will need to be managed during operations to prevent discharge. Feasible management strategies for preventing discharge from the OPS during operations while minimising potential disruption to operations (ie. through storage of water in the pit during operations) include:
    - Blending of groundwater from pit dewatering bores with Sediment Control Dam (SCD) water for provision of downstream environmental flows (if water quality permits).
    - Increasing Project water usage, if possible.
- Potential for frequent release of environmental flows, water quality permitting, from the SCD and Clean Water Storage (CWS) during operations.

The key conclusions from the conceptual Project water balance post-closure include:

- Pit lake development (to provide a water cover for backfilled waste rock and low grade ore) is estimated to take between 3 and 16 years depending on groundwater inflow rates. Pumping of water from the three water storages to the open pit is likely to be required to rapidly provide a permanent water cover (minimum of 2 m depth) over the potentially sulfidic pit wallrock and backfilled waste rock and low grade ore (if unsold).
- Under the CSIRO 'low impact' climate change projections for 2060 (Tambo River Basin; 5% increase in stream flow) (DSE, 2011), the pit lake level, assumed to start at spill level, is expected to fluctuate between spill level and approximately 2.5 m below spill level. Overflow from the pit to Tomato creek would be expected to occur under this scenario.
- Under the CSIRO 'medium impact' climate change projections for 2060 (Tambo River Basin; 20% reduction in stream flow and ~7% reduction in rainfall) (DSE, 2011), the pit lake level, assumed to start at spill level, is expected to fluctuate between spill level and approximately 2.5 m below spill level. Overflow from the pit to Tomato creek would be expected to occur under this scenario.
- Under the CSIRO 'high impact' climate change projections for 2060 (Tambo River Basin; 42% reduction in stream flow and ~15% reduction in rainfall) (DSE, 2011), the pit lake level, assumed to start at spill level, is expected to fluctuate between spill level and approximately 5 m below spill level. Overflow from the pit to Tomato creek would be expected to occur under this scenario.

4.1 Water Management Principles

The disturbance of water courses, vegetation and geological materials by mining activities has the potential to influence local hydrology, hydrogeology and surface and groundwater quality. The key potential issues affecting local hydrology, hydrogeology and surface and groundwater quality from mining projects include:

- Development of an open pit, surface water storages and construction of a waste rock dump intercepting water courses has the potential to interrupt surface flow regimes in downstream creeks during construction, operations and post-closure.
- Development of an open pit below the groundwater table will require the de-watering of the open pit which has the potential to lower the groundwater table surrounding the open pit (Figure 4.1).
- Clearance of vegetation and land disturbance has the potential to cause erosion and increase turbidity / suspended solids concentrations in surface water runoff.
- The oxidation of previously unweathered sulfidic minerals in waste rock, ore and pit wallrock through mining has the potential to produce (refer to *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit*):
    - Acid and metalliferous drainage (AMD);
    - Neutral and metalliferous drainage (NMD); and / or
    - Elevated sulfate salinity.
- Management of wastewaters (eg. sewage) from a site construction and operations workforce has the potential to lead to elevated nutrient concentrations and pathogens in site water.
- Residues and spills of ammonium nitrate fuel oil (ANFO) during blasting preparations may lead to elevated nutrient (nitrogen) concentrations in waters draining the open pit, waste rock dump and ore stockpiles.

- Storage and use of hazardous materials (including hydrocarbons) during construction and operations may have the potential to affect downstream water quality if spills or improper management of materials occur.

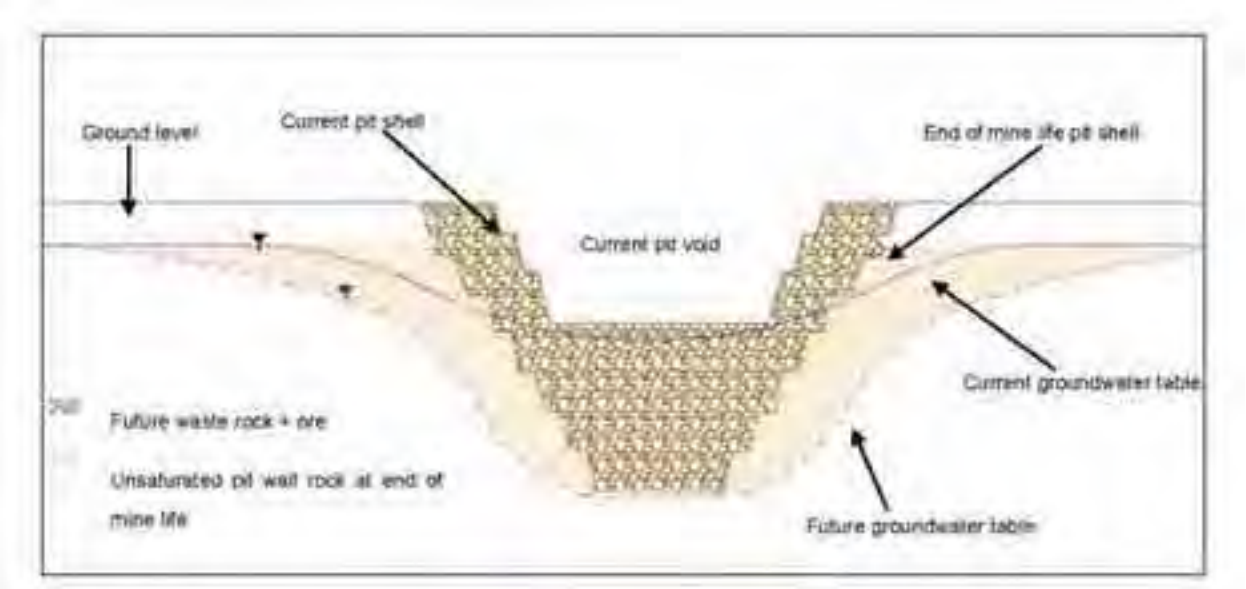

Figure 4.1: Conceptual cross-section of an open pit showing the development of a groundwater cone of depression surrounding an open pit mine extending beneath the water table.

The design of the Project and management of water aims to minimise potential hydrology, hydrogeology and surface and groundwater quality impacts during construction, operations and post-closure. The key principles of management of site water include:

- Minimise the surface and groundwater catchments and catchment area potentially impacted by the Project.
- Where possible, allow for the release of unaffected water from the Project for downstream environment flows during construction, operations and post-closure.
- Maximise the long-term geotechnical stability of Project facilities during construction, operations and post-closure.
- Maximise the long-term geochemical stability of geological materials during operations and post-closure (refer to *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit*).
- Maintain and re-use all potentially affected drainage on-site during construction and operations.
- Post-closure, all potentially affected drainage should be captured and managed to ensure that water released from the Project achieves downstream environmental objectives.

The application of these management principles in Project design is described in Section 4.2.

4.2 Integration of Management Principles into Project Design

The proposed Project plan integrates the management principles described in Section 4.1. The Project layout, which incorporates these principles, is shown in Figure 1.2. Management of long term geochemical stability and classification of geological materials are outlined in *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit.*

Features of the proposed Project design to note with regard to management of water include (Figures 4.2 and 4.3):

- Use of a dry Low Intensity Magnetic Separation (dry LIMS) process for processing of ore. The dry and reagent-free process will significantly reduce the Project's water requirements during operations.
- Constraining the Project footprint to the Boggy Creek catchment (only) to limit potential hydrology/water quality impacts to this catchment alone (ie. avoiding potential impacts to the Hospital Creek catchment).
- Location of the waste rock dump upstream of the pit to allow drainage to be captured in the pit post-closure, providing opportunity for passive water treatment (in the pit lake) and minimising possible requirements for active water treatment.
- Location of the temporary low grade ore stockpile upstream of the pit to allow drainage to be captured during operations, with excess drainage associated with extreme storm events allowed to discharge into the open pit.
- Backfilling of the open pit with potentially sulfidic waste rock and low grade ore (if unsold) post-closure to allow for a permanent water cover (minimum of 2 m depth) to prevent sulfide oxidation.
- Filling of the open pit with water post-closure and allowing the pit lake to overflow into Tomato Creek with a positive water balance.
- Construction of three water storages (Table 4.1) to capture site surface water runoff and facilitate mine water supply during operations. The three water storages are as follows:
    - Operations Water Storage, located immediately downstream of the open pit on Tomato Creek.
    - Sediment Control Dam, located downstream of the open pit and mine industrial area (MIA) on Gap Creek.
    - Clean Water Storage, located downstream of the Operations Water Storage and MIA on Tomato Creek, upstream of the confluence with Harris/Gap Creek.
- The Operations Water Storage will be used to hold drainage from the waste rock dump, temporary low grade ore stockpile, open pit, ROM pad and stockyard and groundwater from pit dewatering (eg. water with potentially elevated salinity, dissolved metals and/or acidity) during operations by pumping from sumps at each drainage collection location.
- During operations, the Operations Water Storage will be managed as follows:
    - Water for operational use will be preferentially abstracted from the Operations Water Storage to keep the water level as low as possible (to provide maximum capacity for high rainfall events).
    - Apart from a small direct catchment area, all inflows into the Operations Water Storage are pumped from sumps around the mine site. Pumping from the various sumps will be managed so as to ensure that the Operations Water Storage does not exceed capacity.

  - During extreme storm events, pumping from the various sumps will need to be managed so as to ensure that the Operations Water Storage cannot exceed capacity. Excess drainage at the sumps upstream of the open pit (upper Tomato Creek and upper Gap creek) will be allowed to discharge into the open pit, if required.
  - Surface seepage under the dam wall will be collected in a sump and pumped back into the Operations Water Storage.
  - Groundwater extracted for pit dewatering may be diverted to the Sediment Control Dam (to maintain environmental flows and offset up-stream capture of surface water) if operations water supply from the Operations Water Storage is sufficient.

- Post-closure, the Operations Water Storage will be partially decommissioned as a polishing wetland to passively treat overflow from the pit lake.
- The Sediment Control Dam will be used to hold drainage from the proposed Project facilities (excluding the pit, waste rock dump, temporary low grade ore stockpile, ROM pad and stockyard) located in the Gap Creek catchment and allow settlement of suspended sediments, before release.
- All Project facilities will be arranged such that all drainage (excluding the pit, waste rock dump, temporary low grade ore stockpile and ROM pad) will be directed into Gap Creek upstream of the Sediment Control Dam.
- During operations, the Sediment Control Dam will be managed as follows:
  - Water will be required from the Sediment Control Dam for mine water use if the Operations Water Storage is dry.
  - Excess water in the Sediment Control will need to be allowed to overflow via the spillway to release environmental flows to the downstream receiving environment, where possible.
- Post-closure, the Sediment Control Dam is to be decommissioned and the site rehabilitated if no alternative use for the dam is identified.
- The Clean Water Storage will be used to capture clean water to supplement site water resources. It will also provide another level of protection for the downstream environment in the extremely unlikely event of a failure in the Operations Water Storage.
- During operations, the Clean Water Storage will be managed as follows:
  - Water will be required from the Clean Water Storage for mine water use if the Operations Water Storage and Sediment Control Dam are dry.
  - Water in the dam will be allowed to overflow via the spillway to release environmental flows to the downstream receiving environment, where possible.
- Post-closure, the Clean Water Storage is to be partially decommissioned as a polishing wetland (in addition to the decommissioned Operations Water Storage) to passively enhance water quality from the flooded open pit.
- Post-closure, if groundwater inflows are not determined to be sufficient, one or all three water storage dams will be used to provide water to assist with the rapid filling of the open pit so as to minimise the period that any sulfidic wallrock and backfilled mine materials are exposed.
- To maximise the amount of runoff reporting to the open pit post-closure, the waste rock dump is to be completed with a cover system, using suitable waste rock and clay materials from decommissioned water storages, to minimise the infiltration of water into the dump and maximise runoff generation. The area of the top surface of the dump is to be maximised and graded to the east to allow all runoff to be captured at the upstream end of Gap Creek and diverted into the adjacent Tomato Creek catchment (using the new topography).

- During construction, sewage will be removed from the Project by vacuum truck and transported to a waste water treatment plant.
- A waste water treatment plant will be used to treat sewage during operations, and treated waste water will need to be recycled for use onsite via the Operations Water Storage.

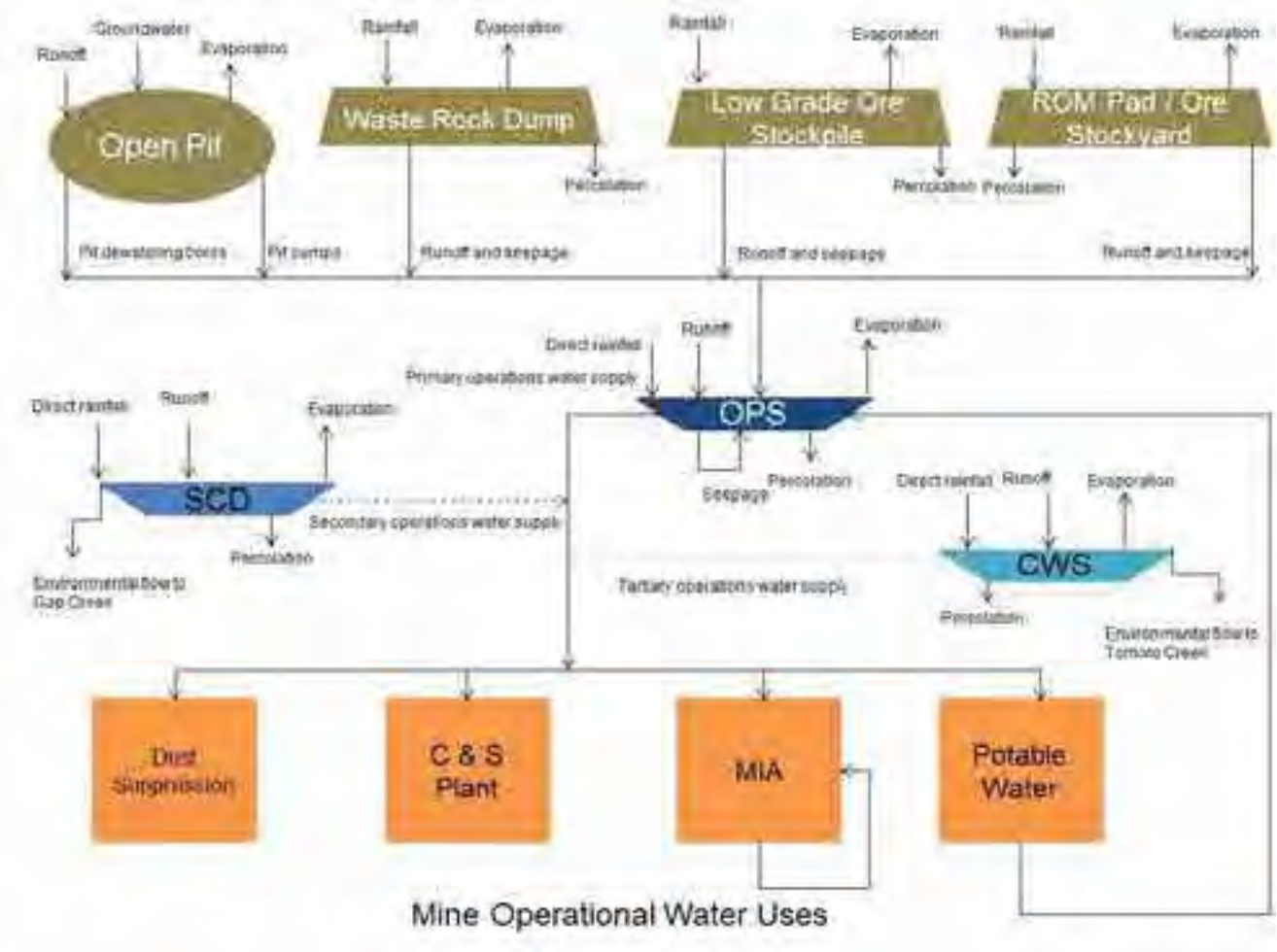

Figure 4.2: Schematic of operations phase Project water flows. Drainage from the open pit, waste rock dump, low grade ore stockpile and ROM pad will need to report to the Operations Water Storage (OPS). Water from the OPS will be the primary water supply for Project operations including dust suppression, crushing and screening plant (C & S Plant), mine industrial area (MIA) and potable water. The Sediment Control Dam (SCD) and Clean Water Storage (CWS) provide the secondary and tertiary water supplies for the Project.

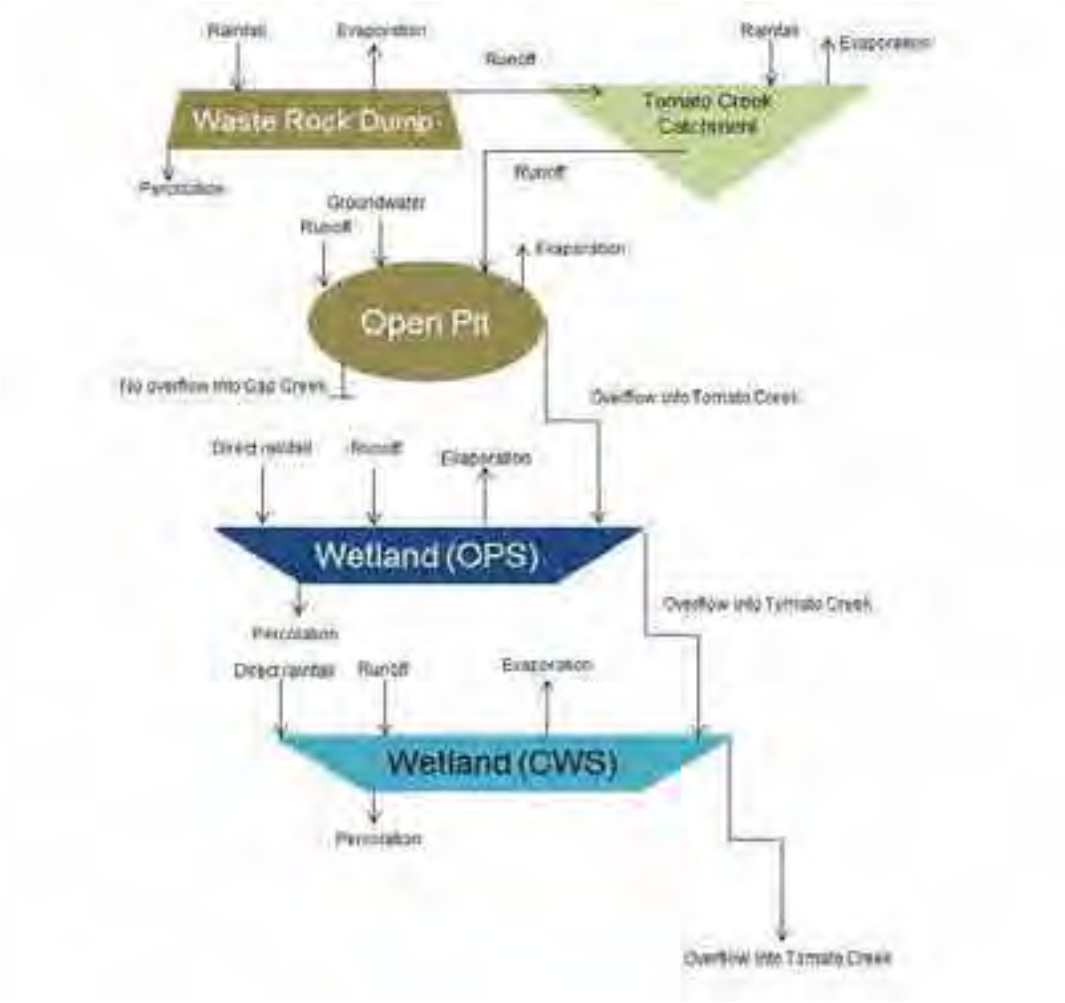

Figure 4.3: Schematic of post-closure Project water flows. Drainage from the waste rock dump will collect in the open pit. The open pit will overflow to Tomato Creek via engineered wetland systems in the decommissioned Operations Water Storage (OPS) and Clean Water Storage (CWS).

4.3 Specific Management Strategies

4.3.1 Hydrology

The Project is located at the top of the Tomato and Gap Creek catchments. The total catchment area for Tomato Creek, upstream of the open pit, is approximately 60 ha. The total catchment area for Gap Creek, upstream of the open pit, is approximately 35 ha. Tomato and Gap Creek flow into Harris Creek, which eventually flows into Boggy Creek and Lake Tyers (See Figure 2.1). The Project intercepts a maximum catchment area of approximately 4.7 km^2 but, a short distance downstream, flows into much larger catchments (eg. Yellow Waterholes and Boggy Creeks) limiting the potential downstream hydrology impacts.

The Project represents a maximum reduction to the downstream catchment areas as follows:

- Approximately 2.5 km downstream of Project, the Project represents a 3 % reduction of the Yellow Waterholes and Tea Tree Creek catchment area.
- Approximately 5 km downstream of the Project, the Project represents a 1.8 % reduction of the Boggy Creek catchment area.
- Approximately 15 km downstream of the Project, the Project represents a 1.7 % reduction of the Boggy Creek catchment area at Nowa Nowa.

However, the reduction of the annual average flow in Boggy Creek, at Nowa Nowa, accounting for the release of environmental flows from the Clean Water Storage and Sediment Control Dam during operations is expected to be approximately 0.8 %. After decommissioning of the water storage dams post-closure, the reduction of the annual average flow in Boggy Creek, at Nowa Nowa, is expected to be up to approximately 0.4 %.

The Project has been designed to limit potential impacts to downstream surface water flows including avoidance of interruption to surface water flows in Harris Creek (Figure 1.2). In addition, the following management measures will be implemented during the construction, operations and post-closure phases of the proposed Project to minimise potential downstream surface water flow impacts:

- Where possible, water will be reused on-site to minimise the potential requirement for fresh water use. All water used during operations will be recycled where possible, including recycling of vehicle wash down water (80% recycled) and potable water (90% reused in operations).
- Use of a dry Low Intensity Magnetic Separation (dry LIMS) process for processing of ore. The dry and reagent-free process will significantly reduce the Project's water requirements during operations.
- Where possible, preferential use of groundwater from open pit dewatering bores for the Project construction and operations water requirements.
- If water quality permits, any excess water from the Clean Water Storage and the Sediment Control Dam will be released via the spillways as environmental flows, where possible.
- If water quality permits, any excess groundwater extracted from open pit dewatering bores during operations may be blended with the Sediment Control Dam water to permit release of environmental flows to the receiving water catchments.

- Post-closure, the open pit will be allowed to fill with water and overflow to Tomato Creek. The Operations and Clean Water Storages will be decommissioned and converted to polishing wetlands that are expected to release flows to Tomato Creek.
- Post-closure, if no beneficial use is identified, the Sediment Control Dam will be decommissioned to allow surface water flows in Gap Creek to be released from the Project site.
- Stream flows will be monitored at key locations downstream of the Project during the construction and operations phases of the proposed Project. Post-closure, monitoring of stream flows at key locations downstream of the proposed Project will need to be conducted until completion criteria are achieved.

If the Project design and management measures outlined above are effectively implemented, potential Project impacts to downstream flows are expected to be low.

4.3.2 Hydrogeology

Mining is proposed to occur below the level of the water table. Dewatering of the open pit will be required during the operations phase via pit dewatering bores and / or open pit sumps to allow mining to occur below the level of the water table. Dewatering of the open pit will likely result in a lowering of the local groundwater table surrounding the open pit (Figure 4.1).

The following management measures will need to be implemented during the construction, operations and post-closure phases of the proposed Project to minimise potential hydrogeology impacts:

- Where possible, water will be reused on-site to minimise the potential requirement for fresh water use. All water used during operations will be recycled where possible, including recycling of vehicle wash down water (80% recycled) and potable water (90% reused in operations).
- Use of a dry Low Intensity Magnetic Separation (dry LIMS) process for processing of ore. The dry and reagent-free process will significantly reduce the Project's water requirements during operations.
- Drainage from the open pit will need to be pumped to the Operations Water Storage during operations for reuse onsite and treatment, if required.
- Post-closure, the open pit will be allowed to fill with water from groundwater inflow, direct rainfall and surface water runoff from the upstream catchments. Groundwater levels surrounding the open pit would be expected to rebound to pre-mining levels in this scenario.
- Groundwater levels and quality will need to be monitored at key locations within the Project area and down hydraulic gradient of the Project during the construction and operations phases of the proposed Project.
- Post-closure, monitoring of groundwater levels and quality at key locations down hydraulic gradient of the proposed Project will need to be conducted until completion criteria are achieved.

If the Project design and management measures outlined above are effectively implemented, potential Project impacts to local hydrogeology are expected to be low.

4.3.3 Turbidity / Sediment

Sediment control is required to ensure compliance of off-site discharge water quality to prescribed standards. Erosion control is important to maintain the geotechnical integrity of the mine infrastructure. Construction and operation activities will need to be managed to limit erosion that may otherwise result in high suspended loads discharging from the mine site.

A key aspect of the sediment transport control strategy will be the construction of the Sediment Control Dam as outlined in Section 4.2.

In addition, the following erosion control and sediment management measures will be implemented during the construction and operations phases of the proposed Project:

- Sequencing of construction activities to reduce erosion potential during the high rainfall months (winter to spring) and account for the implementation and deployment of erosion and sediment control measures.
- Vegetation clearance will be minimised, and vegetation will be preserved in areas where construction will occur at a later date, where possible.
- Vegetation on steep slopes and riparian corridors will be preserved, wherever possible.
- Grading of the Process Plant and Administration areas to drain towards the Sediment Control Dam to allow sediment to settle prior to discharge from site. A surface water diversion drain will need to direct drainage back to the Sediment Control Dam.
- Where practicable, access / haul roads will need to be graded to drain towards the Sediment Control Dam to allow sediment to settle prior to discharge from site.
- Construction/installation of surface water management infrastructure (eg. cut-off/diversion drains, velocity dissipation devices, culverts) where appropriate to minimise and control surface water flow over disturbed areas.
- Locate the waste rock dump and temporary low grade ore stockpile upstream of the open pit and capture drainage from these structures in sumps for pumping to the Operations Water Storage.
- Geotextiles and natural matting will need to be used where appropriate to assist with erosion control on steep slopes (ie. 3:1 or greater) where erosion potential is particularly high.
- Minimisation of dust (eg. water application to unsealed road surfaces).
- Installation of sediment control measures downstream of construction works and disturbed land areas (eg. silt fences, sediment basins, sediment traps, fibre rolls).
- Progressive revegetation of disturbed land areas, giving priority to high risk erosion areas such as steep slopes and sites close to rivers and creeks.
- Monitoring of Project and downstream water quality during construction, operations and post-closure (until completion criteria are achieved) to ensure that downstream environmental objectives are achieved.

The following strategies, adapted from the *Minesite Water Management Handbook* (MCA, 1997), will also be implemented during road construction works:

- Clean surface runoff water will be diverted upstream of work areas.
- Roads will be designed to allow for frequent and safe discharge where runoff is concentrated.
- Roads will be constructed with maximum cross fall (cross-section) slopes of 3%. This will allow water to be cleared from the road surface quickly, but without creating deeply incised scour paths.

- On slopes, up-slope drainage should be diverted and discharge controlled. Drainage should be dissipated from the road surface by outsloping the camber or providing side drains or table drains with protection at the discharge points.
- Where side drains are installed to catch surface water from the pavement and runoff from cut bank slopes, the drains will be sized such that the design flow depth is no higher than the underside of the pavement top coarse or base coarse layer.
- Drains will preferably be directly off the road at cut and fill interfaces or otherwise down batter slopes at designated locations via erosion protected chutes.
- Culverts will be installed at road drainage crossings, perpendicular to the road alignment, with attention given to upstream and downstream erosion protection. If possible, culverts will be positioned at the narrowest part of the stream.
- Culverts will be designed with appropriate slopes to facilitate sediment movement without deposition and consequent culvert blockages.
- Drainage over the surface of drainage crossings will need to have adequate controls to ensure that sediment runoff to the stream is minimised.
- Permanent structures will need to be designed using an average recurrence interval of 50 years, and temporary structures will need to be designed using an average recurrence interval of 2 years (6 hour storm duration).

Post-closure, rehabilitation works are expected to be sufficient to minimise potential downstream turbidity / sediment impacts. The Project rehabilitation and mine closure strategy is outlined in *EES Referral Attachment 1 – Project Description* and *Attachment 2 – Environmental Management Plan*.

The design of the Project and effective implementation of the strategies outlined above are expected to be sufficient to minimise potential impacts associated with turbidity and sediment during construction, operations and post-closure.

4.3.4 Alkalinity / Acidity, Metals and Salinity

The characterisation of geological materials and management strategies to ensure the long-term geochemical stability of the Project are outlined in *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit*.

In addition, the following water management measures will need to be implemented during construction, operations and post-closure phases of the Project to minimise potential alkalinity/ AMD / NMD / salinity impacts:

- Monitoring of Project and downstream water quality during construction, operations and post-closure (until completion criteria are achieved) to ensure that downstream environmental objectives are achieved.
- Alkaline water from any concrete batching used during construction will need to be stored on-site in a HDPE lined pond or pumped to the Operations Water Storage for re-use, if required.
- Water will need to be released from the Clean Water Storage and the Sediment Control Dam, water quality permitting, to provide environmental flows and minimise the potential for evaporative concentration in the water storages.
- For extreme storm events during operations, pumping from the various sumps will need to be managed so as to ensure that the Operations Water Storage cannot exceed capacity. Excess drainage at the sumps upstream of the open pit (upper Tomato Creek and upper Gap creek) will be allowed to discharge into the open pit, if required.

- Post-closure, water will only be released from site if applicable water quality environmental objectives can be achieved. Passive treatment of water (ie. engineered wetland systems) will need to be installed on Tomato Creek (in the decommissioned Operations and Clean Water Storages) to lower potential salinity and dissolved metals concentrations in drainage from the waste rock dump and open pit, if required.
- The Project rehabilitation and closure strategy, including water management, will need to be reviewed throughout the operational life of the Project to determine the feasibility of the strategy.

If the Project design and management measures outlined in Section 4.3.4 are effectively implemented the residual impacts from alkalinity, AMD, NMD and / or salinity are expected to be low.

Specific water management measures, to minimise potential AMD, NMD and / or salinity impacts, for key Project facilities are discussed separately as follows:.

Waste Rock Dump

Specific management measures during operations and post-closure for the management of waste rock dump drainage are as follows:

- The waste rock dump is to be located upstream of the open pit (see Figure 1.2) to allow for collection of drainage and seepage in the open pit post-closure.
- During operations, each lift of the waste rock dump will need to be compacted and graded such that all drainage is directed eastward (upstream) into the Gap Creek and contained in a pond/sump for pumping to the Operations Water Storage for treatment (if necessary) and reuse in ore processing and dust suppression.
- To maximise the amount of runoff reporting to the open pit post-closure, the waste rock dump is to be completed with a cover system, using suitable waste rock and clay materials from decommissioned water storages, to minimise the infiltration of water into the dump and maximise runoff generation. The area of the top surface of the dump is to be maximised and graded to the east to allow all runoff to be captured at the upstream end of Gap Creek and diverted into the adjacent Tomato Creek catchment (using the new topography).
- Category C (see *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit*) waste rock should be backfilled into the open pit on closure for storage under a permanent water cover (minimum 2 m depth) to prevent sulfide oxidation. Backfilling should be conducted such that no waste rock will become perched on pit benches above the height of the final waste rock pile.
- Passive treatment of leachate from the waste rock dump may be required post-closure, in the open pit / and or decommissioned Operations Water Storage. The chemistry of leachate from the waste rock dump is to be monitored throughout operations to confirm any potential requirement for treatment.

Temporary Low Grade Ore Stockpile

Specific management measures during operations and post-closure for the management of the temporary low grade ore stockpile drainage are as follows:

- The temporary low-grade ore stockpile is to be located upstream of the open pit (see Figure 1.2) during operations. Drainage from the stockpile is to be captured in a sump during operations and pumped to the Operations Water Storage for treatment and reuse onsite.
- During extreme rainfall events, drainage from the stockpile would be captured in the open pit.

- On mine closure, all of the low-grade ore (if unsold or unfit for reprocessing) will need to be backfilled into the open pit to ensure a permanent water cover and thereby prevent sulfide oxidation and AMD generation.
- If possible, the northern extent of the open pit should be developed first and the low-grade ore backfilled into the completed northern pit during operations as feasible. The chemistry of drainage from the stockpile should be monitored throughout the operational life of the mine to confirm potential requirements for treatment.

Open Pit and Downstream Water Storages

Specific management measures during operations and post-closure for the management of open pit drainage are as follows:

- Drainage into the open pit during operations is to be pumped to the Operations Water Storage for reuse onsite. If required, drainage from the open pit can be treated to allow for the operational use of the water.
- Category C waste rock (see *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit*) and any low-grade ore remaining on mine closure are to be backfilled into the base of the pit and the pit lake allowed to flood to ensure a permanent water cover (minimum of ~2 m depth).
- Post-closure, the open pit is designed to flood and overflow regularly into Tomato Creek. The overflow level of the pit lake is approximately 190 mAHD, and the pre-mining peak groundwater level in the pit area is approximately 187 mAHD (Figure 4.4). The post-closure flood level of the pit is therefore designed to be marginally higher than the pre-mining groundwater level. This means that wallrock material exposed post-closure, once the pit lake reaches the spill level, will not experience a change in geochemical environment as the material is already above the groundwater table with potential exposure to oxidation.
- The pit lake is designed to provide passive treatment for all inflows through a combination of retention time, sulfate reduction by sulfate reducing bacteria (SRB), and acid neutralisation by alkalinity produced by SRB activity and the dissolution of limestone, and alkalinity brought in by groundwater.
- Some sulfide oxidation is expected from these exposed highwalls in the long term, but geochemical assessment shows that no acid drainage will be produced (see *EES Referral Attachment 6*). Based on observations from historical quarries in the area, this oxidation only appears to occur on rock surfaces and is expected to be limited. All drainage from the exposed highwalls reports to the pit for passive treatment.
- As the pit is flooded, any acidity or salinity generated in the groundwater drawdown cone during operations will be flushed into the pit. The chemistry of pit lake water should be monitored throughout the flooding operation to identify whether treatment (eg addition of limestone or calcium hydroxide) may be required in this initial flood period.
- To minimise the period that wall rock is exposed to atmospheric oxygen on closure and to dilute potentially saline water, flooding of the pit should be augmented by pumping from the Clean Water Storage and Sediment Control Dam (in addition to natural inflows from groundwater and upstream runoff).
- An extended period of low water level in the pit post-closure (ie. due to slow rate of flooding) may permit sulfide oxidation to proceed in backfill and wall rock materials, resulting in the accumulation of acidity in the pit lake. This situation should be prevented as far as practicable.

- A layer of acid-consuming materials (eg. Category N waste rock; see *EES Referral Attachment 6*) and organic material should be laid over the backfilled materials in order to promote the activity of sulfate-reducing bacteria in the base of the pit lake. This will assist in minimising levels of sulfate salinity and any metals in the pit lake over the long term.
- The rim of the mine pit and the upstream catchments should be revegetated in order to ensure a long-term supply of organic matter in into the pit lake.
- Drainage from the catchments upstream of the pit should be maximised and kept clean. The waste rock pile is to be installed with a cover system and revegetated on closure to minimise infiltration into the pit and maximise clean runoff, which will need to be diverted into the adjacent southern catchment (Tomato Creek) using the new topography at the top of the waste rock catchment.
- The southern upstream catchment of Tomato Creek should be fully rehabilitated after removal of the temporary low-grade ore stockpile and Category C waste rock.
- The Operations Water Storage is to be decommissioned on closure but the structure retained as a wetland to passively treat overflow from the pit lake.
- The Clean Water Storage should similarly be decommissioned (unless other uses are found) but the structure retained as an additional wetland to polish water draining from the decommissioned Operation Water Storage.
- The Sediment Control Dam is to be decommissioned on mine closure and the former channel reinstated if no alternative use for the dam is identified.

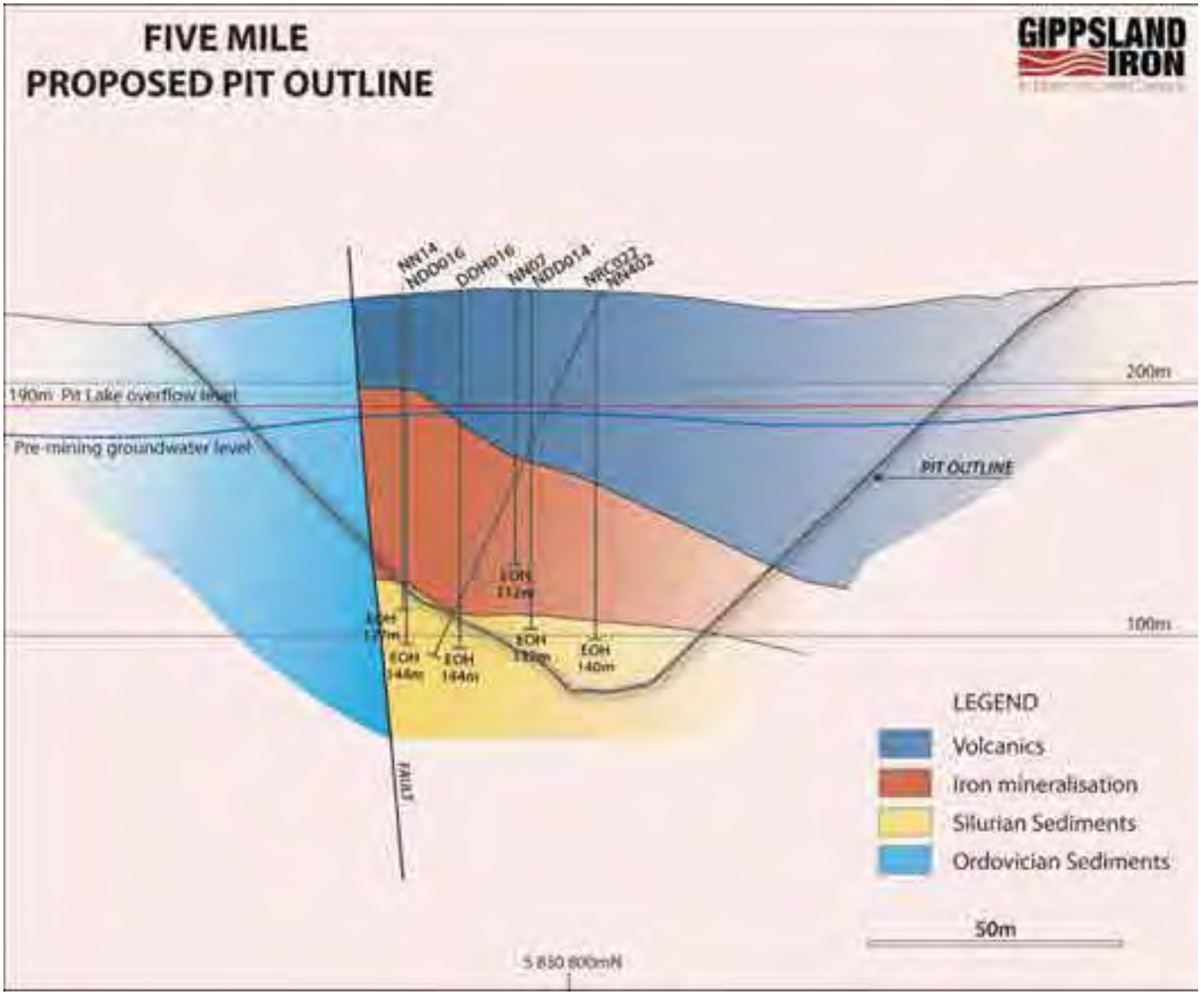

Figure 4.4: Cross section of the proposed pit showing the pre-mining groundwater level and the pit lake spill level post-closure.

ROM Ore and LIMS Product

Specific management measures during operations for the management of ROM ore and dry LIMS product drainage are as follows:

- The ROM pad will need to be constructed of low permeability clay material (or other suitable products) to minimise the potential for the percolation of water from the temporary ore stockpile to the groundwater system.
- ROM ore and dry LIMS product should not be stockpiled under unsaturated conditions for more than ~2 years (see *EES Referral Attachment 6*).
- Drainage from the ROM pad has the potential to present with elevated levels of sulfate and dissolved metals. Drainage from the ROM pad is to be contained and transferred to the Operations Water Storage for treatment (if necessary) and reuse in ore processing and dust suppression.
- Drainage from the LIMS product stockpile has the potential to present with elevated levels of sulfate and dissolved metals. Drainage from the stockpiled product is to be contained and treated if necessary.
- Post-closure, any remaining ROM ore or LIMS product should be sold or backfilled into the open pit below a permanent water cover of sufficient depth (~minimum of 2 m depth) to prevent sulfide oxidation.

4.3.5 Nutrients and Pathogens

Nutrient and pathogen management is required to ensure compliance of off-site discharge water quality to applicable standards. Key aspects of the Project design to manage potential nutrient and pathogen impacts will need to include:

- During construction, sewage will need to be removed from the Project by vacuum truck and transported to a waste water treatment plant.
- Installation and operation of a wastewater treatment plant to treat sewage from the operations workforce. Treated water from the wastewater treatment plant will need to be recycled for use onsite via the Operations Water Storage.
- No landfill disposal of waste will occur at the Project. General waste will need to be removed from site.

In addition, the following nutrient management measures will be implemented during the construction, operations and post-closure phases of the proposed Project:

- Monitoring of Project and downstream water quality during construction, operations and post-closure (until completion criteria are achieved) to ensure that downstream environmental objectives are achieved.
- During operations, drainage from the waste rock dump, temporary low grade ore stockpile, open pit and ROM pad will need to be pumped to the Operations Water Storage and reused onsite.
- For extreme storm events during operations, pumping from the various sumps will be managed so as to ensure that the Operations Water Storage cannot exceed capacity. Excess drainage at the sumps upstream of the open pit (upper Tomato Creek and upper Gap creek) will be allowed to discharge into the open pit, if required.

- Post-closure, water would only be released from site if applicable water quality environmental objectives can be achieved. Passive treatment of water (ie. engineered wetland systems) will need to be installed on Tomato Creek (in the decommissioned Operations and Clean Water Storages) to lower potential nutrient concentrations in drainage from the waste rock dump and open pit, if required.
- The Project rehabilitation and closure strategy, including water management, will be reviewed throughout the operational life of the Project to determine the feasibility of the strategy.

If the Project design and management measures outlined above are effectively implemented the potential residual impacts associated with nutrients and pathogens are expected to be low.

4.3.6 Hazardous Materials

Hazardous materials management, including hydrocarbons and water treatment reagents (ie. potable and wastewater), is required to ensure compliance of off-site discharge water quality to applicable water quality standards.

The following hazardous materials management measures will be implemented during the construction, operations and post-closure phases of the proposed Project:

- All hazardous waste materials will be removed from the Project site and transported to a hazardous waste management facility.
- The storage of any hazardous reagents / chemicals will be in accordance with the relevant Material Safety Data Sheet in purpose-built bunded or special confinement areas. Chemical spills will need to be managed in accordance with the relevant Material Safety Data Sheets.
- Containers of liquid hazardous materials such as fuels, oils and lubricants will be located in bunded areas during site construction works. Bunds will be designed and installed in accordance with appropriate guidelines / standards and have sufficient capacity to hold at least 110 % of the maximum volume stored. Temporary shelters will be constructed, to prevent collection of rainfall within the bunded areas.
- The management of the refuelling and maintenance of heavy machinery should include:
    - Regular maintenance of vehicles and equipment to prevent hydrocarbon leaks.
    - Vehicle and equipment maintenance and refuelling should be conducted in designated areas where contaminated runoff can be contained.
    - Install oil/grease traps or alternative treatment systems to facilitate hydrocarbon removal from water from vehicle washdown areas and refuelling areas via filtration and/or absorption (eg. small-scale activated carbon units).
- Vehicles and equipment should be parked on sealed surfaces where contaminated runoff can be contained.

o The management of spills or leaks of liquid hazardous materials should include:

o Stockpiles of loose absorbent material, such as saw dust, should be stored on-site at all times during construction.

o As a precaution, hydrocarbon spill response kits (eg. Sorbex) and absorbent floating booms should also be stored on site in case of spills that occur outside bunded areas.

o An Environmental Emergency Response Plan should be developed prior to commencing Project construction to ensure that the appropriate procedures for the management of hydrocarbon spills are implemented.

- Containers of liquid hazardous materials such as fuels, oils and lubricants need to be located in bunded areas during site construction works. Bunds should be designed and installed in accordance with appropriate guidelines / standards and have sufficient capacity to hold at least 110 % of the maximum volume stored. Temporary shelters should also be constructed, to prevent collection of rainfall within the bunded areas.

- Monitoring of Project and downstream water quality during construction, operations and post-closure (until completion criteria are achieved) to ensure that downstream environmental objectives are achieved.

If the management measures outlined above are implemented during construction, operations and at decommissioning the residual impacts associated with hazardous materials are expected to be very low.

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Annex A
Conceptual Project Water Balance

EARTH SYSTEMS
Environment | Water | Sustainability

Australian Business Number 42 120 062 544

CONCEPTUAL PROJECT WATER BALANCE
NOWA NOWA IRON PROJECT, VICTORIA, AUSTRALIA

prepared for

Eastern Iron Limited

October, 2013

INTRODUCTION

Eastern Iron Limited ('Eastern Iron'), through its wholly owned subsidiary Gippsland Iron Pty Ltd, proposes to develop the Nowa Nowa Iron Project ('the Project'). The Project is a greenfield development of a high grade magnetite/hematite deposit generally referred to as '5 Mile'. It is located approximately 7 km north of the township of Nowa Nowa, which is situated on the Princes Highway between Bairnsdale and Orbost in East Gippsland, Victoria. Earth Systems were engaged by Eastern Iron Limited to develop a water management strategy for their Nowa Nowa Iron Project.

A water management strategy has been designed to minimise potential Project impacts to downstream hydrology, local hydrogeology and surface water and groundwater quality during construction, operations and post-closure (refer to *EES Referral Attachment 5 - Surface and Ground Water Baseline and Assessment*). Schematics of water flows for the Project during operations and post-closure are provided in Figure 1 and Figure 2. The purpose of this report is to develop a conceptual water balance for the Project during operations and post-closure in order to demonstrate the feasibility of the proposed water management strategy including the following water management objectives:

- Operations:
  - Provision of sufficient water for the Project during the operations phase.
  - Requirements for storage of water in the open pit in order to achieve no discharge of Operations Water Storage (OPS) water.
  - Water release from the Sediment Control Dam (SCD) and Clean Water Storage (CWS) to provide for downstream environmental flows during the operations phase.
- Post-Closure
  - Allowance for the open pit to fill with water post-closure to provide a permanent cover over backfilled potentially sulfidic geological material (eg. waste rock and low grade ore) (refer to *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit*).

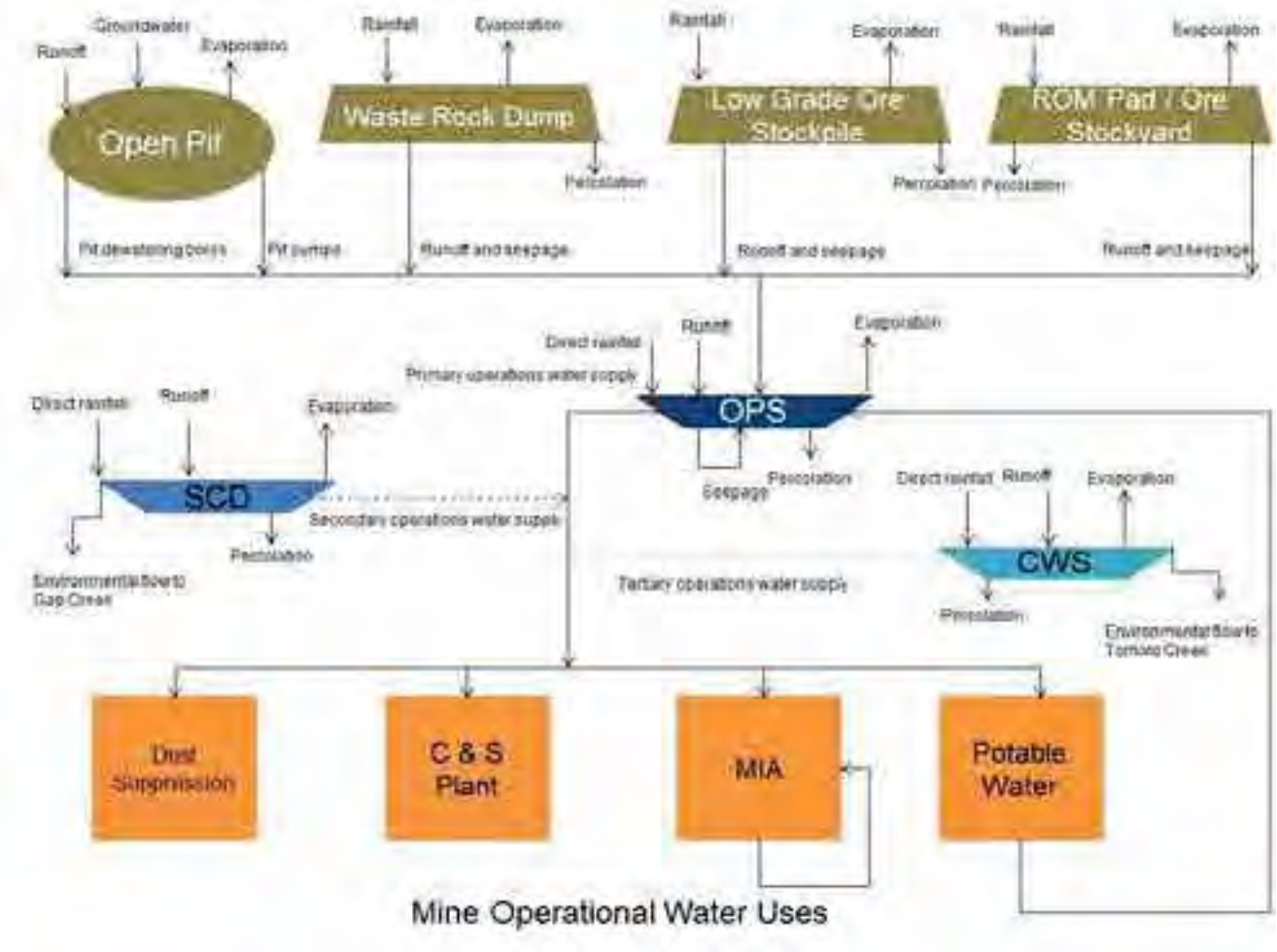

Figure 1: Schematic of operations phase Project water flows. Drainage from the open pit, waste rock dump, low grade ore stockpile and ROM pad will need to report to the Operations Water Storage (OPS). Water from the OPS will be the primary water supply for Project operations including dust suppression, crushing and screening plant (C & S Plant), mine industrial area (MIA) and potable water. The Sediment Control Dam (SCD) and Clean Water Storage (CWS) provide the secondary and tertiary water supplies for the Project.

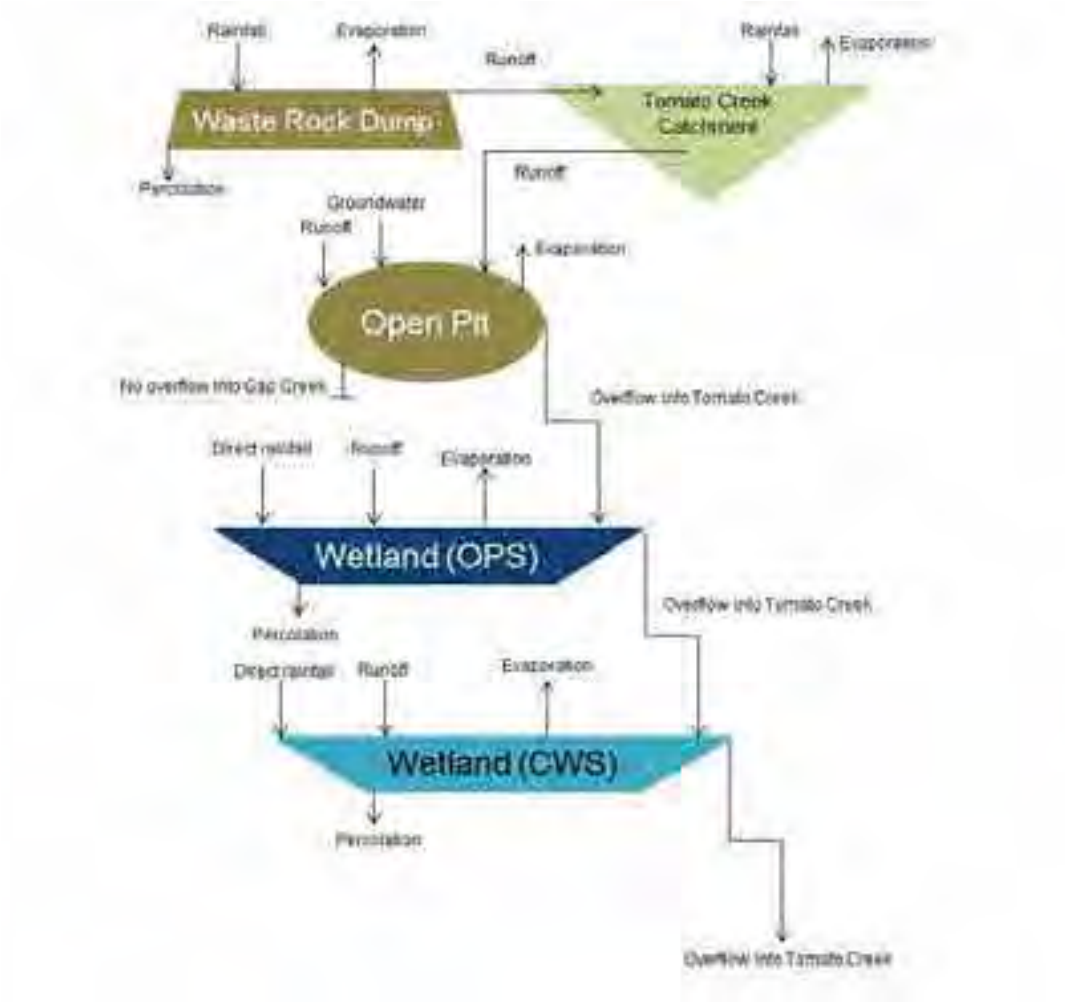

Figure 2: Schematic of post-closure Project water flows. Drainage from the waste rock dump will collect in the open pit. The open pit will overflow to Tomato Creek via engineered wetland systems in the decommissioned Operations Water Storage (OPS) and Clean Water Storage (CWS).

METHOD

Conceptual water balances were developed for the proposed Project during operations and the open pit post-closure. A number of key assumptions were used in the development of the water balance including:

- Source Catchments software (eWater CRC) was used to model flows for the various Project area sub-catchments. Key assumptions used in the modelling of flows using Source Catchments software include:
  - Daily BoM long term rainfall data at Nowa Nowa (Station number: 084028) between 1949 and 2012 and mean daily evaporation data at Orbost (Station No.: 084030) between 1994 and 2011.
  - Default input parameters values were used and adjusted for representative values for south-eastern Australia (Boughton, 2009) including:
    - Baseflow index (BFI): 0.32-0.33.
    - Baseflow recession constant (K_{base}): 0.966-0.980.
    - Surface runoff recession constant (K_{surf}): 0.35.
    - Surface storage values (C-values) were adjusted to match the flow estimates from AECOM's RORB model.
  - Uniform properties run-off and storage properties over the entire catchment areas.
  - That the rainfall and evaporation input data are representative of the catchments.
- Meteorological input data included:
  - Daily Bureau of Meteorology (BoM) long term rainfall data at Nowa Nowa (Station number: 084028) between 1949 and 2012. Note: Rainfall from the Nowa Nowa BoM site was used in place of the Mt Nowa Nowa (which is closer to the Project site) BoM site (Station No.: 084144), as long term rainfall data was only available from the Nowa Nowa BoM site. Rainfall at the two sites is compared in *EES Referral Attachment 5 - Surface and Ground Water Baseline and Assessment*.
  - Mean daily pan evaporation data at Orbost (Station No.: 084030) between 1994 and 2011.
  - A coefficient of 0.7, commonly applied for converting pan evaporation to free water evaporation (NOAA, 1982), was applied to the pan evaporation data for evaporation rates from the water storages and open pit.
- Development of a 'Wet Scenario', which uses the full 64 year rainfall data set from the Nowa Nowa BoM station, and a 'Dry Scenario', which uses the last 20 years of rainfall data from the Nowa Nowa BoM station (refer to *EES Referral Attachment 5 - Surface and Ground Water Baseline and Assessment* for assessment of historic rainfall data at Nowa Nowa).
- An effective runoff coefficient of 0.5 for rainfall falling over the open pit area as an estimate based on previous Project experience.
- An estimated groundwater dewatering rate of 2.5 L/s for the open pit (via pit dewatering bores and / or pit sumps).

- An operational Project water use of 0.45 ML / day (Engenium, 2013). Project water use is abstracted first from the Operations Water Storage, then the Sediment Control Dam and finally from the Clean Water Storage.
- Water storages will need to be engineered / constructed to minimise permeability through the foundations of the water storage. It has been assumed the water storages will be constructed with a hydraulic conductivity of approximately $1x10^{-6}$ cm/s through the water storage foundations, within the range of hydraulic conductivities for clay material (Fetter, 2001).
- An estimated pit lake surface area of ~21 ha post-closure.
- Post-closure, a range of groundwater inflow rates to the open pit have been considered. For simplicity, the groundwater inflow rates have been assumed to be constant irrespective of the level of pit lake development. Groundwater inflow is assumed to stop once the pre-mining groundwater level is reached. The groundwater inflow rates modelled include:
    - 1 L/s;
    - 2.5 L/s; and
    - 5 L/s.
- Approximately 1.5 Mm^3 of sulfidic waste rock and low grade ore, at a porosity of 40 vol. %, will be backfilled into the open pit post-closure (refer to *EES Referral Attachment 6 – Geochemical Assessment and Management Strategies for the 5 Mile Deposit*).
- Rainfall and evaporation input data are representative of the Project site.

Surface water flow rate estimates are for an ungauged catchment. Hydrology monitoring will be conducted within the catchment, prior to Project construction, in order to refine / validate the flow rate estimates.

The potential impact of climate change on pit lake development was also assessed using the CSIRO modelled projections for 2060 for the Tambo River basin, which the Project site falls within, including (DSE, 2011):

- Potential 'low impact' scenario:
    - 5 % increase in stream flow.
- Potential 'medium impact' scenario:
    - 20 % reduction in stream flow; and
    - ~7 % reduction in rainfall (ie. for direct rainfall over pit lake).
- Potential 'high impact' scenario:
    - 42 % reduction in stream flow; and
    - ~15 % reduction in rainfall (ie. for direct rainfall over pit lake).

The pit lake was assumed to start at the spill volume (ie. effective volume of 5,200 ML accounting for backfilled material) and the variation in pit lake volume was estimated over a 20 year period.

CONCEPTUAL PROJECT WATER BALANCE - OPERATIONS

Project Water Supply

Hydrological modelling suggests that pit runoff will be 50–150 ML/y, and runoff from the Tomato Creek and Gap Creek catchments (ie. waste rock dump and low grade ore stockpile) upstream of the pit will be 30–90 ML/y. The minimum annual volume of groundwater requiring extraction in order to allow mining to proceed and continue is estimated to be 30–150 ML/y. These estimates indicate that the bulk of operational demand (~164 ML/year) is expected to be met by surface water drainage from the affected catchments (ie. waste rock dump, open pit and low grade ore stockpile) and pit dewatering, to be stored in the Operations Water Storage.

Key results from the assessment of Project water supply during operations for the 'wet scenario' include (Figure 3):

- The three water storage facilities are likely to provide sufficient water for the proposed Project during operations, with no dry days modelled in the water storages after they commence filling with water.
- The water storages fill quickly (within 1 year) with a high annual rainfall (~1,300 mm/year) at the start of the data set.
- Alternative water supply (eg. increased rate of pit dewatering bore extraction) for the Project may be required in the initial stages directly after construction of the three water storages as the water storages to fill with water.

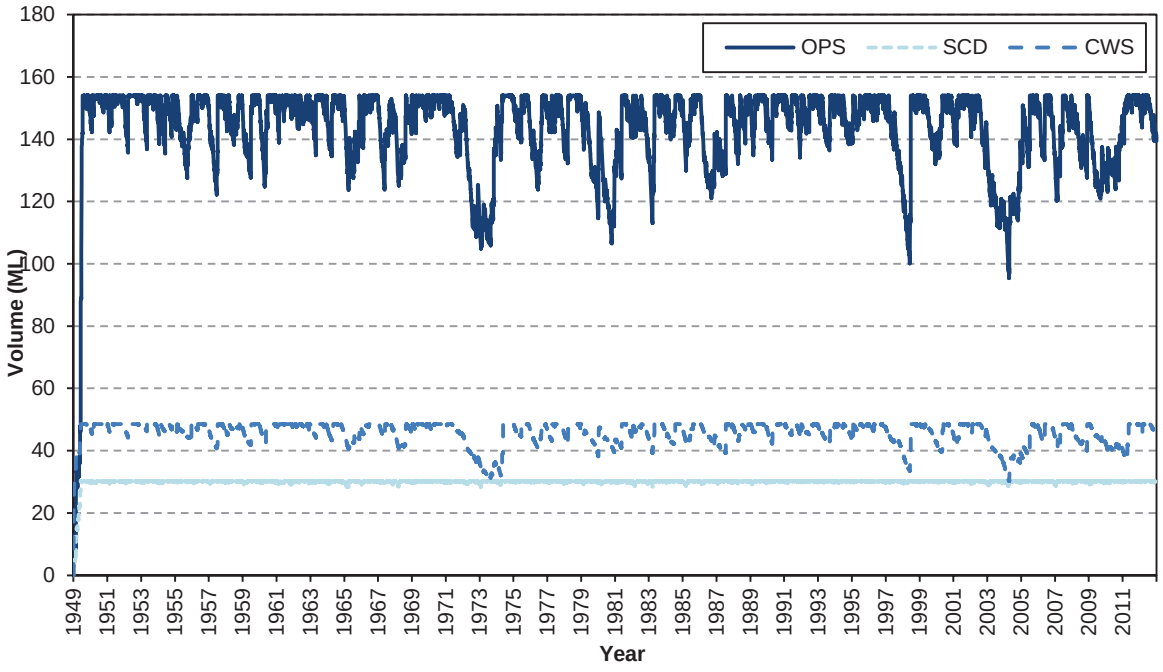

Figure 3: Estimated volume of water stored in the Operations Water Storage (OPS), Sediment Control Dam (SCD) and Clean Water Storage (CWS) under operating conditions for the 'wet scenario'.

Key results from the assessment of Project water supply during operations for the 'dry scenario' include (Figure 4):

- The three water storage facilities are likely to provide sufficient water for the proposed Project during operations, with no dry days modelled in the water storages after they commence filling with water.
- The water storages fill quickly (in approximately 1 year) with a lower annual rainfall (approximately 1,000 mm/year).
- Alternative water supply (eg. increased rate of pit dewatering bore extraction) for the Project may be required in the initial stages directly after construction of the three water storages as the water storages to fill with water.

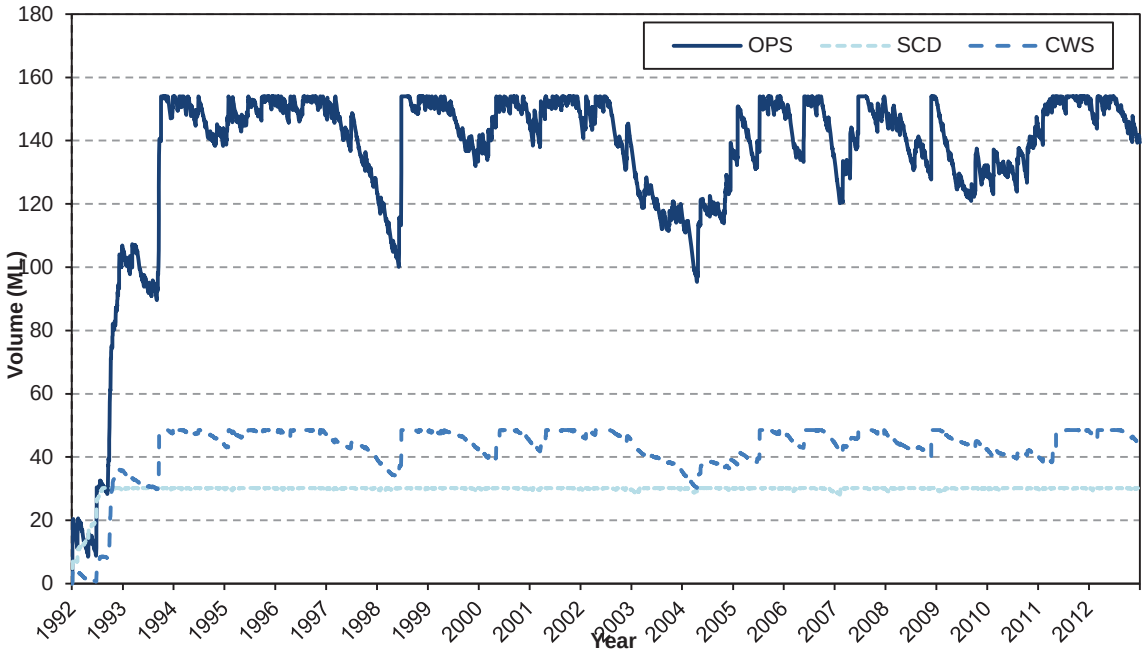

Figure 4: Estimated volume of water stored in the Operations Water Storage (OPS), Sediment Control Dam (SCD) and Clean Water Storage (CWS) under operating conditions for the 'dry scenario'.

Requirements for Water Storage in Open Pit

The management of Project water and the Operations Water Storage (OPS) is outlined in detail in *EES Referral Attachment 5 - Surface and Ground Water Baseline and Assessment*. Key aspects of Project water and the OPS during operations include:

- Project water will need to be managed such that there will be no discharge of water from the OPS during operations.
- During extreme storm events, excess drainage at the sumps upstream of the open pit (upper Tomato Creek and upper Gap creek) will, if necessary, be allowed to discharge into the open pit or be pumped into the open pit.

Key results from the assessment of potential requirements for storage of water in the open pit during operations to prevent discharge of water from the OPS include (Table 1, Figures 5 & 6):

- The volume of in the OPS may be managed by diverting groundwater from pit dewatering bores to the Sediment Control Dam, allowing for the release of the water as

environmental flows for downstream creeks (water quality permitting). This greatly reduces the potential requirement for storage of water in the open pit during operations (~5 % of modelled days 'wet scenario'; and <1 % of modelled days dry scenario).

- Alternatively, the volume of water in the OPS may be managed by increasing the Project water usage, if possible. Increasing the average Project water use to 0.6 ML/day (eg. increasing dust suppression) greatly reduces the potential requirement for storage of water in the open pit during operations (~5 % of modelled days 'wet scenario'; and <1 % of modelled days dry scenario).
- A combination of increased Project water use (0.6 ML/day) and diverting of groundwater from pit dewatering to the SCD for release as environmental flows greatly reduces the potential requirement for storage of water in the open pit during operations (~1 % of modelled days 'wet scenario'; and <1 % of modelled days dry scenario)

Table 1: Estimated percentage of days where storage of Project drainage may be required in the open pit in order to prevent discharge of water from the Operations Water Storage (OPS).

Condition	Percentage of days (wet scenario)	Percentage of days (dry scenario)
Groundwater from pit dewatering pumped to OPS	~10 %	~5 %
Groundwater from pit dewatering diverted to SCD for environmental flow release	~5 %	<1 %
Increased water usage to 0.6 ML/day	~5 %	<1 %
Combined increased water usage (0.6 ML/day) and groundwater diverted to SCD	~1 %	<1 %

Potential for Environmental Flows from Sediment Control Dam and Clean Water Storage

Key results from the assessment of potential environmental flow release from the Sediment Control Dam (SCD) and Clean Water Storage (CWS) during operations for the 'wet scenario' include (Figures 5 & 6):

- Environmental flows may be released, water quality permitting, on approximately 20 % of days from the SCD under operating conditions to supplement downstream flows in Gap and Harris Creeks.
- Environmental flows may be released, water quality permitting, on approximately 30 % of days from the CWS under operating conditions to supplement downstream flows in Gap and Harris Creeks.

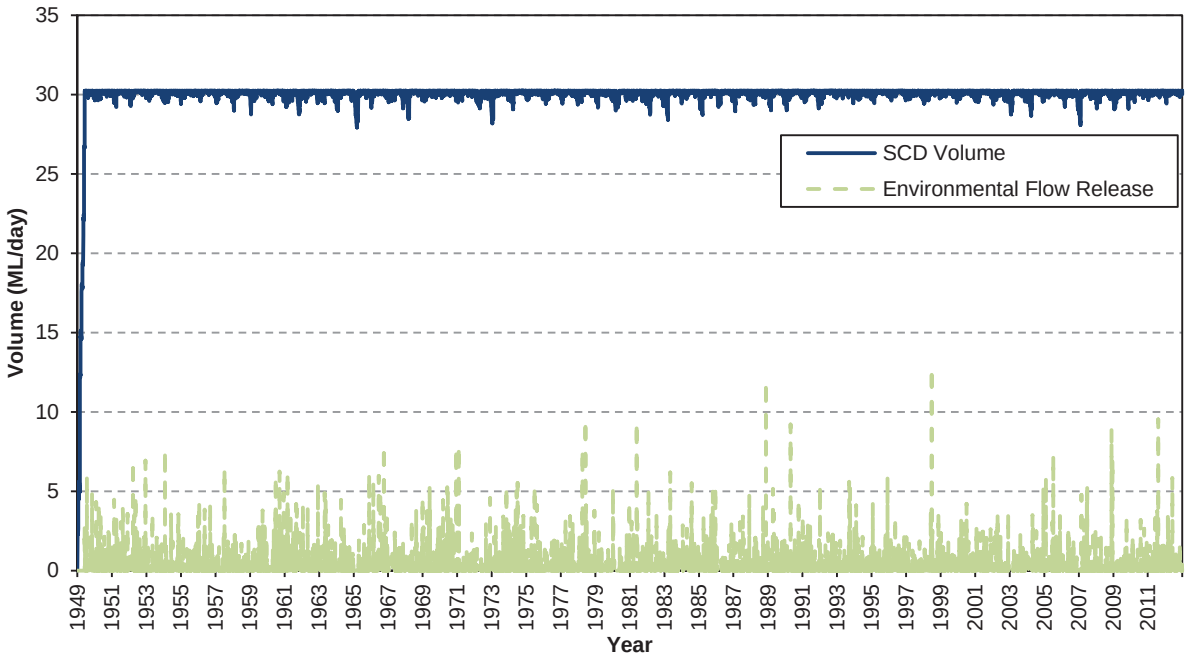

Figure 5: Sediment Control Dam (SCD) water volume and modelled environmental release volumes (ML/day) under operating conditions for the 'wet scenario'.

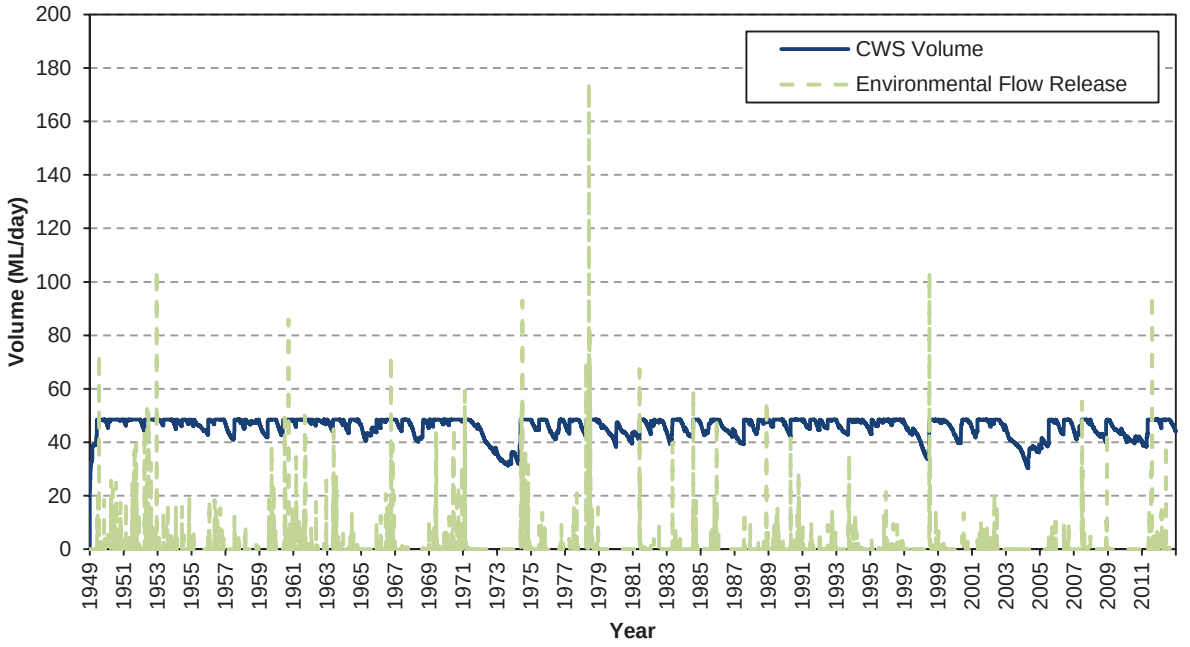

Figure 6: Clean Water Storage (CWS) water volume and modelled environmental release volumes (ML/day) under operating conditions for the 'wet scenario'.

Key results from the assessment of potential environmental flow release from the Sediment Control Dam (SCD) and Clean Water Storage (CWS) during operations for the 'dry scenario' include (Figures 7 & 8):

- Environmental flows may be released, water quality permitting, on approximately 20 % of days from the SCD under operating conditions to supplement downstream flows in Gap and Harris Creeks.
- Environmental flows may be released, water quality permitting, on approximately 20 % of days from the CWS under operating conditions to supplement downstream flows in Gap and Harris Creeks.

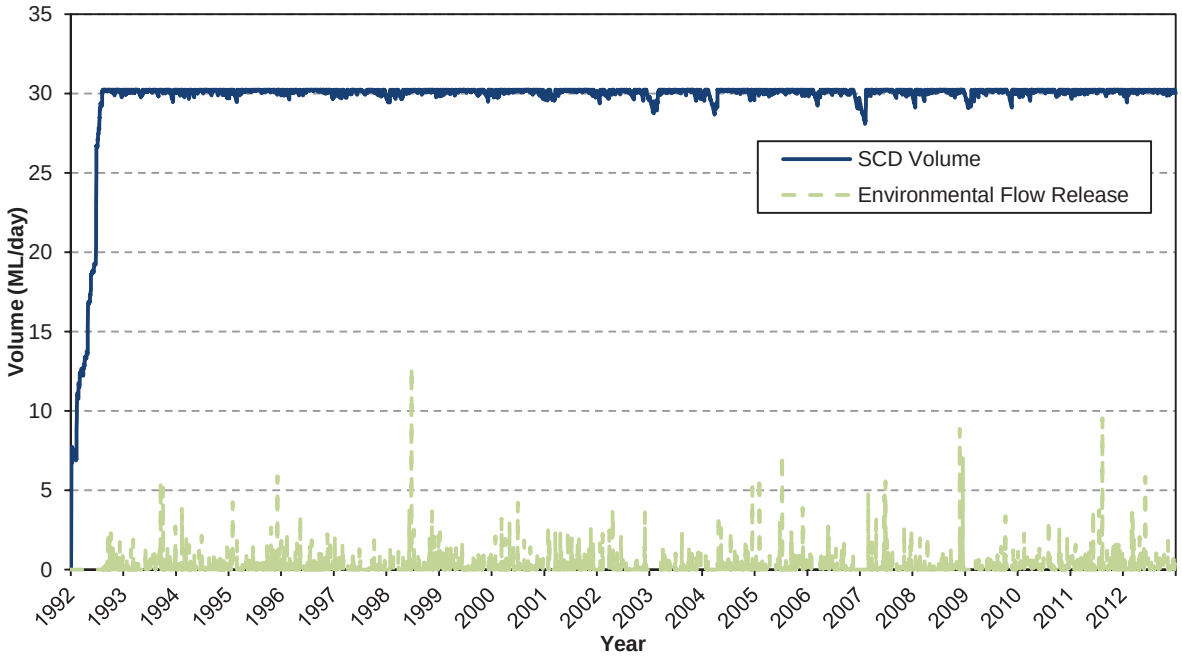

Figure 7: Sediment Control Dam (SCD) water volume and modelled environmental release volumes (ML/day) under operating conditions for the 'dry scenario'.

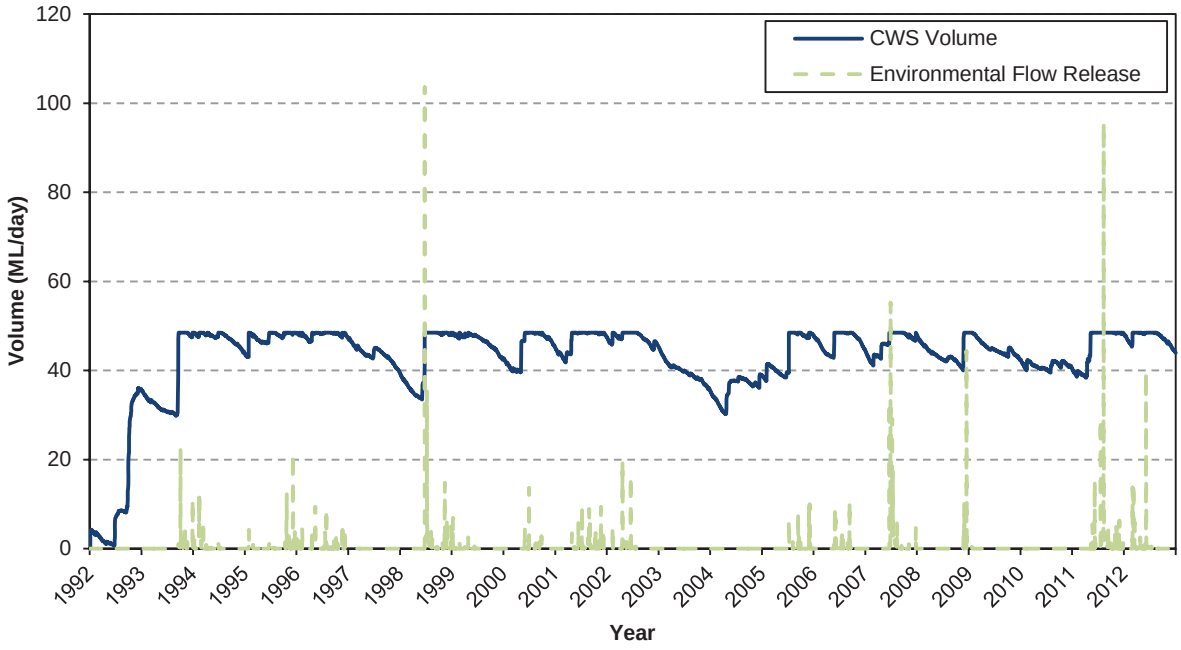

Figure 8: Clean Water Storage (CWS) water volume and modelled environmental release volumes (ML/day) under operating conditions for the 'dry scenario'.

CONCEPTUAL PROJECT WATER BALANCE – POST-CLOSURE

Post-closure, potentially sulfidic waste rock and low grade ore will be backfilled into the open pit. The key uncertainty, with regard to water management, is the length of time required to flood the potentially sulfidic waste rock and low grade ore material (if unsold at closure) and potentially exposed sulfidic pit wallrock.

Key results from the assessment of pit lake development, post-closure, under varying groundwater inflow rates for the 'dry scenario' include (Figure 9):

- Pit lake development, through rainfall and runoff alone, is estimated to provide a permanent water cover for the waste rock and low grade ore backfilled to the open pit, with an assumed volume of 1.5 Mm^3 and porosity of 40 vol. %, in approximately 16 years.
- Groundwater inflows into the open pit are expected to significantly increase the rate of pit lake development:
    - A groundwater inflow rate of 1 L/s would reduce the expected time to cover the volume of waste rock and low grade ore backfilled to the pit to approximately 7 years.
    - A groundwater inflow rate of 2.5 L/s would reduce the expected time to cover the volume of waste rock and low grade ore backfilled to the pit to approximately 5 years.
    - A groundwater inflow rate of 5 L/s would reduce the expected time to cover the volume of waste rock and low grade ore backfilled to the pit to approximately 3 years.
- Water from the three Project water storages is likely to be required to increase the rate of pit lake development in order to rapidly provide a permanent water cover (at least 2 m

depth) to prevent potential sulfide oxidation in the pit wallrock and backfilled waste rock and low grade ore.

- By pumping all flows reporting to the CWS and SCD (~130 ML/year) at closure, it is estimated that it may take between 2 and 4 years to provide a permanent water cover (at least 2 m depth) to prevent potential sulfide oxidation in the backfilled waste rock and low grade ore.
- Once the pit lake has reached the spill volume, under the CSIRO 'low impact' climate change model projections (ie. 5% increase in streamflow), the pit lake volume fluctuates between the spill volume (~5,200 ML) and approximately 5,100 ML over a 20 year period. This is equivalent to a fluctuation in water level of approximately 2.5 m.
- Once the pit lake has reached the spill volume, under the CSIRO 'medium impact' climate change model projections (ie. 20% reduction in streamflow; ~7% reduction in rainfall), the pit lake volume fluctuates between the spill volume (~5,200 ML) and approximately 5,100 ML over a 20 year period. This is equivalent to a fluctuation in water level of approximately 2.5 m.
- Once the pit lake has reached the spill volume, under the CSIRO 'high impact' climate change model projections (ie. 42% reduction in streamflow; ~15% reduction in rainfall), the pit lake volume fluctuates between the spill volume (~5,200 ML) and approximately 5,000 ML over a 20 year period. This is equivalent to a fluctuation in water level of approximately 5 m.

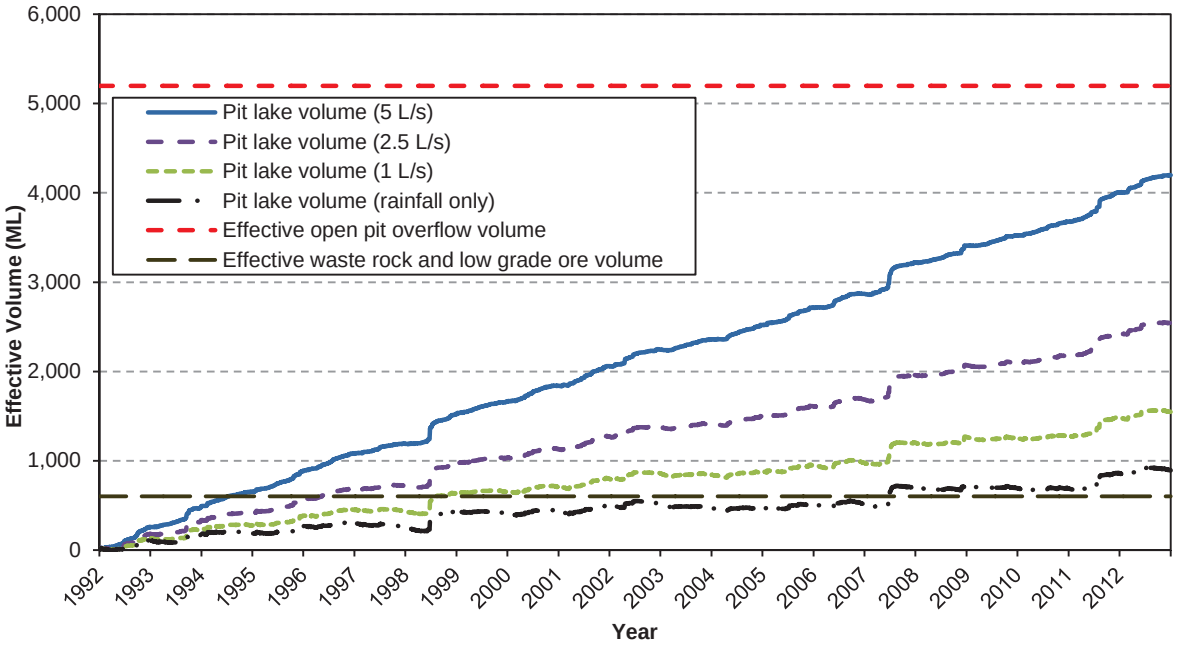

Figure 9: Pit lake development, post-closure, under the 'dry scenario' estimated at four different groundwater inflow scenarios (rainfall / runoff only, 1 L/s groundwater inflow, 2.5 L/s groundwater inflow, and 5 L/s groundwater inflow).

CONCLUSIONS

Key conclusions from the conceptual water balance include:

- Mine water supply is expected to be met by runoff from the waste rock dump, low grade ore and open pit catchments; pit groundwater dewatering and the three water storages.
- The Operations Water Storage (SCD) will need to be managed during operations to prevent discharge. Feasible management strategies for preventing discharge from the OPS during operations while minimising potential disruption to operations (ie. through storage of water in the pit during operations) include:
    - Blending of groundwater from pit dewatering bores with CWS water for provision of downstream environmental flows (if water quality permits).
    - Increasing Project water usage, if possible.
- Potential for frequent release of environmental flows, water quality permitting, from the Sediment Control Dam (SCD) and Clean Water Storage (CWS) during operations.
- Pit lake development (to provide a water cover for backfilled waste rock and low grade ore) is estimated to take between 3 and 16 years depending on groundwater inflow rates. Pumping of water from the three water storages to the open pit is likely to be required to rapidly provide a permanent water cover (minimum of 2 m depth) over the potentially sulfidic pit wallrock and backfilled waste rock and low grade ore (if unsold).
- Under the CSIRO 'low impact' climate change projections for 2060 (Tambo River Basin; 5% increase in stream flow) (DSE, 2011), the pit lake level, assumed to start at spill level, is expected to fluctuate between spill level and approximately 2.5 m below spill level. Overflow from the pit to Tomato creek would be expected to occur under this scenario.
- Under the CSIRO 'medium impact' climate change projections for 2060 (Tambo River Basin; 20% reduction in stream flow and ~7% reduction in rainfall) (DSE, 2011), the pit lake level, assumed to start at spill level, is expected to fluctuate between spill level and approximately 2.5 m below spill level. Overflow from the pit to Tomato creek would be expected to occur under this scenario.
- Under the CSIRO 'high impact' climate change projections for 2060 (Tambo River Basin; 42% reduction in stream flow and ~15% reduction in rainfall) (DSE, 2011), the pit lake level, assumed to start at spill level, is expected to fluctuate between spill level and approximately 5 m below spill level. Overflow from the pit to Tomato creek would be expected to occur under this scenario.

MANAGEMENT REQUIREMENTS

Key management requirements include:

- Conduct hydrology monitoring within the Project site to refine / validate the estimates provided in the conceptual water balance.
- Continue to conduct hydrogeology monitoring (including groundwater levels, quality and pumping tests) within the proposed pit area to refine / validate the estimates provided in the conceptual water balance.

- Update and refine the water balance throughout the feasibility, construction, and operations phases of the Project to review the feasibility of the proposed water management strategies during operations and post-closure.

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Annex B
AECOM Nowa Nowa Surface Water Report

Eastern Iron
15-Oct-2013

Nowa Nowa Surface Water Study

Nowa Nowa Surface Water Study

Client: Eastern Iron

ABN: N/A

Prepared by

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15-Oct-2013

Job No.: 60298430

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Quality Information

Document Nowa Nowa Surface Water Study

Ref 60298430

Date 15-Oct-2013

Prepared by Quan Lau

Reviewed by Peter Meyers

Revision History

Revision	Revision Date	Details	Authorised	
			Name/Position	Signature
A	15/10/2013	Final Report	Peter Meyers Associate Director	

Table of Contents

1.0 Introduction

1.1 Background

Eastern Iron engaged AECOM to conduct a surface water assessment for a proposed mining development located in East Gippsland, Victoria. Eastern Iron is investigating the potential for a magnetite processing operation based on magnetite deposits located at Nowa Nowa, in line with its strategy of reducing exploration risk by developing projects close to existing transport infrastructure. Based on current reserves, the mine will have an operational life of approximately 10 years, with the possibility of extension should further reserves be discovered.

1.2 Objectives

The surface water study has been undertaken to provide flood and stormwater input to inform future investigations and design. In particular the study will:

- Determine 100 year ARI flood levels, depths and velocities for waterways with the potential to impact the site.
- Comment on the impact of the proposed site works on existing flood characteristics.
- Identify sediment loads that will be associated with stormwater runoff due to mine activities.
- Investigate potential yields from surface water and identify locations where storages can be constructed.

1.3 Study Area

The Project is located 3 km north of the town of Nowa Nowa in East Gippsland, on Bruthen-Buchan Road. The extent of the study area is shown in Figure 1. Data from areas surrounding the study area has also been included where appropriate.

Figure 1 Study Area Location

1.4 Data Used

The following data was collected for the purposes of this study:

- Shuttle Radar Topography Mission (SRTM) topographic data
- Australian Hydrological Geospatial Fabric Rainfall data for location of watercourses
- Existing roads from the AECOM internal roads dataset
- Rainfall intensity-duration-frequency (IFD) data from the Bureau of Meteorology (BOM)
- LIDAR data obtained from Eastern Iron
- Proposed site infrastructure obtained from Eastern Iron

2.0 Hydrological Modelling

2.1 Purpose

The RORB software program was used to develop the hydrological model for the catchment area. The purpose of the hydrological model is to generate inflows to be input into the hydraulic model.

2.2 RORB Hydrological Model Setup

The RORB model scheme and general configuration were established using MiRORB and MapInfo using contour data obtained from the SRTM.

2.2.1 Catchment Information

The catchment extent has a total area of 7.9 km^2 and encloses the location of the proposed site infrastructure. This includes the entire area that will contribute flows to the relevant river system. For this assessment, the river system consists of four river reaches; one main branch and three subsidiary branches. The catchment outlet is located at the north-west boundary of the proposed site. The catchment is indicated in Figure 2.

2.2.2 Sub-Areas and Reach Alignments

The following process was used to further schematise the catchment into subareas, nodes and reaches using MiRORB.

- *Defining sub-areas:* Sub-areas were defined at the locations where flow values were required, based on the topography and location of watercourses.
- *Collecting flows at each sub-area:* Flows at each sub-area were collected using nodes placed at the centroid of each sub-area. Additional nodes were placed at sub-area boundaries where required.
- *Determining reaches:* Reaches were drawn to collect flows from nodes and rout it to the outlet at I1.

2.3 RORB Model Calibration

2.3.1 Calibration Approach

Calibration of the RORB hydrological model is an important part of the runoff estimation process to provide a reliable level of confidence in the results. In the absence of historical flood data, the RORB model was calibrated using the Rational Method for runoff calculation, using the method set out in the *Australian Rainfall and Runoff* (AR&R) guidelines.

An iterative process was used to determine the appropriate kc value. This was done by adjusting the kc value until the flows output by RORB matched the flows determined using the Rational Method, with an acceptably small margin of error.

2.3.2 Rational Method Calculations

Three calibration points (C1, M1 and I1) were selected and the 100 year peak flows were calculated for each of these points.

IFD factors were generated from the Bureau of Meteorology (BOM) tool and these were used to obtain the average rainfall intensities. These are shown in Table 1.

Table 1 IFD Factors obtained from BOM

	Intensity (mm/hr)						
DURATION (min)	1 Year	2 years	5 years	10 years	20 years	50 years	100 years
5	49.4	65.9	91.1	108	130	162	188
6	46.5	62	85.4	101	122	152	177
10	38.1	50.6	69	81.4	97.7	121	140
20	27.4	36.1	48.5	56.7	67.5	82.7	95
30	22.2	29.2	38.8	45.1	53.5	65.2	74.7
60	15.4	20.1	26.4	30.4	35.8	43.2	49.2
120	10.9	14.1	18.2	20.7	24.2	28.9	32.7
180	9.02	11.6	14.8	16.7	19.4	23	25.9
360	6.55	8.38	10.4	11.6	13.4	15.7	17.5
720	4.61	5.88	7.24	8.05	9.2	10.7	11.9
1440	3.03	3.88	4.83	5.41	6.21	7.3	8.15
2880	1.85	2.4	3.07	3.49	4.07	4.86	5.49
4320	1.39	1.81	2.34	2.68	3.14	3.77	4.27

As the catchment area is undeveloped, the Fraction Impervious (FI) values for all sub-areas were assumed to be 0. The runoff coefficient (C_y) was calculated according to AR&R and was found to be 0.223.

Table 2 shows the results of the Rational Method calculations and the resultant peak flows at each calibration point.

Table 2 Rational Method Results

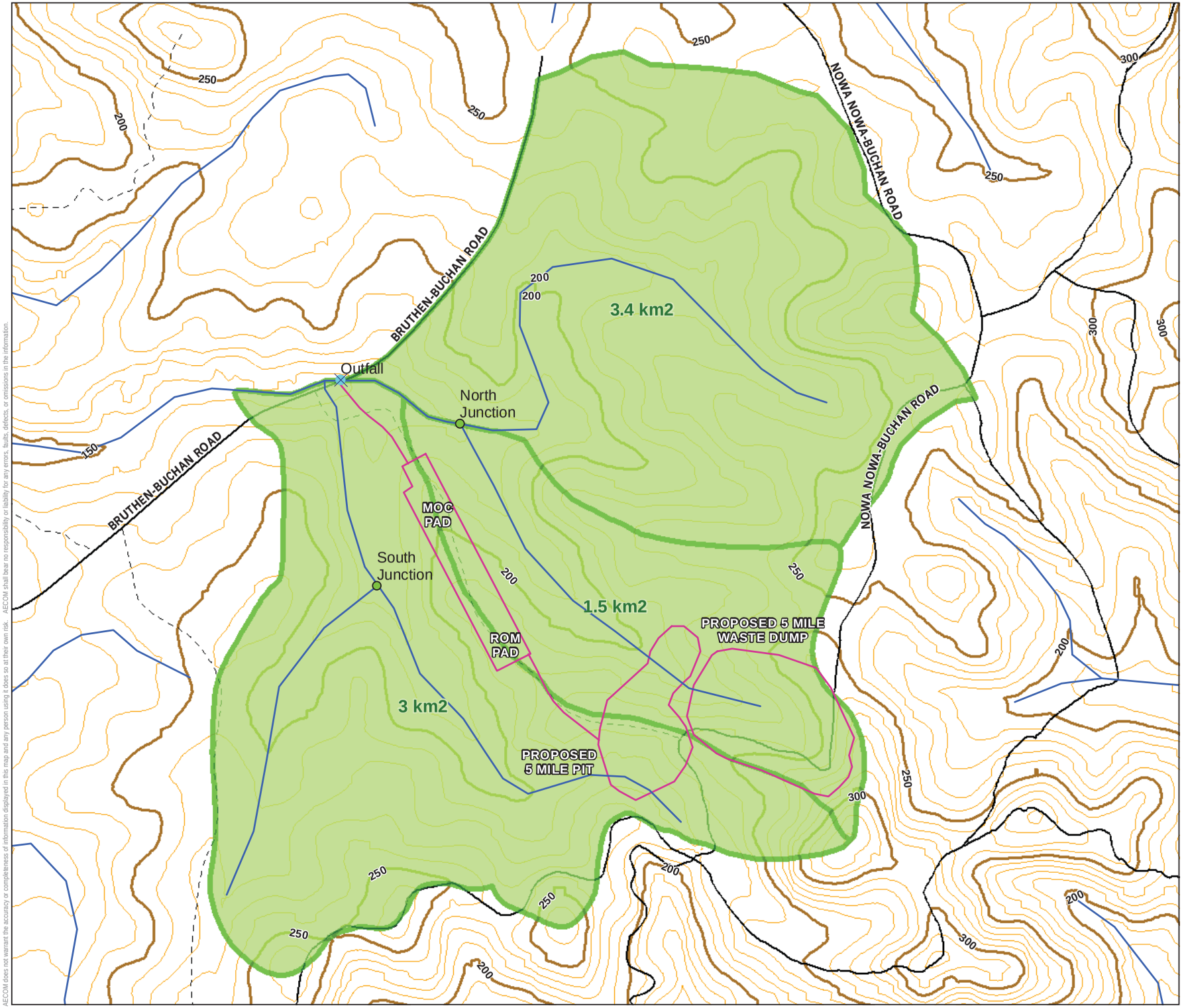
Calibration Point	Area (km^2)	Fraction Impervious	t_c (min)	C_{10}	C_y	${}^{tc}I_Y$ (mm/hr)	Peak Flow (m^3/s)
C1	3.17	0.0	70.66	0.172	0.223	46.18	9.08
M1	2.46	0.0	64.23	0.172	0.223	48.10	7.36
I1	8.55	0.0	103.08	0.172	0.223	37.38	19.85

2.3.3 RORB Calibration Results

For the purposes of the calibration process, the RORB model was run using the following parameters:

- Initial loss = 10.00 mm
- Runoff coefficient = 0.6
- IFD factors as determined by BOM for the Nowa Nowa site

Table 3 shows the results of the RORB calibration process. Using an iterative process, the value of kc was adjusted until the RORB flows at nodes C1, M1 and I1 matched the flows determined using the Rational Method. A value of 7.1 was chosen for kc.



EASTERN IRON
SURFACE WATER
Catchment Boundaries

Figure 02

LEGEND

- Site Infrastructure (approx)
- Catchments
- Watercourses
- ROAD
- TRACK
- Major Contour (50m)
- Minor Contour (10m)

0 100 200 400
Metres

1:15,000 (when printed at A3)

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Data sources:
Aerial Flown 12/04/2013

Table 3 RORB Calibration Log

kc	C1		M1		I1		Total Error
	Q_{max}	% Error	Q_{max}	% Error	Q_{max}	% Error	
6	10.1	11%	8.2	12%	24.1	21%	44.3%
7	9.1	0%	7.5	1%	21.9	11%	12.1%
7.1	**9.0**	**-1%**	**7.4**	**0%**	**21.7**	**10%**	**10.6%**
7.5	8.8	-3%	7.1	-4%	21.0	6%	12.8%
8	8.5	-7%	6.8	-7%	20.2	2%	15.5%

2.4 RORB Model Parameters

Table 4 shows the final parameters adopted in the RORB model.

Table 4 Parameters adopted for use in RORB Model

Parameter	Value
Kc	7.10
Initial loss	10.00
m	0.80
Runoff coefficient	0.6

The model was run to generate inflow hydrographs for each of the sub-areas; these inflows were then used as input into the hydraulic model. The scenarios modelled included the following ARIs, for the full range of storm durations of 10 minutes to 72 hours:

- 20 year
- 50 year
- 100 year

2.5 Design Flow Rates

The adopted peak flow rates used in the hydraulic modelling are summarised in Table 5

Table 5 Peak flow rates

Location	Peak Flow Rate (m^3/s)			Storm Duration
	100 year ARI	50 year ARI	20 year ARI	Hours
Outfall	22.4755	15.3572	11.1651	12
Northern Junction	13.3	9.2733	6.806	12
Southern Junction	7.1495	5.1764	3.7531	9

3.0 Hydraulic Modelling

3.1 Purpose

A hydraulic model was developed to determine the water surface elevation along the river reaches, including the depth and width of the flow. This was done using the software packages 12D and HEC-RAS.

3.2 12D Model

12D was used to build a terrain model and generate river cross-sections for input into HEC-RAS. The LIDAR data was imported into 12D and used to create a triangulated irregular network (TIN) to represent the river channels and floodplains.

Cross-sections were drawn perpendicular to the river reaches at intervals of approximately 100 m. These cross-sections were then imported into HEC-RAS for hydraulic analysis.

3.3 HEC-RAS

A one-dimensional steady flow HEC-RAS model was used to perform flow computations for 20, 50 and 100-year ARIs.

3.3.1 Model Parameters

Following a visual inspection of the site, the Manning's n values in Table 6 were adopted for the model. These values were applied across the whole model for all reaches.

Table 6 Manning's n values adopted for HEC-RAS Model

Location	Description	Manning's n value
Main channel	Dense vegetation	0.08
Left and right flood banks	Dense vegetation	0.08

3.3.2 Flows and Boundary Conditions

Flow values obtained from the 100-year ARI RORB model were input into HEC-RAS at several locations, as shown in Table 7.

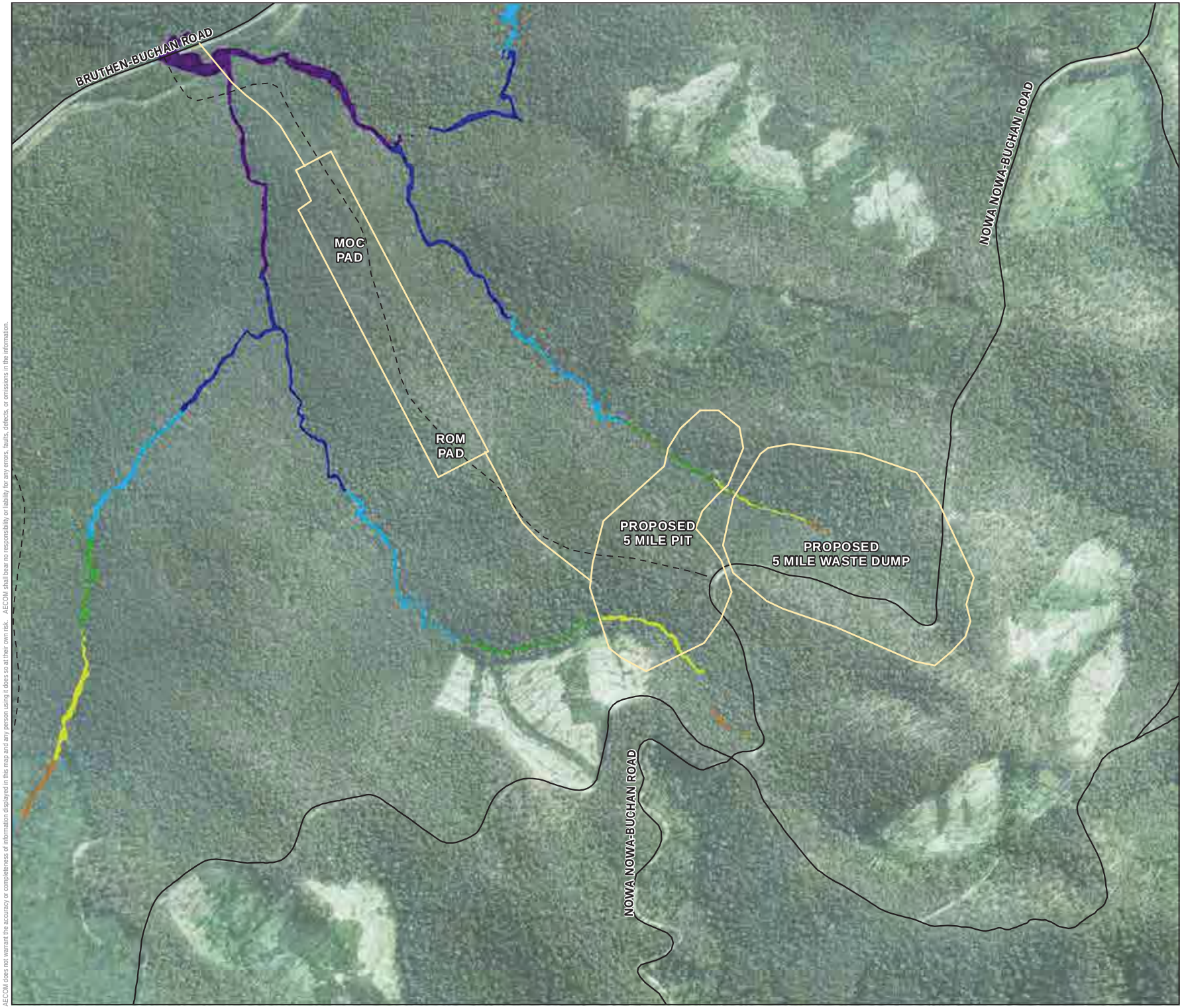
Table 7 Flow data used in HEC-RAS Model

Reach	Chainage	Flow (m^3/s)
1983	1983.09	11.165
250	667.82	6.806
2257	2857.46	3.7531

The boundary condition used was a downstream water level of 153 m AHD at the catchment outlet at Bruthen-Buchan Road.

3.4 Hydraulic Model Results

The results from the HEC-RAS model were imported into GIS to generate flood maps. Figures 2, 3 and 4 indicate the 100 year ARI flood level, depth and velocity respectively.



EASTERN IRON
SURFACE WATER
100 year ARI Flood Levels

Figure 03

LEGEND

Site Infrastructure (approx)

Road Type

ROAD

TRACK

Water Surface Elevations (m AHD)

- 150.8 - 160.0
- 160.1 - 170.0
- 170.1 - 180.0
- 180.1 - 190.0
- 190.1 - 200.0
- 200.1 - 210.0
- 210.1 - 215.0

0 100 200 400

Metres

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Data sources:
Aerial Flown 12/04/2013

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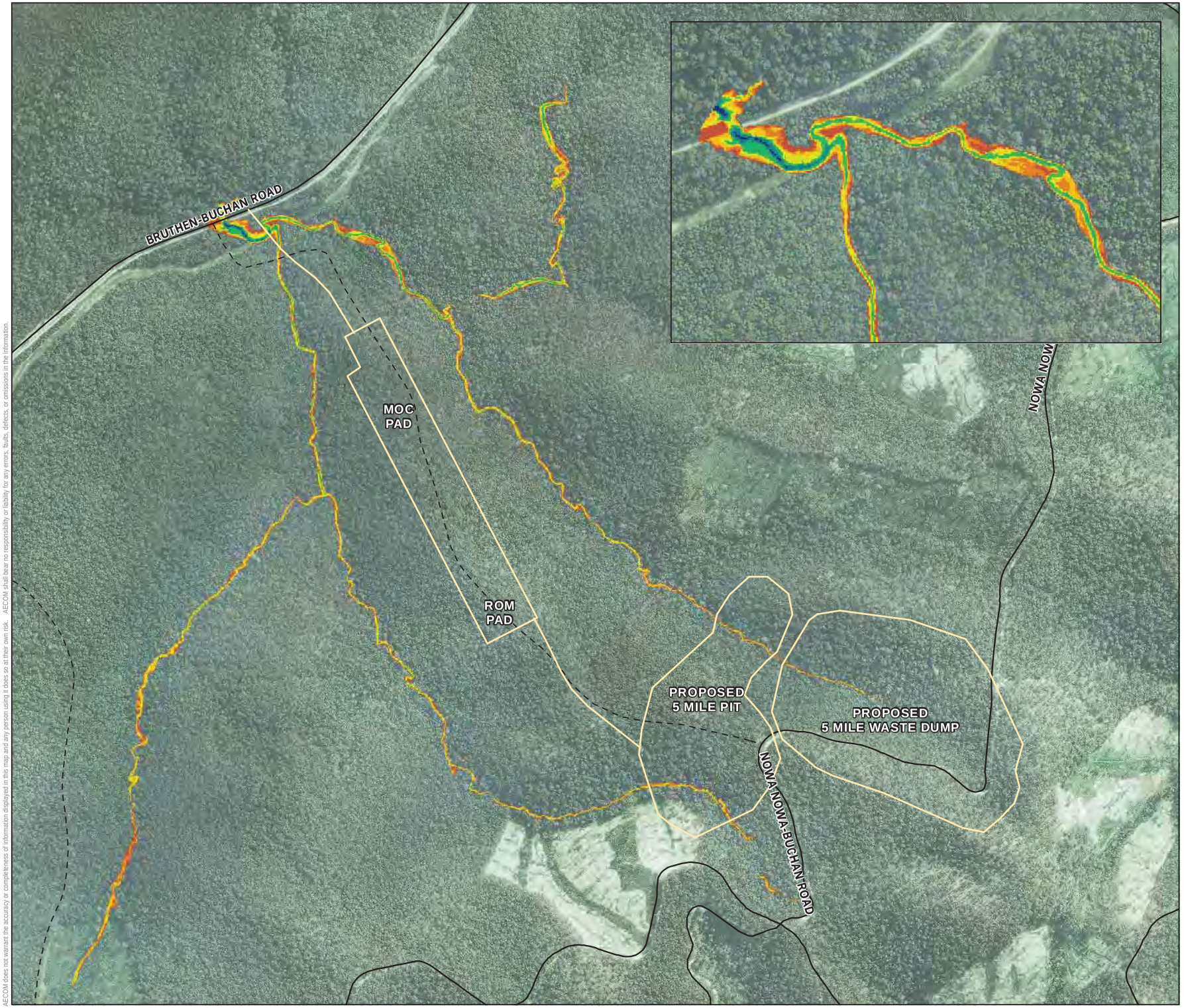

EASTERN IRON
SURFACE WATER
100 year ARI Flood Depths
Figure 04

LEGEND

Site Infrastructure (approx)

Road Type

ROAD

TRACK

Water Depths (m)

- 0 - 0.25
- 0.26 - 0.50
- 0.51 - 1.00
- 1.01 - 1.50
- 1.51 - 2.00
- 2.01 - 3.00
- 3.01 - 4.00
- 4.01 - 5.00

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Metres

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Data sources:
Aerial Flown 12/04/2013

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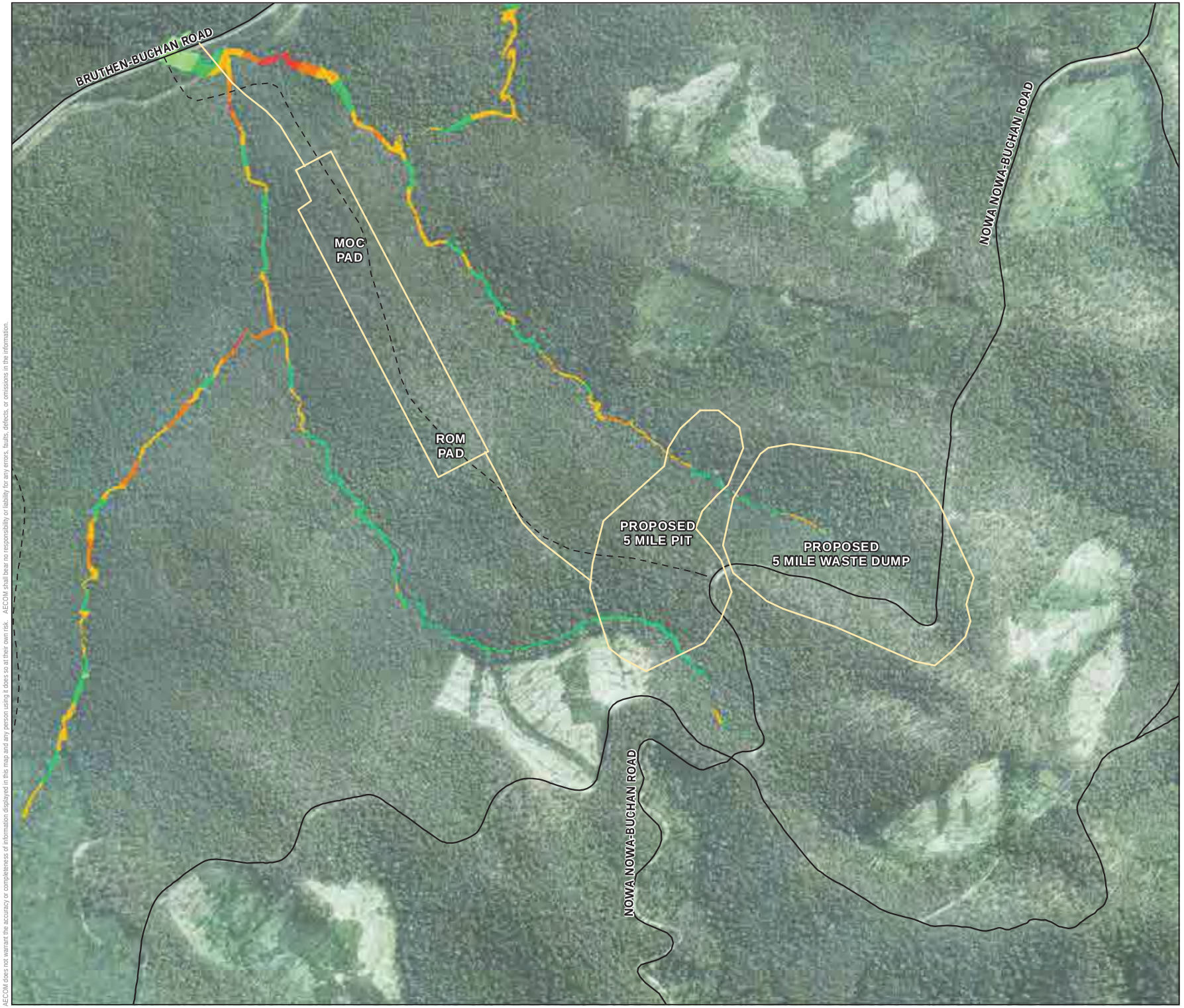

EASTERN IRON
SURFACE WATER
100 year ARI Flow Velocities
Figure 05

LEGEND

Site Infrastructure (approx)

Road Type

ROAD

TRACK

Velocity (m/s)

0.23 - 0.50

0.51 - 1.00

1.01 - 1.50

1.51 - 2.00

2.01 - 2.60

0 100 200 400

Metres

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Data sources:
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4.0 Mitigation and Impacts

4.1 Flood protection works

While much of the mine site is not flood prone, stormwater will need to be managed at 5 mile pit and the waste dump to prevent flooding. The access haul road will also need to be designed to ensure the mine can continue to operate during large rainfall events.

4.1.1 5 mile pit

5 mile pit sits across two valleys which will convey water during rain events. To prevent runoff from the upstream catchment discharging into the pit, it will be preferable to divert flows around the excavated area, however due to the steep topography, any diversion channels are likely to require deep excavation, particularly through the ridge to the north. This can be managed by staging the excavation of the mine to start at the top of the hills and maintain the existing waterways in the valley until mining has reduced the size of the ridges. At this time, shallower diversion channels can be constructed when the waterway is mined through.

If water cannot be diverted around the mine pit, an alternative is to construct a water storage upstream of the pit to capture runoff during storm events and then pump the water around the pit over an extended period.

4.1.2 Waste dump

As the waste dump is proposed to be constructed near the top of the catchment, runoff flows will be small and easier to manage. Local diversion channels can be constructed to divert runoff around the waste dump and discharge to down the valley.

4.1.3 Access haul road

The flood mapping indicates that the proposed haul road alignment will cross the main waterway near Bruthen-Buchan Road. Realigning the road to the west towards the existing access track will mean the haul road only needs to cross a smaller tributary. This will reduce the size of culverts required under the road to convey the flows. Alternatively the haul road could be shifted further to the east to enable a single waterway crossing upstream of the two main creeks.

4.2 Sediment

Runoff from haul roads and ROM pads will contain sediment which if not managed will deposit in nearby water courses.

Guidelines for “Sediment Control on Unsealed Roads”, prepared by Clearwater, indicates that runoff from unsealed roads can reach levels in excess of 600mg/l. MUSIC modelling has been used to determine potential sediment loads transported by stormwater runoff. MUSIC was developed by the CRC for Catchment Hydrology simulate stormwater runoff volumes and associated pollutant loads. The modelling indicates that approximately 8 tons of sediment could be transported in stormwater runoff each year from disturbed areas. This assumes 4 km of 20m wide haul roads and 1ha of cleared land associated with the ROM pad.

Sediment basins can be used to effectively remove sediment from stormwater prior to discharging to existing waterways. Sediment basins should be constructed to capture runoff from the haul road and ROM. Suggested locations for sediment basins are indicated in Figure 5. Due to the likely presence of fine silts and clays, a sediment basin with permanent water is likely to be the most effective. This will required the construction of an excavated volume able to store the 10 year ARI 2 hour runoff volume. An overflow weir discharging the downstream waterways will need to be sized to discharge flows from the basin.

4.3 Management of disturbed areas

Sediment loads can be minimised and managed by incorporating the following principles into the design of the mine:

- Minimise disturbed areas
- Keep clean water runoff from the catchment separate from sediment effected runoff
- Prevent clean water runoff from flowing onto disturbed areas
- Provide sediment basins to remove sediment prior to discharging to natural waterways

4.4 Impacts on downstream waterways

4.4.1 Flood levels

Due to the steep topography and the location of the mine within the catchment, proposed works such as haul roads pits and mine infrastructure will have no impact on water levels external to the site. Culverts over the waterway immediately before the Bruthen-Buchan Road may result in increased water levels, however these will be contained within the site.

4.4.2 Surface Water Capture

Capturing of catchment stormwater runoff for use within the site will result in altered flow characteristics in downstream waterways.

Volumes

Capturing surface water will reduce the overall volume of stormwater in downstream waterways which may impact existing water users. Consultation and discussions with water authorities should be undertaken if surface water capture is to be considered further.

Environmental flows

Removing water from the catchment will alter the frequency and flow patterns which may impact waterway health and reduce aquatic habitat. The potential water storage could be designed to allow for environmental flows to be maintained so the flow patterns downstream of the site continue to represent existing low flow events.

5.0 Catchment Yield

5.1 Runoff Volumes

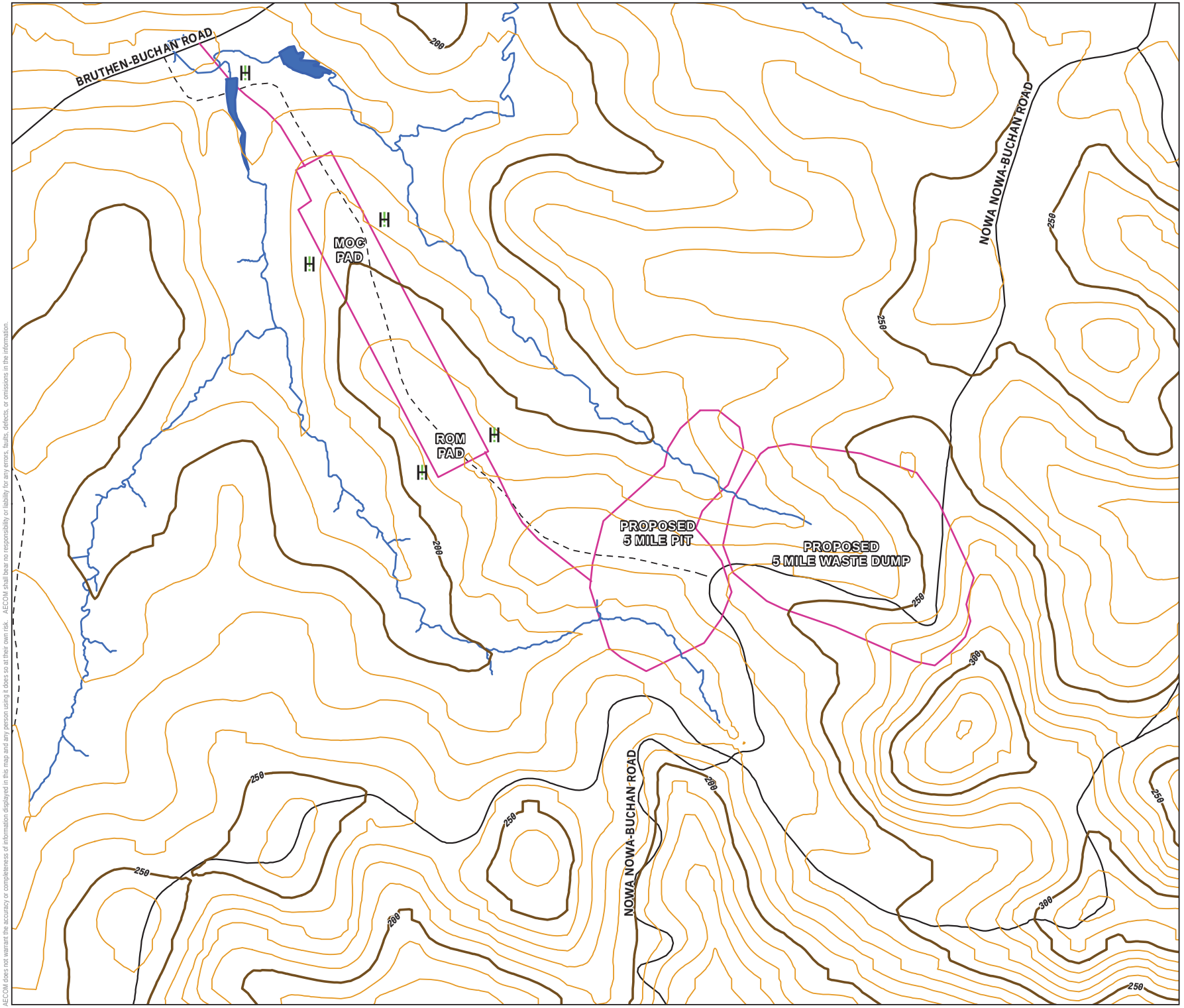
Surface water runoff may be used as an additional water source to supplement groundwater and mine water for use in the mine operations for dust suppression and processing. A preliminary catchment yield analysis has been undertaken to determine the annual runoff volume and size online storages.

The analysis indicates that the total catchment area of approximately 7.9km^2 will generate approximately an average annual runoff volume of 435ML. The runoff volume is sensitive to soil moisture losses and if surface water is to be relied on as a water source it is recommended that spoil testing be undertaken to improve the reliability of the analysis.

5.2 Potential locations for surface water dams

On site water storages are best located towards Bruthen-Buchan Road to maximise the contributing catchment. The flatter topography at in this part of the site also means that lower embankments are required to achieve the necessary storage volume.

Two storages on each of the main waterways have been sized and are indicated in Figure 5. For the purpose of this analysis, a dam embankment height of 5m has been adopted, with the corresponding volumes determined from the contour data.



EASTERN IRON
SURFACE WATER
Potential Sediment Basin Locations
Figure 06

LEGEND

- Site Infrastructure (approx)

Road Type

- ROAD
- TRACK
- Potential Sediment Basins
- Possible Water Collection Sites
- Index Contour (50m)
- Minor Contour (10m)

0 100 200 400
Metres

1:10,000 (when printed at A3)

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Aerial Flown 12/04/2013

5.3 Surface Water Reliability

An assessment has been undertaken to determine the volume of catchment runoff that could be used to support mine operations. A preliminary water balance model was used using historical rainfall data to quantify the volume of water that could be captured by the water storages discusses above. The analysis assumes the following parameters:

- Total storage volume 8,200m^3
- Demand 164ML/year
- Soil loss 3.6mm/hour

The analysis indicated that the above system will enable approximately 103ML to be captured annually. A large proportion of the captured runoff will be lost to evaporation and seepage, while some runoff will bypass the storage when it is full. Using this arrangement will result in approximately 61% of the total water demand being met by surface water. The analysis also indicated that water would only be available in the storages for reuse approximately 46% of the time.

The sensitivity of the size of the storages on the total captured volume was assessed. It was found that increasing the volume to 15,000m^3 increased the captured water volume to 114ML, meeting approximately 67% of the annual demand.

5.4 Suitability of surface water capture

Legislative and regulatory requirements will also need to be considered as part of identifying a reliable water supply for Eastern Iron. Victoria has a well-established legislative framework, underpinned by the *Water Act 1989*, that seeks to achieve a balance between consumptive use of the State's water resources and the protection of environmental values. Persistent drought across Victoria through much of the last decade also motivated further thought about the way our water resources are managed, culminating in the development of four regional Sustainable Water Strategies (SWS). The Gippsland SWS identifies the extent of the water resources in this part of the State, as well as a range of actions to ensure the sustainable and equitable management of these resources to 2050. Key authorities responsible for overseeing these actions, as well as enforcing relevant legislation, include the rural water authority (Southern Rural Water) and Catchment Management Authorities (East Gippsland CMA).

The harvestable yield of the proposed dams should therefore not necessarily be assumed to represent the volume of water available for the project. Eastern Iron must obtain a 'take and use' entitlement for the water it requires, the availability of which will depend on water already allocated to other consumptive users in the catchment as well as environmental flow requirements. Southern Rural Water is legally bound to comply with rules that determine Sustainable Diversion Limits (SDL), which identify the extent of harvesting permitted within a given catchment. To protect downstream environmental flows, the SDL is likely to be significantly less than the total harvestable volume that may be available.

Annex C
Summary Tables for Groundwater and Surface Water Quality

Table B1: Baseline field monitoring groundwater quality results for the monitoring wells within the proposed Project area in June 2013^.

Field Parameters		Unit	Site			Water Quality Criteria
			NNPBH 1	NNPBH 2	NNPBH 3	SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off event	One-off event	One-off event	
General Parameters	pH	pH Unit	7.51	7.09	6.35	6.4-7.7
	Electrical Conductivity @ 25°C	µS/cm	1,965	3,171	3,974	≤500
	ORP	mV	242.50	47.30	133.40	N/A
	Temperature	°C	15.10	15.90	15.30	N/A
	TDS	mg/L	1275.00	2061.00	2582.00	N/A

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains).
^ Highlighted values show a result outside of the relevant water quality criteria.

Table B2: Baseline laboratory sample groundwater quality results for the monitoring wells within the proposed Project area in June 2013^.

Lab Parameters	Unit	Laboratory Detection Limit	Monitoring Well			Water Quality Guidelines
			NNPBH1	NNPBH2	NNBH3	SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	One-off Sampling Event	One-off Sampling Event	
General Parameters						
pH (Lab)	pH Unit	-	7.58	7.39	6.48	6.4-7.7
Electrical Conductivity (Lab)	µS/cm	1	2,010	2,920	4,050	≤500
Total hardness as CaCO3	mg/L	1	564	984	935	-
Total Alkalinity as CaCO3	mg/L	1	386	289	118	-
Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	-
Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	-
Bicarbonate Alkalinity as CaCO3	mg/L	1	386	289	118	-
Major Ions						
Sodium	mg/L	1	183	219	402	-
Magnesium	mg/L	1	91	154	215	-
Potassium	mg/L	1	5	16	16	-
Calcium	mg/L	1	76	140	20	-
Chloride	mg/L	1	437	718	1,120	-
Fluoride	mg/L	0.1	0.6	1.6	0.6	-
Sulfate as SO4 - Turbidimetric	mg/L	1	26	220	190	-
Dissolved Metals						
Aluminium	mg/L	0.01	<0.01	<0.01	0.01	0.055[A]
Antimony	mg/L	0.001	<0.001	0.002	<0.001	ID
Arsenic	mg/L	0.001	<0.001	0.002	0.002	0.013[I]

Lab Parameters	Unit	Laboratory Detection Limit	Monitoring Well			Water Quality Guidelines
			NNPBH1	NNPBH2	NNBH3	SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	One-off Sampling Event	One-off Sampling Event	
Barium	mg/L	0.001	0.226	0.179	0.059	-
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	ID
Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	ID
Boron	mg/L	0.05	<0.05	0.34	0.23	0.37[C]
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.0002[H]
Caesium	mg/L	0.001	<0.001	<0.001	<0.001	-
Cerium	mg/L	0.001	<0.001	<0.001	<0.001	-
Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.001[CIH]
Cobalt	mg/L	0.001	0.005	0.003	0.012	ID
Copper	mg/L	0.001	0.007	0.001	0.002	0.0014[H]
Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	-
Erbium	mg/L	0.001	<0.001	<0.001	<0.001	-
Europium	mg/L	0.001	<0.001	<0.001		-
Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	-
Gallium	mg/L	0.001	<0.001	<0.001	<0.001	ID
Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	-
Holmium	mg/L	0.001	<0.001	<0.001	<0.001	-
Iron	mg/L	0.05	<0.05	0.80	3.44	ID
Indium	mg/L	0.001	<0.001	<0.001	<0.001	-
Lanthanum	mg/L	0.001	<0.001	<0.001	<0.001	ID
Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.0034[H]
Lithium	mg/L	0.001	0.009	0.017	0.016	-
Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	-

Lab Parameters	Unit	Laboratory Detection Limit	Monitoring Well			Water Quality Guidelines
			NNPBH1	NNPBH2	NNBH3	SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	One-off Sampling Event	One-off Sampling Event	
Manganese	mg/L	0.001	0.087	0.256	0.339	1.9[C]
Molybdenum	mg/L	0.001	0.022	0.020	0.003	ID
Neodymium	mg/L	0.001	<0.001	<0.001	<0.001	-
Nickel	mg/L	0.001	<0.001	0.003	0.026	0.011[H]
Praseodymium	mg/L	0.001	<0.001	<0.001	<0.001	-
Rubidium	mg/L	0.001	0.003	0.023	0.013	-
Samarium	mg/L	0.001	<0.001	<0.001	<0.001	-
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	0.011[Be]
Silver^	mg/L	0.001	<0.001	<0.001	<0.001	0.00005
Strontium	mg/L	0.001	0.319	0.614	0.038	-
Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	-
Terbium	mg/L	0.001	<0.001	<0.001	<0.001	-
Thallium	mg/L	0.001	<0.001	<0.001	<0.001	ID
Thorium	mg/L	0.001	<0.001	<0.001	<0.001	-
Thulium	mg/L	0.001	<0.001	<0.001	<0.001	-
Tin	mg/L	0.001	<0.001	<0.001	<0.001	ID
Titanium	mg/L	0.01	<0.01	<0.01	<0.01	-
Uranium	mg/L	0.001	0.004	0.008	0.002	ID
Vanadium	mg/L	0.01	0.010	0.010	<0.01	ID
Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	-
Yttrium	mg/L	0.001	<0.001	<0.001	<0.001	-
Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	-
Zinc	mg/L	0.005	0.017	0.102	0.038	0.008[H]

Lab Parameters	Unit	Laboratory Detection Limit	Monitoring Well			Water Quality Guidelines
			NNPBH1	NNPBH2	NNBH3	SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	One-off Sampling Event	One-off Sampling Event	
Nutrients						
Ammonia as N	mg/L	0.01	0.08	0.01	0.06	0.9[D]
Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	-
Nitrate as N	mg/L	0.01	0.05	0.21	0.06	0.7
Nitrite + Nitrate as N	mg/L	0.01	0.05	0.21	0.06	N/A
Total Kjeldahl Nitrogen as N	mg/L	0.1	<0.1	<0.1	<0.1	N/A
Total Nitrogen as N	mg/L	0.1	<0.1	0.2	<0.1	0.6
Total Phosphorus as P	mg/L	0.01	0.04	0.05	0.06	0.045
Reactive Phosphorus as P	mg/L	0.01	<0.01	<0.01	<0.01	-
Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	0.007[F]

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains); T(95%) Metals, T (99%) Non-metals, T (95%) Ammonia.
[A] Aluminium for pH > 6.5;
[B] Chemicals for which bioaccumulation and secondary poisoning effects should be considered.
[C] Figure may not protect key species from acute (and chronic) toxicity. Refer to Section 8.3.7 of ANZECC/ARMCANZ water quality guidelines.
[D] Ammonia as Total ammonia [NH4-N] at pH 8. For changes in trigger value with pH refer to Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[E] for Total Selenium;
[F] Cyanide as un-ionised HCN, measured as [CN]; see Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[H] Chemicals for which alogorithms have been provided in table 3.4.3 (ANZECC/ARMCANZ Guidelines) to account for the effects of hardness. The values have been calculated
[I] for Arsenic, AsV; for Chromium, CrVI;
ID= Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 (ANZECC/ARMCANZ Guidelines.)
Highlighted values show guideline exceedance. Red highlights show the exceedance of the relevant water quality guidelines.
^ Dissolved silver concentrations were all below the detection limit (<0.001 mg/L), however the detection limit was greater than the surface water quality environmental objectives for silver (0.00005 mg/L).

Table B3: Baseline field monitoring water quality results for NOWA2 and NOWA11^.

Field Parameters		Unit	Site						Water Quality Guidelines
			NOWA11 Yellow Waterholes Creek u/s Harris Creek			NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains
			Mean	Minimum	Maximum	Mean	Minimum	Maximum	
General Parameters	pH	pH Unit	6.38	6.27	6.48	6.18	5.31	7.12	6.4-7.7
	Electrical Conductivity @ 25°C	µS/cm	494	426	562	390	238	489	≤500
	ORP	mV	280	222	337	247	127	355	-
	Turbidity	NTU	0	0	0	0	0	0	≤10
	Dissolved O_2	mg/L (% saturation)	5.92 (53.82%)			6.52 (59.9%)	5.40 (47.5%)	8.15 (84.02%)	85-110%
	Temperature	°C	8.95	7.7	10.2	10.6	7.3	15.7	-

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains).
^ Highlighted values show a result outside of the relevant water quality criteria.

Table B4: Baseline laboratory sample water quality results for NOWA2 and NOWA11^.

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
General Parameters	pH (Lab)	pH Unit	-	6.96	6.34	6.16	6.51	6.4-7.7
	Electrical Conductivity (Lab)	µS/cm	1	473	368	259	477	≤500
	Total Suspended Solids	mg/L	5	<5	6	6	6	-
	Total hardness as CaCO3	mg/L	1	66	59	38	80	-
	Total Alkalinity as CaCO3	mg/L	1	25	9.0	6.0	12.0	-
	Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	-
	Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	-
	Bicarbonate Alkalinity as CaCO3	mg/L	1	25	9.0	6.0	12.0	-
	Oil and Grease	mg/L	5	<5	<5	<5	<5	ID
Major Ions	Sodium	mg/L	1	61.0	40.0	30.0	50.0	-
	Magnesium	mg/L	1	10.0	12.5	8.0	17.0	-
	Potassium	mg/L	1	3.0	2.0	2.0	2.0	-
	Calcium	mg/L	1	10.0	3.0	2.0	4.0	-
	Chloride	mg/L	1	126.0	95.0	57.0	133.0	-
	Fluoride	mg/L	1	<0.1	<0.1	<0.1	<0.1	-
	Sulfate as SO4 - Turbidimetric	mg/L	1	16.0	12.0	10.0	14.0	-

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
Total Metals	Aluminium	mg/L	0.01	0.63	3.14			0.055[A]
	Antimony	mg/L	0.001	0.004	<0.001			ID
	Arsenic	mg/L	0.001	0.001	<0.001			0.013[I]
	Barium	mg/L	0.001	0.068	0.026			-
	Beryllium	mg/L	0.001	<0.001	<0.001			ID
	Bismuth	mg/L	0.001	<0.001	<0.001			ID
	Boron	mg/L	0.050	0.140	<0.05			0.37[C]
	Cadmium	mg/L	0.0001	<0.0001	<0.0001			0.0002[H]
	Caesium	mg/L	0.001	<0.001	<0.001			-
	Cerium	mg/L	0.001	0.002	0.010			-
	Chromium	mg/L	0.001	<0.001	0.002			0.001[CIH]
	Cobalt	mg/L	0.001	<0.001	<0.001			ID
	Copper	mg/L	0.001	0.004	<0.001			0.0014[H]
	Dysprosium	mg/L	0.001	<0.001	<0.001			-
	Erbium	mg/L	0.001	<0.001	<0.001			-
	Europium	mg/L	0.001	<0.001	<0.001			-
	Gadolinium	mg/L	0.001	<0.001	<0.001			-
	Gallium	mg/L	0.001	<0.001	<0.001			ID

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
	Hafnium	mg/L	0.01	<0.01	<0.01			-
	Holmium	mg/L	0.001	<0.001	<0.001			-
	Iron	mg/L	0.050	0.990	1.92			ID
	Indium	mg/L	0.001	<0.001	<0.001			-
	Lanthanum	mg/L	0.001	0.001	0.004			ID
	Lead	mg/L	0.001	0.003	<0.001			0.0034[H]
	Lithium	mg/L	0.001	0.002	<0.001			-
	Lutetium	mg/L	0.001	<0.001	<0.001			-
	Manganese	mg/L	0.001	0.051	0.015			1.9[C]
	Mercury	mg/L	0.0001	<0.0001	<0.0001			0.0006
	Molybdenum	mg/L	0.001	0.002	<0.001			ID
	Neodymium	mg/L	0.001	0.001	0.004			-
	Nickel	mg/L	0.001	0.002	<0.001			0.011[H]
	Praseodymium	mg/L	0.001	<0.001	0.001			-
	Rubidium	mg/L	0.001	0.034	0.002			-
	Samarium	mg/L	0.001	<0.001	<0.001			-
	Selenium	mg/L	0.01	<0.01	<0.01			0.011[Be]
	Silver^	mg/L	0.001	<0.001	<0.001			0.00005

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
	Strontium	mg/L	0.001	0.086	0.032			-
	Tellurium	mg/L	0.005	<0.005	<0.005			-
	Terbium	mg/L	0.001	<0.001	<0.001			-
	Thallium	mg/L	0.001	<0.001	<0.001			ID
	Thorium	mg/L	0.001	<0.001	0.001			-
	Thulium	mg/L	0.001	<0.001	<0.001			-
	Tin	mg/L	0.001	<0.001	<0.001			ID
	Titanium	mg/L	0.01	<0.01	0.05			-
	Uranium	mg/L	0.001	<0.001	<0.001			ID
	Vanadium	mg/L	0.01	<0.01	<0.01			ID
	Ytterbium	mg/L	0.001	<0.001	<0.001			-
	Yttrium	mg/L	0.001	<0.001	0.002			-
	Zirconium	mg/L	0.005	<0.005	<0.005			-
	Zinc	mg/L	0.005	0.065	0.007			0.008[H]
Dissolved Metals	Aluminium	mg/L	0.01	0.14	0.23	0.11	0.35	0.055[A]
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.013[I]
	Barium	mg/L	0.001	0.072	0.033	0.020	0.046	-

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
	Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Boron	mg/L	0.05	<0.05	<0.05	<0.05	<0.05	0.37[C]
	Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002[H]
	Caesium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Cerium	mg/L	0.001	0.001	0.006	0.003	0.008	-
	Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.001[CIH]
	Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Copper	mg/L	0.001	0.002	0.001	<0.001	0.001	0.0014[H]
	Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Erbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Europium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Gallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	-
	Holmium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Iron	mg/L	0.05	0.61	0.46	0.25	0.67	ID
	Indium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
	Lanthanum	mg/L	0.001	<0.001	0.002	0.001	0.003	ID
	Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.0034[H]
	Lithium	mg/L	0.001	0.001	<0.001	<0.001	<0.001	-
	Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Manganese	mg/L	0.001	0.033	0.028	0.011	0.044	1.9[C]
	Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006
	Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Neodymium	mg/L	0.001	<0.001	0.003	0.001	0.004	-
	Nickel	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.011[H]
	Praseodymium	mg/L	0.001	<0.001	0.001	<0.001	0.001	-
	Rubidium	mg/L	0.001	0.002	0.001	<0.001	0.001	-
	Samarium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	0.011[Be]
	Silver^	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.00005
	Strontium	mg/L	0.001	0.092	0.045	0.028	0.061	-
	Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	-
	Terbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Thallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
	Thorium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Thulium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Tin	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Titanium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	-
	Uranium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	ID
	Vanadium	mg/L	0.01	<0.01	0.01	<0.01	0.02	ID
	Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	-
	Yttrium	mg/L	0.001	<0.001	0.001	<0.001	0.002	-
	Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	-
	Zinc	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	0.008[H]
Nutrients	Ammonia as N	mg/L	0.01	0.04	0.01	<0.01	0.02	0.9[D]
	Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	-
	Nitrate as N	mg/L	0.01	0.08	0.02	<0.01	0.04	0.7
	Nitrite + Nitrate as N	mg/L	0.01	0.08	0.02	<0.01	0.04	N/A
	Total Kjeldahl Nitrogen as N	mg/L	0.1	0.5	<0.1	<0.1	<0.1	N/A
	Total Nitrogen as N	mg/L	0.1	0.6	<0.1	<0.1	<0.1	0.6
	Total Phosphorus as P	mg/L	0.01	0.03	0.01	<0.01	0.02	0.045
	Reactive Phosphorus as P	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	-

Lab Parameters		Unit	Laboratory Detection Limit	Site				Water Quality Guidelines
				NOWA11 Yellow Waterholes Creek u/s Harris Creek	NOWA2 Harris Creek u/s Bruthen-Buchan Road			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off sampling event	Mean	Minimum	Maximum	
	Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	0.007[F]
Coliforms	Total Coliforms	Colonies/100mL	1	86	22	22	22	-
	Faecal Coliforms	Colonies/100mL	1	60	<2	<2	<2	150[#]

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains); T(95%) Metals, T (99%) Non-metals, T (95%) Ammonia.
[A] Aluminium for pH > 6.5;
[B] Chemicals for which bioaccumulation and secondary poisoning effects should be considered.
[C] Figure may not protect key species from acute (and chronic) toxicity. Refer to Section 8.3.7 of ANZECC/ARMCANZ water quality guidelines.
[D] Ammonia as Total ammonia [NH4-N] at pH 8. For changes in trigger value with pH refer to Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[E] for Total Selenium;
[F] Cyanide as un-ionised HCN, measured as [CN]; see Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[H] Chemicals for which alogorithms have been provided in table 3.4.3 (ANZECC/ARMCANZ Guidelines) to account for the effects of hardness. The values have been calculated
[I] for Arsenic, AsV; for Chromium, CrVI;
ID= Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 (ANZECC/ARMCANZ Guidelines.)
Highlighted values show guideline exceedance. Red highlights show the exceedance of the relevant water quality guidelines.
^ Dissolved and total silver concentrations were all below the detection limit (<0.001 mg/L), however the detection limit was greater than the surface water quality environmental objectives for silver (0.00005 mg/L).

Table B5: Baseline field monitoring water quality results for NOWA1, NOWA6 and NOWA14^.

Field Parameters		Unit	Site									Water Quality Guidelines
			NOWA14 Boggy Creek u/s Yellow Water Holes Creek			NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains
			Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
General Parameters	pH	pH Unit	6.26	5.54	7.21	6.57	6.01	7.25	7.08	6.42	7.91	6.4-7.7
	Electrical Conductivity @ 25°C	µS/cm	450	297	624	585	70	1,368	686	276	1,020	≤500
	ORP	mV	250	198	338	346	119	950	216	118	270	-
	Turbidity	NTU	32	0	53	10	0	40	5	0	15	≤10
	Dissolved O_2	mg/L (% saturation)	6.83 (62.4%)	5.33 (48.93%)	8.32 (82.36%)	6.28 (59.24%)	5.47 (49.12%)	7.48 (76.1%)	8.63 (86.93%)	7.21 (65.49%)	10.23 (107.92%)	85-110%
	Temperature	°C	10.5	6.8	14	12.34	7.30	20.90	15.50	8.40	25.00	-

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains).
^ Highlighted values show a result outside of the relevant water quality criteria.

Table B6: Baseline laboratory sample water quality results for NOWA1, NOWA6 and NOWA14^.

Lab Parameters		Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
				NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
General Parameters	pH (Lab)	pH Unit	-	6.29	7.03	6.86	7.19	7.47	6.72	8.11	6.4-7.7
	Electrical Conductivity (Lab)	µS/cm	1	326	506	377	634	710	281	1,040	≤500
	Total Suspended Solids	mg/L	5	<5	<5	<5	<5	3	<5	5	-
	Total hardness as CaCO3	mg/L	1	47	78	54	102	124	41	173	-
	Total Alkalinity as CaCO3	mg/L	1	6	38.0	15.0	61.0	38.5	9.0	55.0	-
	Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	<1	-
	Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	<1	-
	Bicarbonate Alkalinity as CaCO3	mg/L	1	6	38.00	15.00	61.00	38.50	9.00	55.00	-
	Oil and Grease	mg/L	5	<5	<5	<5	<5	<5	<5	<5	ID
Major Ions	Sodium	mg/L	1	39	63.5	42.0	85.0	86.0	33.0	118.0	-
	Magnesium	mg/L	1	9	13.0	9.0	17.0	21.8	7.0	31.0	-
	Potassium	mg/L	1	2	3.5	3.0	4.0	4.8	2.0	7.0	-
	Calcium	mg/L	1	4	10.0	7.0	13.0	13.8	5.0	18.0	-
	Chloride	mg/L	1	87	137.0	96.0	178.0	190.8	60.0	282.0	-
	Fluoride	mg/L	1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	0.2	-
	Sulfate as SO4 -	mg/L	1	17	13.5	12.0	15.0	18.5	14.0	22.0	-

Lab Parameters		Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
				NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
	Turbidimetric										
Total Metals	Aluminium	mg/L	0.01	2.00	1.04			0.67	0.03	1.31	0.055[A]
	Antimony	mg/L	0.001	0.007	0.013			<0.001	<0.001	<0.001	ID
	Arsenic	mg/L	0.001	0.002	0.002			<0.001	<0.001	<0.001	0.013[I]
	Barium	mg/L	0.001	0.032	0.048			0.052	0.039	0.064	-
	Beryllium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	ID
	Bismuth	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	ID
	Boron	mg/L	0.050	0.07	0.07			0.10	<0.05	0.17	0.37[C]
	Cadmium	mg/L	0.0001	0.0002	<0.0001			<0.0001	<0.0001	<0.0001	0.0002[H]
	Caesium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Cerium	mg/L	0.001	0.005	0.003			0.002	<0.001	0.004	-
	Chromium	mg/L	0.001	<0.001	<0.001			0.001	<0.001	0.001	0.001[CIH]
	Cobalt	mg/L	0.001	0.001	<0.001			<0.001	<0.001	<0.001	ID
	Copper	mg/L	0.001	0.005	0.003			0.001	0.001	0.001	0.0014[H]
	Dysprosium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Erbium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Europium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Gadolinium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-

Lab Parameters	Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
			NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
Gallium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	ID
Hafnium	mg/L	0.01	<0.01	<0.01			<0.01	<0.01	<0.01	-
Holmium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
Iron	mg/L	0.050	2.02	1.18			0.70	0.24	1.16	ID
Indium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
Lanthanum	mg/L	0.001	0.003	0.002			0.001	<0.001	0.002	ID
Lead	mg/L	0.001	0.001	0.002			<0.001	<0.001	<0.001	0.0034[H]
Lithium	mg/L	0.001	0.001	0.001			0.002	<0.001	0.004	-
Lutetium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
Manganese	mg/L	0.001	0.033	0.022			0.006	0.003	0.009	1.9[C]
Mercury	mg/L	0.0001	<0.0001	<0.0001			<0.0001	<0.0001	<0.0001	0.0006
Molybdenum	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	ID
Neodymium	mg/L	0.001	0.003	0.002			0.001	<0.001	0.002	-
Nickel	mg/L	0.001	0.004	0.002			0.001	<0.001	0.001	0.011[H]
Praseodymium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
Rubidium	mg/L	0.001	0.005	0.003			0.004	0.004	0.004	-
Samarium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
Selenium	mg/L	0.01	<0.01	<0.01			<0.01	<0.01	<0.01	0.011[Be]

Lab Parameters		Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
				NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
	Silver^	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	0.00005
	Strontium	mg/L	0.001	0.035	0.054			0.106	0.045	0.167	-
	Tellurium	mg/L	0.005	<0.005	<0.005			<0.005	<0.005	<0.005	-
	Terbium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Thallium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	ID
	Thorium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Thulium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Tin	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	ID
	Titanium	mg/L	0.01	0.02	<0.01			<0.01	<0.01	<0.01	-
	Uranium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	ID
	Vanadium	mg/L	0.01	<0.01	<0.01			<0.01	<0.01	<0.01	ID
	Ytterbium	mg/L	0.001	<0.001	<0.001			<0.001	<0.001	<0.001	-
	Yttrium	mg/L	0.001	0.002	0.001			0.001	<0.001	0.002	-
	Zirconium	mg/L	0.005	<0.005	<0.005			<0.005	<0.005	<0.005	-
	Zinc	mg/L	0.005	0.030	0.010			0.005	<0.005	0.008	0.008[H]
Dissolved Metals	Aluminium	mg/L	0.01	0.32	0.14	0.08	0.20	0.09	0.01	0.32	0.055[A]
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Arsenic	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.002	0.013[I]

Lab Parameters	Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
			NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
Barium	mg/L	0.001	0.026	0.058	0.045	0.070	0.068	0.034	0.098	-
Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Boron	mg/L	0.05	<0.05	0.06	<0.05	0.10	0.16	<0.05	0.51	0.37[C]
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002[H]
Caesium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Cerium	mg/L	0.001	0.004	0.002	0.001	0.002	0.001	<0.001	0.004	-
Chromium	mg/L	0.001	0.001	0.001	<0.001	0.001	<0.001	<0.001	<0.001	0.001[CIH]
Cobalt	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Copper	mg/L	0.001	0.003	0.002	0.002	0.002	0.002	0.001	0.002	0.0014[H]
Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Erbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Europium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Gallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Holmium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Iron	mg/L	0.05	1.13	0.77	0.54	0.99	0.23	0.09	0.43	ID

Lab Parameters	Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
			NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
Indium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Lanthanum	mg/L	0.001	0.002	0.001	<0.001	0.001	0.001	<0.001	0.002	ID
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0034[H]
Lithium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	0.004	<0.001	0.016	-
Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Manganese	mg/L	0.001	0.039	0.022	0.019	0.024	0.006	0.003	0.011	1.9[C]
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006
Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Neodymium	mg/L	0.001	0.003	0.001	<0.001	0.002	0.001	<0.001	0.002	-
Nickel	mg/L	0.001	0.003	0.001	0.001	0.001	0.001	<0.001	0.001	0.011[H]
Praseodymium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Rubidium	mg/L	0.001	<0.001	0.003	0.002	0.003	0.005	0.002	0.008	-
Samarium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011[Be]
Silver^	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00005
Strontium	mg/L	0.001	0.037	0.095	0.061	0.128	0.159	0.046	0.306	-
Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
Terbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-

Lab Parameters		Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
				NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
	Thallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Thorium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Thulium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Tin	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Titanium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
	Uranium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Vanadium	mg/L	0.01	<0.01	0.01	<0.01	0.02	0.01	<0.01	0.02	ID
	Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Yttrium	mg/L	0.001	0.002	0.001	<0.001	0.001	0.001	<0.001	0.001	-
	Zirconium	mg/L	0.01	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
	Zinc	mg/L	0.005	0.006	<0.005	<0.005	<0.005	0.003	<0.005	0.006	0.008[H]
Nutrients	Ammonia as N	mg/L	0.01	<0.01	0.03	<0.01	0.05	0.03	<0.01	0.06	0.9[D]
	Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
	Nitrate as N	mg/L	0.01	0.02	0.07	0.07	0.07	0.04	0.02	0.08	0.7
	Nitrite + Nitrate as N	mg/L	0.01	0.02	0.07	0.07	0.07	0.04	0.02	0.08	N/A
	Total Kjeldahl Nitrogen as N	mg/L	0.1	<0.1	0.13	<0.1	0.20	0.11	<0.1	0.30	N/A
	Total Nitrogen as N	mg/L	0.1	<0.1	0.18	<0.1	0.30	0.11	<0.1	0.30	0.6
	Total Phosphorus as P	mg/L	0.01	0.04	0.02	0.01	0.02	0.06	0.04	0.12	0.045

Lab Parameters		Unit	Laboratory Detection Limit	Site							Water Quality Guidelines
				NOWA14 Boggy Creek u/s Yellow Water Holes Creek	NOWA1 Boggy Creek u/s Bruthen-Buchan Road			NOWA6 Boggy Creek u/s Nowa Nowa			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
	Reactive Phosphorus as P	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
	Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007[F]
Coliforms	Total Coliforms	Colonies/100mL	1	4	8	8	8	27	0	70	-
	Faecal Coliforms	Colonies/100mL	1	<2	6	6	6	91	12	200	150[#]

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains); T(95%) Metals, T (99%) Non-metals, T (95%) Ammonia.
[A] Aluminium for pH > 6.5;
[B] Chemicals for which bioaccumulation and secondary poisoning effects should be considered.
[C] Figure may not protect key species from acute (and chronic) toxicity. Refer to Section 8.3.7 of ANZECC/ARMCANZ water quality guidelines.
[D] Ammonia as Total ammonia [NH4-N] at pH 8. For changes in trigger value with pH refer to Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[E] for Total Selenium;
[F] Cyanide as un-ionised HCN, measured as [CN]; see Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[H] Chemicals for which alogorithms have been provided in table 3.4.3 (ANZECC/ARMCANZ Guidelines) to account for the effects of hardness. The values have been calculated
[I] for Arsenic, AsV; for Chromium, CrVI;
ID= Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 (ANZECC/ARMCANZ Guidelines.)
Highlighted values show guideline exceedance. Red highlights show the exceedance of the relevant water quality guidelines.
^ Dissolved and total silver concentrations were all below the detection limit (<0.001 mg/L), however the detection limit was greater than the surface water quality environmental objectives for silver (0.00005 mg/L).

Table B7: Baseline field monitoring water quality results for NOWA3^.

Field Parameters		Unit	Site			Water Quality Guidelines
			NOWA3 Ironstone Creek d/s Decommissioned Quarry			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains
			Mean	Minimum	Maximum	
General Parameters	pH	pH Unit	4.18	3.82	4.87	6.4-7.7
	Electrical Conductivity @ 25°C	µS/cm	832	133	1,483	≤500
	ORP	mV	424	354	508	-
	Turbidity	NTU	4.93	0	10.5	≤10
	Dissolved O_2 [l]	mg/L (% saturation)	7.36 (68.6%)	6.49 (59.1%)	8.89 (86.9%)	85-110%
	Temperature	°C	11.8	10.6	13.9	-

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains).
^ Highlighted values show a result outside of the relevant water quality criteria.

Table B8: Baseline laboratory sample water quality results for NOWA3^.

Lab Parameters		Unit	Laboratory Detection Limit	Site			Water Quality Guidelines
				NOWA3 Ironstone Creek d/s Decommissioned Quarry			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				Mean	Minimum	Maximum	
General Parameters	pH (Lab)	pH Unit	-	4.41	3.79	5.19	6.4-7.7
	Electrical Conductivity (Lab)	µS/cm	1	797	239	1,340	≤500
	Total Suspended Solids	mg/L	5	7	<5	11	-
	Total hardness as CaCO3	mg/L	1	158	26	284	-
	Total Alkalinity as CaCO3	mg/L	1	<1	<1	<1	-
	Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	-
	Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	-
	Bicarbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	-

Lab Parameters		Unit	Laboratory Detection Limit	Site			Water Quality Guidelines
				NOWA3 Ironstone Creek d/s Decommissioned Quarry			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				Mean	Minimum	Maximum	
	Oil and Grease	mg/L	5	<5	<5	<5	ID
Major Ions	Sodium	mg/L	1	77.5	28.0	125.0	-
	Magnesium	mg/L	1	26.3	5.0	46.0	-
	Potassium	mg/L	1	5.0	2.0	8.0	-
	Calcium	mg/L	1	20.0	2.0	38.0	-
	Chloride	mg/L	1	147.5	49.0	248.0	-
	Fluoride	mg/L	1	0.45	0.10	0.80	-
	Sulfate as SO4 - Turbidimetric	mg/L	1	143.0	21.0	265.0	-
Total Metals	Aluminium	mg/L	0.01	5.27	2.10	8.43	0.055[A]
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Arsenic	mg/L	0.001	0.002	0.001	0.002	0.013[I]
	Barium	mg/L	0.001	0.042	0.021	0.062	-
	Beryllium	mg/L	0.001	0.004	<0.001	0.008	ID
	Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Boron	mg/L	0.050	0.05	<0.05	0.07	0.37[C]
	Cadmium	mg/L	0.0001	0.0002	<0.0001	0.0004	0.0002[H]
	Caesium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Cerium	mg/L	0.001	0.013	0.007	0.019	-
	Chromium	mg/L	0.001	0.001	<0.001	0.001	0.001[CIH]
	Cobalt	mg/L	0.001	0.082	0.007	0.156	ID
	Copper	mg/L	0.001	0.078	0.008	0.148	0.0014[H]
	Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Erbium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Europium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Gallium	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	-
	Holmium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Iron	mg/L	0.05	1.33	0.92	1.74	ID
	Indium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Lanthanum	mg/L	0.001	0.001	<0.001	0.002	ID
	Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.0034[H]
	Lithium	mg/L	0.001	0.003	<0.001	0.006	-

Lab Parameters		Unit	Laboratory Detection Limit	Site			Water Quality Guidelines
				NOWA3 Ironstone Creek d/s Decommissioned Quarry			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				Mean	Minimum	Maximum	
	Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Manganese	mg/L	0.001	0.335	0.038	0.631	1.9[C]
	Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.0006
	Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Neodymium	mg/L	0.001	0.002	<0.001	0.003	-
	Nickel	mg/L	0.001	0.015	0.002	0.028	0.011[H]
	Praseodymium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Rubidium	mg/L	0.001	0.007	0.004	0.009	-
	Samarium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Selenium	mg/L	0.01	<0.01	<0.01	<0.01	0.011[Be]
	Silver^	mg/L	0.001	<0.001	<0.001	<0.001	0.00005
	Strontium	mg/L	0.001	0.065	0.028	0.101	-
	Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	-
	Terbium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Thallium	mg/L	0.001	0.001	<0.001	0.001	ID
	Thorium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Thulium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Tin	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Titanium	mg/L	0.01	0.01	<0.01	0.01	-
	Uranium	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	ID
	Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Yttrium	mg/L	0.001	0.001	<0.001	0.002	-
	Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	-
	Zinc	mg/L	0.005	0.022	<0.005	0.042	0.008[H]
Dissolved Metals	Aluminium	mg/L	0.01	3.37	0.61	7.42	0.055[A]
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Arsenic	mg/L	0.001	0.002	<0.001	0.004	0.013[I]
	Barium	mg/L	0.001	0.036	0.018	0.054	-
	Beryllium	mg/L	0.001	0.004	<0.001	0.007	ID
	Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Boron	mg/L	0.05	0.03	<0.05	0.06	0.37[C]
	Cadmium	mg/L	0.0001	0.0002	<0.0001	0.0003	0.0002[H]
	Caesium	mg/L	0.001	<0.001	<0.001	<0.001	-

Lab Parameters		Unit	Laboratory Detection Limit	Site			Water Quality Guidelines
				NOWA3 Ironstone Creek d/s Decommissioned Quarry			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				Mean	Minimum	Maximum	
	Cerium	mg/L	0.001	0.009	0.004	0.018	-
	Chromium	mg/L	0.001	<0.001	<0.001	<0.001	0.001[CIH]
	Cobalt	mg/L	0.001	0.082	0.006	0.167	ID
	Copper	mg/L	0.001	0.059	0.008	0.133	0.0014[H]
	Dysprosium	mg/L	0.001	0.001	<0.001	0.003	-
	Erbium	mg/L	0.001	0.001	<0.001	0.002	-
	Europium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Gadolinium	mg/L	0.001	0.001	<0.001	0.003	-
	Gallium	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	-
	Holmium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Iron	mg/L	0.05	1.06	0.55	1.89	ID
	Indium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Lanthanum	mg/L	0.001	0.003	0.001	0.006	ID
	Lead	mg/L	0.001	<0.001	<0.001	<0.001	0.0034[H]
	Lithium	mg/L	0.001	0.002	<0.001	0.004	-
	Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Manganese	mg/L	0.001	0.376	0.035	0.810	1.9[C]
	Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	0.0006
	Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Neodymium	mg/L	0.001	0.004	0.002	0.008	-
	Nickel	mg/L	0.001	0.016	0.002	0.033	0.011[H]
	Praseodymium	mg/L	0.001	0.001	<0.001	0.002	-
	Rubidium	mg/L	0.001	0.006	0.002	0.010	-
	Samarium	mg/L	0.001	0.001	<0.001	0.002	-
	Selenium	mg/L	0.01	<0.01	<0.01	<0.01	0.011[Be]
	Silver^	mg/L	0.001	<0.001	<0.001	<0.001	0.00005
	Strontium	mg/L	0.001	0.064	0.027	0.109	-
	Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	-
	Terbium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Thallium	mg/L	0.001	0.001	<0.001	0.001	ID
	Thorium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Thulium	mg/L	0.001	<0.001	<0.001	<0.001	-
	Tin	mg/L	0.001	<0.001	<0.001	<0.001	ID

Lab Parameters		Unit	Laboratory Detection Limit	Site			Water Quality Guidelines
				NOWA3 Ironstone Creek d/s Decommissioned Quarry			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				Mean	Minimum	Maximum	
	Titanium	mg/L	0.01	<0.01	<0.01	<0.01	-
	Uranium	mg/L	0.001	<0.001	<0.001	<0.001	ID
	Vanadium	mg/L	0.01	0.01	<0.01	0.02	ID
	Ytterbium	mg/L	0.001	0.001	<0.001	0.001	-
	Yttrium	mg/L	0.001	0.010	0.002	0.024	-
	Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	-
	Zinc	mg/L	0.005	0.017	<0.005	0.033	0.008[H]
Nutrients	Ammonia as N	mg/L	0.01	0.02	<0.01	0.06	0.9[D]
	Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	-
	Nitrate as N	mg/L	0.01	0.01	<0.01	0.02	0.7
	Nitrite + Nitrate as N	mg/L	0.01	0.01	<0.01	0.02	N/A
	Total Kjeldahl Nitrogen as N	mg/L	0.1	0.14	<0.1	0.40	N/A
	Total Nitrogen as N	mg/L	0.1	0.14	<0.1	0.40	0.6
	Total Phosphorus as P	mg/L	0.01	0.05	0.02	0.09	0.045
	Reactive Phosphorus as P	mg/L	0.01	<0.01	<0.01	<0.01	-
	Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	0.007[F]
Coliforms	Total Coliforms	Colonies/100mL	1	11	0	22	-
	Faecal Coliforms	Colonies/100mL	1	11	8	12	150[#]

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains); T(95%) Metals, T (99%) Non-metals, T (95%) Ammonia.
[A] Aluminium for pH > 6.5;
[B] Chemicals for which bioaccumulation and secondary poisoning effects should be considered.
[C] Figure may not protect key species from acute (and chronic) toxicity. Refer to Section 8.3.7 of ANZECC/ARMCANZ water quality guidelines.
[D] Ammonia as Total ammonia [NH4-N] at pH 8. For changes in trigger value with pH refer to Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[E] for Total Selenium;
[F] Cyanide as un-ionised HCN, measured as [CN]; see Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[H] Chemicals for which alogorithms have been provided in table 3.4.3 (ANZECC/ARMCANZ Guidelines) to account for the effects of hardness. The values have been calculated
[I] for Arsenic, AsV; for Chromium, CrVI;
ID= Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 (ANZECC/ARMCANZ Guidelines.)
Highlighted values show guideline exceedance. Red highlights show the exceedance of the relevant water quality guidelines.
^ Dissolved and total silver concentrations were all below the detection limit (<0.001 mg/L), however the detection limit was greater than the surface water quality environmental objectives for silver (0.00005 mg/L).

Table B9: Baseline field monitoring water quality results for NOWA7, NOWA8 and NOWA9^.

Field Parameters		Unit	Site									Water Quality Guidelines
			NOWA7 Bill Creek u/s Wairewa			NOWA8 Hospital Creek u/s Wairewa			NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains
			Mean	Minimum	Maximum	Mean	Minimum	Maximum	Mean	Minimum	Maximum	
General Parameters	pH	pH Unit	6.24	6.10	6.37	6.00	5.82	6.17	7.06	6.24	8.02	6.4-7.7
	Electrical Conductivity @ 25°C	µS/cm	209	101	317	537	269	804	1,549	451	1,946	≤500
	ORP	mV	220	197	242	260	225	295	220	110	286	-
	Turbidity	NTU	11.5	11.5	11.5	19	9	28	5	0	14	≤10
	Dissolved O_2	mg/L (% saturation)	-			5.32 (47%)	5.32 (47%)	5.32 (47%)	7.18 (70.6%)	5.79 (51.5%)	9.14 (94.3%)	85-110%
	Temperature	°C	9.7	7.9	11.4	9.1	8.6	8.6	14.4	8.1	22.8	-

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains).
^ Highlighted values show a result outside of the relevant water quality criteria.

Table B10: Baseline laboratory sample water quality results for NOWA7, NOWA8 and NOWA9^.

Lab Parameters		Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
				NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
General Parameters	pH (Lab)	pH Unit	-	6.58	6.28	7.24	6.24	8.02	6.4-7.7
	Electrical Conductivity (Lab)	µS/cm	1	336	294	1,696	474	2,250	≤500
	Total Suspended Solids	mg/L	5	<5	8	<5	<5	<5	-
	Total hardness as CaCO3	mg/L	1	43	34	246	54	339	-
	Total Alkalinity as CaCO3	mg/L	1	14	9	102.5	15.0	245.0	-
	Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	-
	Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	-
	Bicarbonate Alkalinity as CaCO3	mg/L	1	14	9	102.5	15.0	245.0	-
	Oil and Grease	mg/L	5	<5	<5	<5	<5	<5	ID
Major Ions	Sodium	mg/L	1	41	38	234	60	310	-
	Magnesium	mg/L	1	8	7	36	10	51	-
	Potassium	mg/L	1	4	2	8	3	10	-
	Calcium	mg/L	1	4	2	39	5	68	-
	Chloride	mg/L	1	74	69	467	129	634	-
	Fluoride	mg/L	0.1	<0.1	<0.1	0.2	<0.1	0.5	-

Lab Parameters		Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
				NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
	Sulfate as SO4 - Turbidimetric	mg/L	1	17	12	42	7	114	-
Total Metals	Aluminium	mg/L	0.01	0.59	0.79	0.38	0.01	0.75	0.055[A]
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Arsenic	mg/L	0.001	<0.001	<0.001	0.001	<0.001	0.001	0.013[I]
	Barium	mg/L	0.001	0.024	0.027	0.061	0.032	0.089	-
	Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Boron	mg/L	0.05	<0.05	<0.05	0.06	<0.05	0.10	0.37[C]
	Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002[H]
	Caesium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Cerium	mg/L	0.001	0.003	0.004	0.002	<0.001	0.003	-
	Chromium	mg/L	0.001	0.001	0.002	0.001	<0.001	0.002	0.001[CIH]
	Cobalt	mg/L	0.001	0.001	0.001	0.001	<0.001	0.001	ID
	Copper	mg/L	0.001	0.002	0.002	0.001	<0.001	0.002	0.0014[H]
	Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Erbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Europium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-

Lab Parameters	Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
			NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Gallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Holmium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Iron	mg/L	0.050	1.14	1.84	1.20	0.28	2.12	ID
Indium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Lanthanum	mg/L	0.001	0.001	0.002	0.001	<0.001	0.002	ID
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0034[H]
Lithium	mg/L	0.001	<0.001	<0.001	0.002	<0.001	0.004	-
Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Manganese	mg/L	0.001	0.044	0.082	0.086	0.065	0.106	1.9[C]
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0006
Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Neodymium	mg/L	0.001	0.002	0.003	0.001	<0.001	0.002	-
Nickel	mg/L	0.001	0.002	0.002	0.002	<0.001	0.003	0.011[H]
Praseodymium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Rubidium	mg/L	0.001	0.003	0.002	0.005	0.003	0.007	-

Lab Parameters	Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
			NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
Samarium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011[Be]
Silver^	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00005
Strontium	mg/L	0.001	0.033	0.023	0.182	0.046	0.318	-
Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
Terbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Thallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Thorium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Thulium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Tin	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Titanium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Uranium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ID
Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Yttrium	mg/L	0.001	0.001	0.002	0.001	<0.001	0.001	-
Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
Zinc	mg/L	0.005	0.009	0.009	0.008	<0.005	0.013	0.008[H]

Lab Parameters		Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
				NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
Dissolved Metals	Aluminium	mg/L	0.01	0.20	0.32	0.03	<0.01	0.061	0.055[A]
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Arsenic	mg/L	0.001	<0.001	<0.001	0.001	<0.001	0.003	0.013[I]
	Barium	mg/L	0.001	0.024	0.027	0.084	0.031	0.110	-
	Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Boron	mg/L	0.05	<0.05	<0.05	0.08	<0.05	0.16	0.37[C]
	Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0002[H]
	Caesium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Cerium	mg/L	0.001	0.002	0.003	0.001	<0.001	0.002	-
	Chromium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001[CIH]
	Cobalt	mg/L	0.001	0.001	0.001	0.001	<0.001	0.001	ID
	Copper	mg/L	0.001	0.001	0.001	0.001	<0.001	0.002	0.0014[H]
	Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Erbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Europium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-

Lab Parameters	Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
			NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
			One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
Gallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
Holmium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Iron	mg/L	0.05	0.61	1.22				ID
Indium	mg/L	0.001	<0.001	<0.001				-
Lanthanum	mg/L	0.001	0.001	0.002	0.001	<0.001	0.001	ID
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0034[H]
Lithium	mg/L	0.001	<0.001	<0.001	0.004	<0.001	0.011	-
Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Manganese	mg/L	0.001	0.048	0.094	0.116	0.047	0.213	1.9[C]
Mercury	mg/L	0.0001	<0.0001	<0.0001				0.0006
Molybdenum	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
Neodymium	mg/L	0.001	0.002	0.003	0.001	<0.001	0.002	-
Nickel	mg/L	0.001	<0.001	0.002	0.001	<0.001	0.002	0.011[H]
Praseodymium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
Rubidium	mg/L	0.001	0.002	0.001	0.006	0.002	0.008	-
Samarium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-

Lab Parameters		Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
				NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
	Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.011[Be]
	Silver^	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.00005
	Strontium	mg/L	0.001	0.035	0.026	0.561	0.047	1.200	-
	Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
	Terbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Thallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Thorium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Thulium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Tin	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID
	Titanium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
	Uranium	mg/L	0.001	<0.001	<0.001	0.001	<0.001	0.001	ID
	Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ID
	Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-
	Yttrium	mg/L	0.001	<0.001	0.002	0.001	<0.001	0.001	-
	Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-
	Zinc	mg/L	0.005	<0.005	<0.005	0.003	<0.005	0.005	0.008[H]
Nutrients	Ammonia as N	mg/L	0.01	0.04	0.08	0.05	0.02	0.08	0.9[D]

Lab Parameters		Unit	Laboratory Detection Limit	Site					Water Quality Guidelines
				NOWA7 Bill Creek u/s Wairewa	NOWA8 Hospital Creek u/s Wairewa	NOWA9 Hospital Creek u/s Tostaree			SEPP WoV (2003) Environmental quality objectives - Cleared Hills and Coastal Plains*
				One-off Sampling Event	One-off Sampling Event	Mean	Minimum	Maximum	
	Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-
	Nitrate as N	mg/L	0.01	0.13	0.04	0.02	0.01	0.02	0.7
	Nitrite + Nitrate as N	mg/L	0.01	0.13	0.04	0.02	0.01	0.02	N/A
	Total Kjeldahl Nitrogen as N	mg/L	0.1	<0.1	<0.1	0.14	<0.1	0.40	N/A
	Total Nitrogen as N	mg/L	0.1	0.1	<0.1	0.14	<0.1	0.40	0.6
	Total Phosphorus as P	mg/L	0.01	0.04	0.03	0.05	0.04	0.07	0.045
	Reactive Phosphorus as P	mg/L	0.01	<0.01	<0.01	0.01	<0.01	0.01	-
	Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.007[F]
Coliforms	Total Coliforms	Colonies/100mL	1	16	40	61	0	96	-
	Faecal Coliforms	Colonies/100mL	1	6	44	67	54	86	150[#]

* SEPP Waters of Victoria (2003) Environmental quality objectives for rivers and streams (Cleared hills and coastal plains); T(95%) Metals, T (99%) Non-metals, T (95%) Ammonia.
[A] Aluminium for pH > 6.5;
[B] Chemicals for which bioaccumulation and secondary poisoning effects should be considered.
[C] Figure may not protect key species from acute (and chronic) toxicity. Refer to Section 8.3.7 of ANZECC/ARMCANZ water quality guidelines.
[D] Ammonia as Total ammonia [NH4-N] at pH 8. For changes in trigger value with pH refer to Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[E] for Total Selenium;
[F] Cyanide as un-ionised HCN, measured as [CN]; see Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
[H] Chemicals for which alogorithms have been provided in table 3.4.3 (ANZECC/ARMCANZ Guidelines) to account for the effects of hardness. The values have been calculated
[I] for Arsenic, AsV; for Chromium, CrVI;
ID= Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 (ANZECC/ARMCANZ Guidelines.)
Highlighted values show guideline exceedance. Red highlights show the exceedance of the relevant water quality guidelines.

^ Dissolved and total silver concentrations were all below the detection limit (<0.001 mg/L), however the detection limit was greater than the surface water quality environmental objectives for silver (0.00005 mg/L).

Table B11: Baseline field monitoring water quality results for NOWA5 and NOWA10^.

Field Parameters		Unit	Site						Water Quality Guidelines	
			NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
			Mean	Minimum	Maximum	Mean	Minimum	Maximum		
General Parameters	pH	pH Unit	7.05	6.05	7.64	7.13	6.57	7.48	6.9-8.3	7.0-8.5
	Electrical Conductivity (Lab)	µS/cm	41,048	894	56,700	45,550	15,900	57,200	-	-
	ORP	mV	147	105	237	200	157	260	-	-
	Turbidity	NTU	6.95	0.00	24.00	14.35	0.00	55.00	18	0.5-10
	Dissolved O_2 l	mg/L (% saturation)	7.8 (81.29%)	5.4 (66.8%)	14 (122%)	7.29 (75.75%)	5.78 (57.19%)	8.8 (95.06%)	70-110%	80-110%
	Temperature	°C	17.14	9.40	26.30	17.00	10.10	24.30	-	-

* Water Quality Guidelines for Victorian Riverine Esuaries - Single-sample at surface.
# Estuaries of South-east Australia (ANZECC/ARMCANZ, 2000).
l = dissolved oxygen values were derived from daytime measurements. Dissolved oxygen concentrations may vary diurnally and with depth. Monitoring programs should assess this potential variability
Highlighted values show guideline exceedance. Red highlights show the exceedance of both ANZECC Aquatic Ecosystems (estuaries) and VIC Riverine Estuaries guidelines. Orange highlights show the exceedance of the ANZECC Aquatic Ecosystems (estuaries) guidelines only. Yellow highlights show the exceedance of the VIC Riverine Estuaries. If printed in black and white these colours correspond to dark, medium and light shades respectively.

Table B12: Baseline laboratory sample water quality results for NOWA5 and NOWA10^.

Lab Parameters		Unit	Laboratory Detection Limit	Site						Water Quality Guidelines	
				NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
				Mean	Minimum	Maximum	Mean	Minimum	Maximum		
General Parameters	pH (Lab)	pH Unit	-	7.22	6.46	7.53	7.33	6.82	7.54	6.9-8.3	7-8.5
	Electrical Conductivity (Lab)	µS/cm	1	41,049	894	56,700	45,550	15,900	57,200	-	-
	Total Alkalinity as CaCO3	mg/L	1	79.50	9.00	111.00	86.75	34.00	112.00	-	-
	Hydroxide Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	-	-
	Carbonate Alkalinity as CaCO3	mg/L	1	<1	<1	<1	<1	<1	<1	-	-
	Bicarbonate Alkalinity as CaCO3	mg/L	1	79.50	9.00	111.00	86.75	34.00	112.00	-	-
	Oil and Grease	mg/L	5	<5	<5	<5	<5	<5	<5	ID	ID
Major Ions	Sodium	mg/L	1	7,526	125	10,400	8,388	2,550	10,600	-	-
	Magnesium	mg/L	1	1,024	17	1,540	1,144	357	1,630	-	-
	Potassium	mg/L	1	353	6	510	384	118	549	-	-
	Calcium	mg/L	1	330	8	469	340	102	502	-	-
	Chloride	mg/L	1	13,964	257	19,700	16,168	5,470	21,200	-	-
	Fluoride	mg/L	1	1.30	<0.1	1.70	0.93	0.40	1.10	-	-
	Sulfate as SO4	mg/L	1	1,943	43	2,640	2,253	750	2,820	-	-
Total Metals	Aluminium	mg/L	0.01	0.49	0.10	0.87	0.44	<0.01	0.87	ID	ID
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
	Arsenic	mg/L	0.001	0.003	<0.001	0.006	0.004	0.002	0.005	ID	ID
	Barium	mg/L	0.001	0.037	0.030	0.043	0.039	0.028	0.050	-	-
	Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID

Lab Parameters	Unit	Laboratory Detection Limit	Site						Water Quality Guidelines	
			NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
			Mean	Minimum	Maximum	Mean	Minimum	Maximum		
Bismuth	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
Boron	mg/L	0.05	1.39	0.06	2.71	1.97	1.05	2.88	ID	ID
Cadmium	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0007[BH]	0.0007[BH]
Caesium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Cerium	mg/L	0.001	0.003	<0.001	0.006	0.002	<0.001	0.004	-	-
Chromium	mg/L	0.001	0.010	0.002	0.017	0.011	0.002	0.019	0.00014[I]	0.00014[I]
Cobalt	mg/L	0.001	0.0015	0.001	0.002	0.001	0.001	0.001	0.000005	0.000005
Copper	mg/L	0.001	0.005	0.002	0.008	0.006	0.004	0.007	0.0003[H]	0.0003[H]
Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Erbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Europium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Gallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
Hafnium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Holmium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Indium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Iron	mg/L	0.05	1.05	<0.05	2.07	0.52	<0.05	1.02	ID	ID
Lanthanum	mg/L	0.001	0.001	<0.001	0.002	0.001	<0.001	0.001	ID	ID
Lead	mg/L	0.001	0.001	<0.001	0.002	0.001	<0.001	0.001	0.0022[H]	0.0022[H]
Lithium	mg/L	0.001	0.136	0.003	0.269	0.164	0.045	0.282	-	-

Lab Parameters	Unit	Laboratory Detection Limit	Site						Water Quality Guidelines	
			NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
			Mean	Minimum	Maximum	Mean	Minimum	Maximum		
Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Manganese	mg/L	0.001	0.021	0.019	0.023	0.026	0.014	0.037	ID	ID
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001[B]	0.0001[B]
Molybdenum	mg/L	0.001	0.007	<0.001	0.014	0.010	0.004	0.015	ID	ID
Neodymium	mg/L	0.001	0.001	<0.001	0.002	0.001	<0.001	0.002	-	-
Nickel	mg/L	0.001	0.001	<0.001	0.002	0.001	<0.001	0.002	0.007[H]	0.007[H]
Praseodymium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Rubidium	mg/L	0.001	0.068	0.006	0.129	0.085	0.032	0.138	-	-
Samarium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Selenium	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ID	ID
Silver^	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0008	0.0008
Strontium	mg/L	0.001	4.25	0.10	8.41	5.53	1.86	9.20	-	-
Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-
Terbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Thallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
Thorium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Thulium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Tin	mg/L	0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	ID	ID
Titanium	mg/L	0.01	0.01	<0.01	0.01	<0.01	<0.01	<0.01	-	-
Uranium	mg/L	0.001	0.002	<0.001	0.003	0.002	<0.001	0.003	ID	ID

Lab Parameters		Unit	Laboratory Detection Limit	Site						Water Quality Guidelines	
				NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
				Mean	Minimum	Maximum	Mean	Minimum	Maximum		
	Vanadium	mg/L	0.01	<0.01	<0.01	<0.01	0.01	<0.01	0.01	0.05	0.05
	Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	0.001	<0.001	0.001	-	-
	Yttrium	mg/L	0.001	0.001	<0.001	0.002	0.001	<0.001	0.001	-	-
	Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-
	Zinc	mg/L	0.005	0.005	<0.005	0.008	0.009	0.008	0.009	0.007	0.007
Dissolved Metals	Aluminium	mg/L	0.010	1.890	1.890	1.890	0.440	0.010	0.870	ID	ID
	Antimony	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
	Arsenic	mg/L	0.001	0.002	<0.001	0.005	0.003	<0.001	0.006	ID	ID
	Barium	mg/L	0.001	0.039	0.032	0.043	0.037	0.032	0.046	-	-
	Beryllium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
	Bismuth	mg/L	0.001	0.0006	<0.001	0.001	<0.001	<0.001	<0.001	ID	ID
	Boron	mg/L	0.050	3.00	0.06	4.79	3.40	1.05	5.08	ID	ID
	Cadmium	mg/L	0.0001	0.0001	<0.0001	0.0001	0.0001	<0.0001	0.0001	0.0007[BH]	0.0007[BH]
	Caesium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
	Cerium	mg/L	0.001	0.001	<0.001	0.004	0.001	<0.001	0.002	-	-
	Chromium	mg/L	0.001	0.005	<0.001	0.019	0.006	<0.001	0.016	0.00014[I]	0.00014[I]
	Cobalt	mg/L	0.001	0.001	<0.001	0.001	0.001	<0.001	0.001	0.000005	0.000005
	Copper	mg/L	0.001	0.004	<0.001	0.007	0.005	<0.001	0.008	0.0003[H]	0.0003[H]
	Dysprosium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
	Erbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-

Lab Parameters	Unit	Laboratory Detection Limit	Site						Water Quality Guidelines	
			NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
			Mean	Minimum	Maximum	Mean	Minimum	Maximum		
Europium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Gadolinium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Gallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
Hafnium	mg/L	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
Holmium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Indium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Iron	mg/L	0.050	0.180	<0.05	0.650	0.133	<0.05	0.350	ID	ID
Lanthanum	mg/L	0.001	0.001	<0.001	0.002	0.001	<0.001	0.001	ID	ID
Lead	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0022[H]	0.0022[H]
Lithium	mg/L	0.001	0.163	0.002	0.234	0.180	0.046	0.273	-	-
Lutetium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Manganese	mg/L	0.001	0.030	0.016	0.045	0.031	0.024	0.034	ID	ID
Mercury	mg/L	0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	0.0001[B]	0.0001[B]
Molybdenum	mg/L	0.001	0.011	0.011	0.012	0.010	0.004	0.013	ID	ID
Neodymium	mg/L	0.001	0.001	<0.001	0.002	0.001	<0.001	0.001	-	-
Nickel	mg/L	0.001	0.001	<0.001	0.001	0.001	<0.001	0.002	0.007[H]	0.007[H]
Praseodymium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Rubidium	mg/L	0.001	0.095	0.003	0.129	0.098	0.029	0.134	-	-
Samarium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
Selenium	mg/L	0.010	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ID	ID

Lab Parameters		Unit	Laboratory Detection Limit	Site						Water Quality Guidelines	
				NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
				Mean	Minimum	Maximum	Mean	Minimum	Maximum		
	Silver^	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.0008	0.0008
	Strontium	mg/L	0.001	6.19	0.10	8.70	6.32	1.92	8.64	-	-
	Tellurium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-
	Terbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
	Thallium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
	Thorium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
	Thulium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
	Tin	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	ID	ID
	Titanium	mg/L	0.010	0.010	<0.01	0.020	0.010	<0.01	0.020	-	-
	Uranium	mg/L	0.001	0.002	<0.001	0.003	0.001	<0.001	0.003	ID	ID
	Vanadium	mg/L	0.010	0.01	<0.01	0.02	0.01	<0.01	0.02	0.05	0.05
	Ytterbium	mg/L	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
	Yttrium	mg/L	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	-	-
	Zirconium	mg/L	0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	-	-
	Zinc	mg/L	0.005	0.005	<0.005	0.006	0.005	<0.005	0.009	0.007[H]	0.007[H]
Nutrients	Ammonia as N	mg/L	0.01	0.07	0.01	0.12	0.09	<0.01	0.14	0.5[D]	0.015
	Nitrite as N	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	-	-
	Nitrate as N	mg/L	0.01	0.03	<0.01	0.10	0.02	<0.01	0.06	ID	-
	Nitrite + Nitrate as N	mg/L	0.01	0.03	<0.01	0.10	0.02	<0.01	0.06	-	0.015
	Total Kjeldahl Nitrogen as N	mg/L	0.1	0.1	<0.1	0.1	0.1	<0.1	0.2	-	-

Lab Parameters		Unit	Laboratory Detection Limit	Site						Water Quality Guidelines	
				NOWA5 Lake Tyers at Nowa Nowa			NOWA10 Lake Tyers below Ironstone creek			Water Quality Guidelines for Victorian Riverine Estuaries (EPA, 2011) *	ANZECC / ARMCANZ Aquatic Ecosystems (Estuaries)#
				Mean	Minimum	Maximum	Mean	Minimum	Maximum		
	Total Nitrogen as N	mg/L	0.1	0.1	<0.1	0.1	0.1	<0.1	0.2	1.5	0.3
	Total Phosphorus as P	mg/L	0.01	0.06	0.04	0.08	0.04	0.03	0.08	0.1	0.03
	Reactive Phosphorus as P	mg/L	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	N/A	0.005
	Total Cyanide	mg/L	0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	0.002[F]	0.002[F]
Coliforms	Total Coliforms	Colonies/100mL	1	23	0	56	22	0	35	-	-
	Faecal Coliforms	Colonies/100mL	1	20	10	38	20	<2	36	≤150[#]	-

* Water Quality Guidelines for Victorian Riverine Esuaries - Single-sample at surface; T(99%) species protection in marine water (ANZECC, 2000) used for toxicants.
# Estuaries of South-east Australia; T(99%) species protection in marine water (ANZECC, 2000) used for dissolved metals, NH3 and NO3.
B Chemicals for which bioaccumulation and secondary poisoning effects should be considered.
D Ammonia as Total ammonia [NH4-N] at pH 8. For changes in trigger value with pH refer to Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
F Cyanide as un-ionised HCN, measured as [CN]; see Section 8.3.7.2 (ANZECC/ARMCANZ guidelines).
H Chemicals for which alogorithms have been provided in table 3.4.3 (ANZECC/ARMCANZ Guidelines) to account for the effects of hardness. The values have been calculated using a hardness of 30 mg/L CaCO3. These should be adjusted to the site specific hardness.
I for Arsenic, AsV; for Chromium, CrVI;
# E.coli guideline for primary contact, SEPP Waters of Victoria (2003).
ID= Insufficient data to derive a reliable trigger value. Users advised to check if a low reliability value or an ECL is given in Section 8.3.7 (ANZECC/ARMCANZ Guidelines.)
Highlighted values show guideline exceedance. Red highlights show the exceedance of both ANZECC Aquatic Ecosystems (estuaries) and VIC Riverine Estuaries guidelines. Orange highlights show the exceedance of the ANZECC Aquatic Ecosystems (estuaries) guidelines only. Green highlights show the exceedance of the VIC Riverine Estuaries. If printed in black and white these colours correspond to dark, light and medium shades respectively.
^ Dissolved and total silver concentrations were all below the detection limit (<0.001 mg/L), however the detection limit was greater than the surface water quality environmental objectives for silver (0.0008 mg/L).

Annex D
Surface and groundwater laboratory analyses

CERTIFICATE OF ANALYSIS

Work Order	: **EM1209515**	Page	: 1 of 5
Client	: **EARTH SYSTEMS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR NIGEL MURPHY	Contact	: Client Services
Address	: SUITE 17 79-83 HIGH STREET KEW VIC, AUSTRALIA 3101	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: nigel.murphy@earthsystems.com.au	E-mail	: Melbourne.Enviro.Services@alsglobal.com
Telephone	: +61 03 9810 7500	Telephone	: +61-3-8549 9600
Facsimile	: +61 03 9853 5030	Facsimile	: +61-3-8549 9601
Project	: NOWAN1202	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: NOWAN1202		
C-O-C number	: ----	Date Samples Received	: 20-AUG-2012
Sampler	: NM	Issue Date	: 27-AUG-2012
Site	: ----		
		No. of samples received	: 3
Quote number	: MEBQ/112/12	No. of samples analysed	: 3

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
Varsha Ho Wing	Non-Metals Team Leader	Melbourne Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.**
- **ED037-P : EM1209515-001 duplicate failed for Alkalinity due to possible sample interference. This has been confirmed by re-analysis.**
- **Ionic Balance out of acceptable limits for EM1209515 #1 due to analytes not quantified in this report.**
- **Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.**
- **Samples were filtered through a 0.45um filter prior to the dissolved metals analysis.**

Analytical Results

Sub-Matrix: **WATER**

Compound	CAS Number	LOR	Unit	Client sample ID: Nowa1	Nowa2	Nowa3	----	----
				Client sampling date / time: 17-AUG-2012 15:00	17-AUG-2012 15:00	17-AUG-2012 15:00	----	----
				EM1209515-001	EM1209515-002	EM1209515-003	----	----
EA005: pH								
pH Value	----	0.01	pH Unit	**7.19**	**6.51**	**4.64**	----	----
EA006: Sodium Adsorption Ratio (SAR)								
Sodium Absorption Ratio	----	0.01	-	**3.65**	**2.43**	**2.46**	----	----
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	----	1	µS/cm	**634**	**477**	**360**	----	----
EA016: Non Marine - Estimated TDS Salinity								
Total Dissolved Solids (Calc.)	----	10	mg/L	**412**	**310**	**234**	----	----
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	----	1	mg/L	**102**	**80**	**43**	----	----
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L	<1	<1	<1	----	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L	<1	<1	<1	----	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L	**61**	**12**	<1	----	----
Total Alkalinity as CaCO3	----	1	mg/L	**61**	**12**	<1	----	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L	**12**	**10**	**30**	----	----
ED045G: Chloride Discrete analyser								
Chloride	16887-00-6	1	mg/L	**178**	**133**	**72**	----	----
ED093F: Dissolved Major Cations								
Calcium	7440-70-2	1	mg/L	**13**	**4**	**4**	----	----
Magnesium	7439-95-4	1	mg/L	**17**	**17**	**8**	----	----
Sodium	7440-23-5	1	mg/L	**85**	**50**	**37**	----	----
Potassium	7440-09-7	1	mg/L	**4**	**2**	**3**	----	----
EG020F: Dissolved Metals by ICP-MS								
Aluminium	7429-90-5	0.01	mg/L	**0.08**	**0.11**	**0.78**	----	----
Dysprosium	7429-91-6	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Silver	7440-22-4	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Arsenic	7440-38-2	0.001	mg/L	<0.001	<0.001	**0.004**	----	----
Bismuth	7440-69-9	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Erbium	7440-52-0	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Boron	7440-42-8	0.05	mg/L	**0.10**	<0.05	<0.05	----	----
Europium	7440-53-1	0.001	mg/L	<0.001	<0.001	<0.001	----	----
Strontium	7440-24-6	0.001	mg/L	**0.128**	**0.061**	**0.029**	----	----
Barium	7440-39-3	0.001	mg/L	**0.070**	**0.046**	**0.052**	----	----
Gadolinium	7440-54-2	0.001	mg/L	<0.001	<0.001	<0.001	----	----

Analytical Results

Sub-Matrix: WATER				Client sample ID	Nowa1	Nowa2	Nowa3	----	----
				Client sampling date / time	17-AUG-2012 15:00	17-AUG-2012 15:00	17-AUG-2012 15:00	----	----
Compound	CAS Number	LOR	Unit		EM1209515-001	EM1209515-002	EM1209515-003	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Gallium	7440-55-3	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	**0.0001**	----	----
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	----	----
Cobalt	7440-48-4	0.001	mg/L		<0.001	<0.001	**0.016**	----	----
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Chromium	7440-47-3	0.001	mg/L		**0.001**	<0.001	<0.001	----	----
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Copper	7440-50-8	0.001	mg/L		**0.002**	**0.001**	**0.008**	----	----
Lanthanum	7439-91-0	0.001	mg/L		<0.001	**0.001**	**0.001**	----	----
Rubidium	7440-17-7	0.001	mg/L		**0.003**	**0.001**	**0.003**	----	----
Lithium	7439-93-2	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Cerium	7440-45-1	0.001	mg/L		**0.001**	**0.003**	**0.004**	----	----
Manganese	7439-96-5	0.001	mg/L		**0.024**	**0.044**	**0.078**	----	----
Neodymium	7440-00-8	0.001	mg/L		<0.001	**0.001**	**0.002**	----	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Nickel	7440-02-0	0.001	mg/L		**0.001**	<0.001	**0.003**	----	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	----	----
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	**0.003**	----	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	----	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	----	----
Vanadium	7440-62-2	0.01	mg/L		**0.02**	**0.02**	**0.02**	----	----
Zinc	7440-66-6	0.005	mg/L		<0.005	<0.005	**0.008**	----	----

Analytical Results

Sub-Matrix: WATER				Client sample ID	Nowa1	Nowa2	Nowa3	----	----
				Client sampling date / time	17-AUG-2012 15:00	17-AUG-2012 15:00	17-AUG-2012 15:00	----	----
Compound	CAS Number	LOR	Unit		EM1209515-001	EM1209515-002	EM1209515-003	----	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Iron	7439-89-6	0.05	mg/L		0.99	0.67	0.96	----	----
EK040P: Fluoride by PC Titrator									
Fluoride	16984-48-8	0.1	mg/L		<0.1	<0.1	0.1	----	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		0.07	0.04	<0.01	----	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		0.07	0.04	<0.01	----	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		0.2	<0.1	0.4	----	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		0.3	<0.1	0.4	----	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		0.01	<0.01	0.02	----	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	----	0.01	mg/L		<0.01	<0.01	<0.01	----	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		6.49	4.20	2.66	----	----
Total Cations	----	0.01	meq/L		5.85	3.82	2.54	----	----
Ionic Balance	----	0.01	%		5.22	4.68	2.15	----	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1301899**	uaPe	q1 : oT
Client	g **EARTH SYSTEMS PTY LTD**	f aL: bat: by	g Envib nmental Divisi: n MelL: cbne
C: ntaRt	q MN NI GENU uHCCHYHY	C: ntaRt	q Client SebviRes
Addbess	q S7 HUE 1- - 5892 3HK3 SUNEEU WEV , HC4A7 SUNAf HA 2101	Addbess	q p V estall Nd S. binPvale , HC Acstbalia 21- 1
E8mail	q b Lebtr. iRRninh eabt@ystemsrR mrac	E8mail	q MelL: cbnerEnvib rSebviResh alsPl: LalrR m
Uele. @ne	q +T1 02 5910 - 600	Uele. @ne	q +T182896p5 5T00
FaRsimile	q +T1 02 5962 6020	FaRsimile	q +T182896p5 5T01
ub jeRt	q YI V AY1C0O	QC f evel	q YEuM 1555 SR@edcle GB2(and Af S QCS2 be) cibement
I bdebncmLeb	q YI V AY1C0O		
C8 8C ncmLeb	q 8888	Date Sam. les NeReived	g C68FEG8C012
Sam. leb	q Nu	Hsisce Date	q 0p8MAN8C012
Site	q 8888		
		Y: r : osam. les beReived	gp
Qc: te ncmLeb	q MEGQq1OqlO	Y: r : osam. les analysed	gp

U@s be. : bt sc. ebsedes any . bevi: cs be. : btBs(/ it@ t@s beoebenRer Nesclts a. . ly t: t@e sam. leBs(as scLmittedr All . aPes : o t@s be. : bt @ave Leen R@eRved and a. . b ved o b beleaser

U@s CetbioRate : oAnalysis R ntains t@e o ll: / inP ino bmati: ng

- K enebal C: mments
- AnalytiRal Nesclts

uaPe	g O: oT
V : bvI bdeb	g EM1201955
Client	g EANU3 Sk SUEMS uUk f UD
ub: jeRt	g YI V AY1C0O

General Comments

U@e analytiRal . b: Redcbes csed Ly t@e Envib: nmental Divisi: n @ave Leen devel: . ed do m estaLlis@ed intebnati: nally beR Pnized . b: Redcbes scR@ as t@se . cLlis@ed Ly t@e 7SEuA4 Au3A4 AS and YEuMr Hh @cse devel: . ed . b: Redcbes abe em. l: yed in t@e aLsenRe : od: Rcmented standabds : bLy Rient be) cestr

V @ebe m: istcbe detebminati: n @as Leen . ebo bmed4bescIts abe be. : bted : n a dby / eiP@Lasisr

V @ebe a be. : bted less t@an Bx(bescIt is @P@ebt@an t@e f I N4t@s may Le dce t: . bimaby sam. le e<tbaRtqdiPestate dilcti: n andq binscoiRent sam. le o banalysisr

V @ebe t@e f I N : oa be. : bted bescIt dicoebs do: m standabd f I N4t@s may Le dce t: @P@m: istcbe R ntent4inscoiRent sam. le BbedcRed / eiP@em. l: yed(: bmatbi< intebcebenRer

V @en sam. linP time inob mati: n is n: t . b: vided Ly t@e Rient4sam. linP dates abe s@/ n / it@ct a time R m. : nentr Hh t@se instanRes4t@e time R m. : nent @as Leen asscmed Ly t@e laL: bat: by o b. b: RessinP . cb. : sesr

Wey g CAS YcmLeb= CAS bePistby ncmLebdo: m dataLase maintained Ly C@emiRal ALstbaRts SebviResr U@e C@emiRal ALstbaRts SebviRe is a divisi: n : ot@e AmebiRan C@emiRal S: Retyr
f I N = f imit : obe. : btinP
^ = U@s bescIt is R m. cted do m individcal analyte deteRti: ns at : baL: ve t@e level : obe. : btinP

- **EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.**
- **EK067G: LOR has been raised for Total Phosphorus as P due to laboratory background observed in the Method Blank**
- **Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.**

YAUA ARRedited f aL: bat: by 9C6

ARRedited a bR m. lianRe / it@ HSI dfEC 1- 0C6r

Signatories

U@s d: Rcment @as Leen eleRtb niRally siPned Ly t@e act@bized siPnat: bies indiRated Lel: / r EleRtb niR siPninP @as Leen Rabbied : ct in R m. lianRe / it@. b: Redcbes s. eRoied in O1 CFN uabt 11r

Signatories	*Position*	*Accreditation Category*
Dilani Febnand:	Seni: b Hh: bPaniRC@emist	MelL: cbne Hh: bPaniRs
EbiRC@ac	Metals Ueam f eadeb	MelL: cbne Hh: bPaniRs
Yiwwi Ste. nie/ swi	Seni: b Hh: bPaniR Hhstbcment C@emist	MelL: cbne Hh: bPaniRs
, abs@a 3 : V inP	Y: n8Metals Ueam f eadeb	MelL: cbne Hh: bPaniRs MelL: cbne Hh: bPaniRs MelL: cbne Hh: bPaniRs

u aPe	g 2 : oT
V : bvl bdeb	g EM1201955
Client	g EANU3 Sk SUEMS u Uk f UD
u b: jeR	g YI V AY1C0O

Analytical Results

ScL8Matbi<: **WATER** (Matbi<: **WATER**)

				Client sample ID	Nowa5	Nowa6	Nowa9	Nowa10	8888
				Client sampling date / time	O18FEG8C012 16g00	O18FEG8C012 16g00	O18FEG8C012 16g00	CC8FEG8C012 16g00	8888
Compound	*CAS Number*	*LOR*	*Unit*		**EM1301899-001**	**EM1301899-002**	**EM1301899-003**	**EM1301899-004**	----
EA005: pH									
pH Value	8888	0r01	. 3 7 nit		**7.53**	**8.11**	**7.92**	**7.47**	8888
EA006: Sodium Adsorption Ratio (SAR)									
Sodium Adsorption Ratio	8888	0r01	8		**53.1**	**3.91**	**6.31**	**53.9**	8888
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	8888	1	µSqRm		**51900**	**1040**	**2090**	**54100**	8888
EA016: Non Marine - Estimated TDS Salinity									
Total Dissolved Solids (Calc.)	8888	10	mPqf		**33700**	**676**	**1360**	**35200**	8888
EA025: Suspended Solids									
Suspended Solids (SS)	8888	6	mPqf		**12**	x6	x6	**38**	8888
EA045: Turbidity									
Turbidity	8888	0r1	YU7		**3.8**	**0.9**	**4.4**	**2.4**	8888
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	8888	1	mPqf		**6040**	**173**	**339**	**6390**	8888
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMI 8O108001	1	mPqf		x1	x1	x1	x1	8888
Carbonate Alkalinity as CaCO3	291O82O8T	1	mPqf		x1	x1	x1	x1	8888
Bicarbonate Alkalinity as CaCO3	- 186O82	1	mPqf		**111**	**55**	**245**	**112**	8888
Total Alkalinity as CaCO3	8888	1	mPqf		**111**	**55**	**245**	**112**	8888
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	1p9098-589	1	mPqf		**2460**	**22**	**7**	**2720**	8888
ED045G: Chloride Discrete analyser									
Chloride	1T99-8008T	1	mPqf		**18600**	**282**	**542**	**20200**	8888
ED093F: Dissolved Major Cations									
Calcium	- pp08-08O	1	mPqf		**374**	**18**	**68**	**400**	8888
Magnesium	- p25856p	1	mPqf		**1240**	**31**	**41**	**1310**	8888
Sodium	- pp08O286	1	mPqf		**9480**	**118**	**267**	**9900**	8888
Potassium	- pp08058-	1	mPqf		**421**	**7**	**8**	**428**	8888
EG020F: Dissolved Metals by ICP-MS									
Aluminium	- pO585086	0r01	mPqf		x0r01	**0.01**	x0r01	**0.01**	8888
Dysprosium	- pO58518T	0r001	mPqf		x0r001	x0r001	x0r001	x0r001	8888
Silver	- pp08CO9p	0r001	mPqf		x0r001	x0r001	x0r001	x0r001	8888
Arsenic	- pp08298O	0r001	mPqf		**0.005**	**0.002**	**0.003**	**0.006**	8888
Bismuth	- pp08T585	0r001	mPqf		**0.001**	x0r001	x0r001	x0r001	8888

Analytical Results

ScL8Matbi<: **WATER** (Matbi<: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: Nowa5	Nowa6	Nowa9	Nowa10	8888
			Client sampling date / time	O18FEG8O012 16g00	O18FEG8O012 16g00	O18FEG8O012 16g00	CO8FEG8O012 16g00	8888
				EM1301899-001	**EM1301899-002**	**EM1301899-003**	**EM1301899-004**	----
EG020F: Dissolved Metals by ICP-MS - Continued								
Erbium	- pp086O80	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Boron	- pp08pO89	0r06	mPqf	**3.74**	**0.51**	**0.16**	**4.06**	8888
Europium	- pp08628l	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Strontium	- pp08Op8T	0r001	mPqf	**7.57**	**0.306**	**1.20**	**8.40**	8888
Barium	- pp08258Z	0r001	mPqf	**0.043**	**0.098**	**0.110**	**0.034**	8888
Gadolinium	- pp086p8O	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Titanium	- pp08Z08T	0r01	mPqf	**0.02**	x0r01	x0r01	**0.02**	8888
Beryllium	- pp08p18-	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Gallium	- pp086682	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Cadmium	- pp08p285	0r0001	mPqf	**0.0001**	x0r0001	x0r0001	**0.0001**	8888
Hafnium	- pp0869 8T	0r01	mPqf	x0r01	x0r01	x0r01	x0r01	8888
Tellurium	CO6p18p58-	0r006	mPqf	x0r006	x0r006	x0r006	x0r006	8888
Cobalt	- pp08p98p	0r001	mPqf	x0r001	x0r001	x0r001	**0.001**	8888
Holmium	- pp08T080	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Uranium	- pp08T181	0r001	mPqf	**0.002**	x0r001	**0.001**	**0.003**	8888
Caesium	- pp08pT8O	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Chromium	- pp08p- 82	0r001	mPqf	**0.019**	x0r001	x0r001	**0.016**	8888
Indium	- pp08- p8T	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Copper	- pp086089	0r001	mPqf	**0.007**	**0.002**	**0.001**	**0.008**	8888
Lanthanum	- p2585180	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Rubidium	- pp081 - 8-	0r001	mPqf	**0.122**	**0.008**	**0.008**	**0.134**	8888
Lithium	- p2585280	0r001	mPqf	**0.234**	**0.016**	**0.011**	**0.273**	8888
Lutetium	- p2585p82	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Thorium	- pp08O581	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Cerium	- pp08p681	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Manganese	- p2585T86	0r001	mPqf	**0.040**	**0.011**	**0.047**	**0.024**	8888
Neodymium	- pp080089	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Molybdenum	- p258598-	0r001	mPqf	**0.011**	x0r001	x0r001	**0.013**	8888
Praseodymium	- pp081080	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Nickel	- pp080O80	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Samarium	- pp08158 5	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Lead	- p2585O81	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Terbium	- pp08O- 85	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888
Antimony	- pp082T80	0r001	mPqf	x0r001	x0r001	x0r001	x0r001	8888

uaPe	g 6 : oT
V : bvl bdeb	g EM1201955
Client	g EANU3 Sk SUEMS uUk f UD
ub: jeR:	g YI V AY1C0O

Analytical Results

ScL8Matbi<: **WATER** (Matbi<: **WATER**)

	Client sample ID	Nowa5	Nowa6	Nowa9	Nowa10	8888
	Client sampling date / time	O18FEG8O012 16g00	O18FEG8O012 16g00	O18FEG8O012 16g00	CO8FEG8O012 16g00	8888
Compound	CAS Number / LOR / Unit	EM1301899-001	EM1301899-002	EM1301899-003	EM1301899-004	----
EG020F: Dissolved Metals by ICP-MS - Continued						
Thulium	- pp08208p 0r001 mPqf	x0r001	x0r001	x0r001	x0r001	8888
Selenium	- - 9O8p58O 0r01 mPqf	x0r01	x0r01	x0r01	x0r01	8888
Ytterbium	- pp08Tp8p 0r001 mPqf	x0r001	x0r001	x0r001	x0r001	8888
Tin	- pp082186 0r001 mPqf	x0r001	x0r001	x0r001	x0r001	8888
Yttrium	- pp08T686 0r001 mPqf	x0r001	x0r001	x0r001	x0r001	8888
Thallium	- pp08O980 0r001 mPqf	x0r001	x0r001	x0r001	x0r001	8888
Zirconium	- pp08T-8. 0r006 mPqf	x0r006	x0r006	x0r006	x0r006	8888
Vanadium	- pp08TO8O 0r01 mPqf	**0.02**	x0r01	x0r01	**0.02**	8888
Zinc	- pp08TT8T 0r006 mPqf	x0r006	x0r006	x0r006	x0r006	8888
Iron	- p2589 58T 0r06 mPqf	x0r06	**0.09**	x0r06	x0r06	8888
EG035F: Dissolved Mercury by FIMS						
Mercury	- p2585- 8T 0r0001 mPqf	x0r0001	x0r0001	x0r0001	x0r0001	8888
EK040P: Fluoride by PC Titrator						
Fluoride	1T59p8p989 0r1 mPqf	**1.7**	**0.2**	**0.5**	**1.1**	8888
EK055G: Ammonia as N by Discrete Analyser						
Ammonia as N	- TTp8p18- 0r01 mPqf	**0.05**	**0.06**	**0.08**	**0.09**	8888
EK057G: Nitrite as N by Discrete Analyser						
Nitrite as N	8888 0r01 mPqf	x0r01	x0r01	x0r01	x0r01	8888
EK058G: Nitrate as N by Discrete Analyser						
Nitrate as N	1p- 5- 86689 0r01 mPqf	**0.01**	**0.03**	**0.01**	x0r01	8888
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser						
Nitrite + Nitrate as N	8888 0r01 mPqf	**0.01**	**0.03**	**0.01**	x0r01	8888
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser						
Total Kjeldahl Nitrogen as N	8888 0r1 mPqf	x0r1	x0r1	x0r1	x0r1	8888
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser						
^ Total Nitrogen as N	8888 0r1 mPqf	x0r1	x0r1	x0r1	x0r1	8888
EK067G: Total Phosphorus as P by Discrete Analyser						
Total Phosphorus as P	8888 0r01 mPqf	**0.07**	**0.05**	**0.05**	x0r02	8888
EK071G: Reactive Phosphorus as P by discrete analyser						
Reactive Phosphorus as P	8888 0r01 mPqf	x0r01	x0r01	x0r01	x0r01	8888
EN055: Ionic Balance						
Total Anions	8888 0r01 me) qf	**578**	**9.51**	**20.3**	**629**	8888
Total Cations	8888 0r01 me) qf	**544**	**8.76**	**18.6**	**569**	8888

Analytical Results

ScL8Matbi<: WATER (Matbi<: WATER)	Client sample ID	Nowa5	Nowa6	Nowa9	Nowa10	8888
	Client sampling date / time	O18FEG8C012 16g00	O18FEG8C012 16g00	O18FEG8C012 16g00	CC8FEG8C012 16g00	8888
Compound CAS Number LOR Unit		EM1301899-001	EM1301899-002	EM1301899-003	EM1301899-004	----
EN055: Ionic Balance - Continued						
Ionic Balance 8888	0r01 %	3.07	4.11	4.49	4.97	8888

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1303943**	Page	: 1 of 6
Client	: **EARTH SYSTEMS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR ROBERT PICCININ	Contact	: Client Services
Address	: SUITE 17 79-83 HIGH STREET KEW VIC, AUSTRALIA 3101	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: robert.piccinin@earthsystems.com.au	E-mail	: Melbourne.Enviro.Services@alsglobal.com
Telephone	: +61 03 9810 7500	Telephone	: +61-3-8549 9600
Facsimile	: +61 03 9853 5030	Facsimile	: +61-3-8549 9601
Project	: NOWA NOWA	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 17-APR-2013
Sampler	: RP	Issue Date	: 26-APR-2013
Site	: ----		
		No. of samples received	: 5
Quote number	: MEBQ/112/12	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.**
- **EG020-F: Metal results for EM1303943 #2 and #5 have been diluted prior to analysis. LORs have been raised accordingly.**
- **EK067G: LOR has been raised for Total Phosphorus as P due to laboratory background observed in the Method Blank**
- **Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.**
- **It is recognised that TKN is less than ammonia for samples #5. However, the difference is within experimental variation of the methods.**
- **Microbiological Analysis performed by ALS Scoresby (NATA Accreditation # 992).**
- **Oil & Grease analysis conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.**

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Danielle White	Administration Assistant	WRG Subcontracting
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
		Melbourne Inorganics
		Melbourne Inorganics
		Melbourne Inorganics
Hoa Nguyen	Senior Inorganic Chemist	Sydney Inorganics
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics
		Melbourne Inorganics
Varsha Ho Wing	Non-Metals Team Leader	Melbourne Inorganics

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	NOWA3	NOWA5	NOWA6	NOWA9	NOWA10
				Client sampling date / time	17-APR-2013 09:05	16-APR-2013 17:10	16-APR-2013 13:50	16-APR-2013 16:30	17-APR-2013 09:45
					EM1303943-001	EM1303943-002	EM1303943-003	EM1303943-004	EM1303943-005
EA005: pH									
pH Value	----	0.01	pH Unit		4.00	7.43	7.55	7.26	7.54
EA006: Sodium Adsorption Ratio (SAR)									
Sodium Adsorption Ratio	----	0.01	-		3.25	54.4	3.80	7.45	58.7
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		1340	54700	767	2250	55000
EA016: Non Marine - Estimated TDS Salinity									
Total Dissolved Solids (Calc.)	----	10	mg/L		871	35600	498	1460	35800
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		8	57	<5	<5	46
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		279	6520	139	327	6160
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	<1
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	105	47	96	106
Total Alkalinity as CaCO3	----	1	mg/L		<1	105	47	96	106
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		256	2630	17	114	2720
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		248	19700	209	634	21200
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		36	469	16	47	357
Magnesium	7439-95-4	1	mg/L		46	1300	24	51	1280
Sodium	7440-23-5	1	mg/L		125	10100	103	310	10600
Potassium	7440-09-7	1	mg/L		8	475	5	10	440
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		4.68	<0.10	0.02	<0.01	<0.10
Dysprosium	7429-91-6	0.001	mg/L		0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Arsenic	7440-38-2	0.001	mg/L		0.002	<0.010	<0.001	0.001	<0.010
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		0.06	4.79	0.05	0.08	5.08

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	NOWA3	NOWA5	NOWA6	NOWA9	NOWA10
				Client sampling date / time	17-APR-2013 09:05	16-APR-2013 17:10	16-APR-2013 13:50	16-APR-2013 16:30	17-APR-2013 09:45
					EM1303943-001	EM1303943-002	EM1303943-003	EM1303943-004	EM1303943-005
EG020F: Dissolved Metals by ICP-MS - Continued									
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**0.109**	**8.70**	**0.146**	**0.695**	**8.64**
Barium	7440-39-3	0.001	mg/L		**0.018**	**0.036**	**0.070**	**0.105**	**0.032**
Gadolinium	7440-54-2	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.10	<0.01	<0.01	<0.10
Beryllium	7440-41-7	0.001	mg/L		**0.006**	<0.010	<0.001	<0.001	<0.010
Gallium	7440-55-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		**0.0003**	<0.0010	<0.0001	<0.0001	<0.0010
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.050	<0.005	<0.005	<0.050
Cobalt	7440-48-4	0.001	mg/L		**0.167**	<0.010	<0.001	<0.001	<0.010
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.087**	<0.010	**0.001**	<0.001	<0.010
Lanthanum	7439-91-0	0.001	mg/L		**0.003**	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.010**	**0.129**	**0.004**	**0.008**	**0.130**
Lithium	7439-93-2	0.001	mg/L		**0.004**	**0.201**	<0.001	**0.004**	**0.221**
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Cerium	7440-45-1	0.001	mg/L		**0.007**	<0.010	<0.001	<0.001	<0.010
Manganese	7439-96-5	0.001	mg/L		**0.810**	**0.045**	**0.003**	**0.213**	**0.034**
Neodymium	7440-00-8	0.001	mg/L		**0.003**	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.011**	<0.001	<0.001	**0.012**
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Nickel	7440-02-0	0.001	mg/L		**0.033**	<0.010	<0.001	**0.002**	<0.010
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.010	<0.001	<0.001	<0.010
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.10	<0.01	<0.01	<0.10

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: NOWA3	NOWA5	NOWA6	NOWA9	NOWA10
				Client sampling date / time: 17-APR-2013 09:05	16-APR-2013 17:10	16-APR-2013 13:50	16-APR-2013 16:30	17-APR-2013 09:45
				EM1303943-001	EM1303943-002	EM1303943-003	EM1303943-004	EM1303943-005
EG020F: Dissolved Metals by ICP-MS - Continued								
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L	<0.001	<0.010	<0.001	<0.001	<0.010
Yttrium	7440-65-5	0.001	mg/L	**0.012**	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L	**0.001**	<0.010	<0.001	<0.001	<0.010
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.10	<0.01	<0.01	<0.10
Zinc	7440-66-6	0.005	mg/L	**0.033**	<0.050	<0.005	<0.005	<0.050
Iron	7439-89-6	0.05	mg/L	**1.89**	<0.50	**0.18**	**0.06**	<0.50
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	<0.004
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.8**	**1.1**	**0.1**	**0.1**	**1.1**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	7664-41-7	0.01	mg/L	**0.02**	**0.10**	**0.01**	**0.02**	**0.11**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	---	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	14797-55-8	0.01	mg/L	**0.01**	**0.02**	**0.03**	**0.02**	**0.01**
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	---	0.01	mg/L	**0.01**	**0.02**	**0.03**	**0.02**	**0.01**
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	---	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^ Total Nitrogen as N	---	0.1	mg/L	<0.1	<0.1	<0.1	<0.1	<0.1
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	---	0.01	mg/L	**0.04**	**0.06**	**0.04**	**0.04**	**0.05**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	14265-44-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
EN055: Ionic Balance								
Total Anions	---	0.01	meq/L	**12.3**	**612**	**7.19**	**22.2**	**657**
Total Cations	---	0.01	meq/L	**11.2**	**582**	**7.38**	**20.3**	**595**

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)			Client sample ID	NOWA3	NOWA5	NOWA6	NOWA9	NOWA10
			Client sampling date / time	17-APR-2013 09:05	16-APR-2013 17:10	16-APR-2013 13:50	16-APR-2013 16:30	17-APR-2013 09:45
Compound	CAS Number	LOR	Unit	EM1303943-001	EM1303943-002	EM1303943-003	EM1303943-004	EM1303943-005
EN055: Ionic Balance - Continued								
Ionic Balance	----	0.01	%	4.68	2.58	1.32	4.47	4.91
EP020: Oil and Grease (O&G)								
Oil & Grease	----	5	mg/L	<5	<5	<5	<5	<5
VIC-MM514: E.coli & Total Coliforms MPN by Colilert								
Total Coliforms (Colilert)	COLIFORMS_COLI	1	orgs/100mL	0	0	0	0	0
VIC-MM518: E.coli & Faecal Coliforms by MF (wastewater)								
Faecal Coliforms	----	1	orgs/100mL	8	10	200	54	<2

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1305153**	r Fus	P1eg:eo
Caisnt	P**EARTH SYSTEMS PTY LTD**	f FLgbFtgby	PEnvibgnmsntFaeDivil igneMsaLgcbns
CgntFRt	PMNeNI GENUer HCCHYHY	CgntFRt	PCaisnteSsbviRsl
AddbsI l	PS7 HUEel -832eKHWKeSUNEEU VE, e4HCpeA7 SUNAf HAe2101	AddbsI l	P. e sI tFaeNdeShbinuvFase4HCeAcI ttbFaiFe21 1
E8mFia	PbgLsbtThiRRnin@sFbt+I yl tsmI TRgmTFc	E8mFia	PMsaLgcbnsTEnvibgTSsbviRsl @FaI uagLFaRgm
Usash+gns	P6o1e02e-310e900	Usash+gns	P6o182839. -e o00
5FRimias	P6o1e02e-392e9020	5FRimias	P6o182839. -e o01
r bgjsRt	PYI , AY1C0O	QCef svsa	PYEr Mel- - - esSR+sdcaseGB2(eFndeAf SeQCS2ebs) cibsmsnt
I bdsbencmLsb	P8888		
C8I 8CencmLsb	P8888	DFtseSFmhasI eNsRsivsd	P1o8MAq8C012
SFmhasb	PNr	HI cseDFts	PO 8MAq8C012
Sits	PYg/ FeYg/ F		
		YgTeg:eFmhasI ebsRsivsd	P9
Qcgtsencmlsb	PMEGQw1OwO	YgTeg:eFmhasI eFnFayI sd	P9

U+il e bshgbte I chsbI sdsI e Fnye hbsvigcI e bshgbtBI (e / it+e t+il e bs:sbsnRsTe NsI cal e Fhhaye tge t+se I FmhasBI (e FI e I cLmittsdTe Aaee hFusI e g:e t+il e bshgbte +Fvse Lssne R+sRksde Fnde Fhhbgvsde :gt bsasFI sTe

U+il eCsbti:iRFtseg:eAnFayI il eRgntFinI et+segaeg/ inuein:gbmFtignP

- WsnsbFaeCgmmsntI
- AnFaytiRFaeNsI cal

r Fus	P Qag:eo
, gbkel bdsb	P EM1209192
Caisnt	P EANUKeSq SUEMSer Uqef UD
r bgjsRt	P YI , AY1C0O

General Comments

U+se FnFaytiRFae hbgRsdcbsI e cl sde Lye t+se Envibgnmsntfae Divil igne +Fvse Lssne dsvsaghsde :bgme sI tFLail +sde intsbnFtignFaaye bsRgunizsde hbgRsdcbsI e I cR+e Fl e t+gl se hcLail +sde Lye t+se 7 SEr Ape Ar KApe ASe Fnde YEr MTe Hhe +gcl s dsvsaghsdehbgRsdcbsI eFbse smhagysdeine+seFLI snRseg:edgRcmsntsdel tFndFbdl egbeLyeRaisntebs) csl tT

, +sbse mgil tcbseIstsbminFtigne+Fl eLssne nsbbgbmsdpbsI cail eFbse bshgbtsdegneFedbye siu+teLFl il T

, +sbse Febshgbtsdeas I le+FneBx(ebsI caiel e+iu+sbet+Fnet+sef I Npet+il emFyeLsedcse tgehbimFbye Fmhase s<tbFRwdiusI tFtsedlactigne Fndwgbeinl c::iRisnte Fmhase gbeFnFayl il T

, +sbse+sef I Neg:eFebshgbtsdebsI caiedi::sbl etgme tFndFbdef I Npet+il emFyeLsedcse tge+iu+emgil tcbseRgntsntpeinl c::iRisnte Fmhase Bbsdc Rsde siu+tesmhagysd(egbemFtbi<eintsbsbsnRsT

, +sne Fmhainuetimse in:gbmFtignel engtehbgvidsdeLye+seRaisntpe Fmhainued Ftsl eFbse +g/ ne it+gcte Feimse Rgmhgnsnt Tehne+sI sein I tFnRsI pet+seimse Rgmhgnsnte+Fl eLssne Fl I cmsdeLye+seaFLgbFtgbyegbehbgRsI I inuehcbhgI sI T

VsyeP CASeYcmLsbe=eCASebsuil tbyencmLsbebgmedFtFLFl semFintFinsdeLyeC+smiRFaeALI tbFRtl eSsbviRsI TeU+seC+smiRFaeALI tbFRtl eSsbviRsel eFedivil igneg:et+seAmsbiRFneC+smiRFaeSgRstyT
f I Ne=ef imiteg:ebshgbtinu
^e=eU+il ebsI caiel eRgmhctsdebgmeindividcFaeFnFaytsedstsRtignl eFtegbeFLgvset+seasvsag:ebshgbtinu

- **EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.**
- **Ionic Balance out of acceptable limits for sample #2 and #5 due to analytes not quantified in this report.**
- **Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.**
- **It is recognised that TKN is less than ammonia for sample #2. However, the difference is within experimental variation of the methods.**
- **Microbiological Analysis performed by ALS Scoresby (NATA Accreditation # 992).**
- **Oil and Grease conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.**

YAUAeARRbsditsdeFLgbFtgbye8C9
e
ARRbsditsdegbeRgmhaiFnRse it+e
HSI wEECel 0C9T

Signatories

U+il e dgRcmsnte +Fl e Lssne sasRtbgniRFaye I iunsde Lye t+se Fct+gbizsde I iunFtgbsI e indiRFtsde Lsag/ Te EasRtbgniRe I iuninue +Fl e Lssne RFbbsde gcte in Rgmhai FnRse it+enbgRsdcbsI el hsR:isdeine O1eC5 Ner Fbdel 1T

Signatories	*Position*	*Accreditation Category*
DFnisase, +its	Adminil tbFtigneAl I il tFnt	, NWeScLRgntbFRtinu
DiaFnie5sbnFndg	SsnigbeHgbuFniReC+smil t	MsaLgcbnseHgbuFniR
		MsaLgcbnseHgbuFniR
		MsaLgcbnseHgbuFniR
KgFeYucysn	SsnigbeHgbuFniReC+smil t	SydnsyeHgbuFniR
SnszFnFe4FngvFR	Ygn8mstFaleHbshel chsbvil gb	MsaLgcbnseHgbuFniR
4Fbl +FeKge, inu	Ygn8MstFaleUsFmef sFdsb	MsaLgcbnseHgbuFniR

r Fus P 2eg:eo
, gtkel bdsb P EM1209192
Caisnt P EANUKeSq SUEMSer Uqef UD
r bgjsRt P YI , AY1C0O

Analytical Results

ScL8MFtbi<: WATER (MFtbi<: WATER)			Client sample ID	NOWA 3	NOWA 5	NOWA 6	NOWA 9	NOWA 10
			Client sampling date / time	198MAq8C012el Pl9	198MAq8C012el oPC9	198MAq8C012el 1P99	1o8MAq8C012el 1PC9	1o8MAq8C012el 1P99
Compound	CAS Number	LOR	Unit	EM1305153-001	EM1305153-002	EM1305153-003	EM1305153-004	EM1305153-005
EA005: pH								
pH Value	8888	0T01	hKe7 nit	3.79	7.47	7.48	7.09	7.50
EA006: Sodium Adsorption Ratio (SAR)								
Sodium Adsorption Ratio	8888	0T01	8	3.10	52.2	3.28	7.97	51.2
EA010P: Conductivity by PC Titrator								
Electrical Conductivity @ 25°C	8888	1	µSvRm	1250	56700	751	1970	57200
EA016: Non Marine - Estimated TDS Salinity								
Total Dissolved Solids (Calc.)	8888	10	muvi	812	36800	488	1280	37200
EA025: Suspended Solids								
Suspended Solids (SS)	8888	9	muvi	x9	37	x9	x9	62
EA065: Total Hardness as CaCO3								
Total Hardness as CaCO3	8888	1	muvi	284	7510	143	264	7960
ED037P: Alkalinity by PC Titrator								
Hydroxide Alkalinity as CaCO3	DMI 8C108001	1	muvi	x1	x1	x1	x1	x1
Carbonate Alkalinity as CaCO3	231C82C8b	1	muvi	x1	x1	x1	x1	x1
Bicarbonate Alkalinity as CaCO3	189C82	1	muvi	x1	93	43	54	95
Total Alkalinity as CaCO3	8888	1	muvi	x1	93	43	54	95
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA								
Sulfate as SO4 - Turbidimetric	1. 3038 - 83	1	muvi	265	2640	21	31	2820
ED045G: Chloride Discrete analyser								
Chloride	1o33 8008b	1	muvi	221	17300	212	561	17800
ED093F: Dissolved Major Cations								
Calcium	. . 08 08O	1	muvi	38	467	16	35	502
Magnesium	. 2- 8- 98	1	muvi	46	1540	25	43	1630
Sodium	. . 080289	1	muvi	120	10400	90	298	10500
Potassium	. . 080- 8	1	muvi	7	510	5	9	549
EG020F: Dissolved Metals by ICP-MS								
Aluminium	. O- 8- 089	0T01	muvi	7.42	x0T01	0.02	x0T01	x0T01
Dysprosium	. O- 8- 18b	0T001	muvi	0.003	x0T001	x0T001	x0T001	x0T001
Silver	. . 08C08	0T001	muvi	x0T001	x0T001	x0T001	x0T001	x0T001
Arsenic	. . 08238O	0T001	muvi	0.001	0.003	x0T001	x0T001	0.003
Bismuth	. . 08b- 8-	0T001	muvi	x0T001	x0T001	x0T001	x0T001	x0T001
Erbium	. . 089C80	0T001	muvi	0.002	x0T001	x0T001	x0T001	x0T001
Boron	. . 08 C83	0T09	muvi	x0T09	3.40	0.07	0.05	3.40

r Fus P . eg:eo
, gbkel bdsb P EM1209192
Caisnt P EANUKeSq SUEMSer Uqef UD
r bgjsRt P YI , AY1C0O

Analytical Results

ScL8MFtbi<: **WATER** (MFtbi<: **WATER**)

	Client sample ID	NOWA 3	NOWA 5	NOWA 6	NOWA 9	NOWA 10
	Client sampling date / time	198MAq8C012el Pl9	198MAq8C012el oP09	198MAq8C012el 1P99	1o8MAq8C012el 1P09	1o8MAq8C012el 1P99
Compound	CAS Number / LOR / Unit	EM1305153-001	EM1305153-002	EM1305153-003	EM1305153-004	EM1305153-005
EG020F: Dissolved Metals by ICP-MS - Continued						
Europium	. . 089281 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Strontium	. . 08O. 8o / 0TD01 / muvi	**0.092**	**8.39**	**0.136**	**0.303**	**8.77**
Barium	. . 082-82 / 0TD01 / muvi	**0.021**	**0.032**	**0.071**	**0.090**	**0.029**
Gadolinium	. . 089. 8O / 0TD01 / muvi	**0.003**	x0TD01	x0TD01	x0TD01	x0TD01
Titanium	. . 082O8o / 0TD1 / muvi	x0TD1	x0TD1	x0TD1	x0TD1	x0TD1
Beryllium	. . 08 18 / 0TD01 / muvi	**0.007**	x0TD01	x0TD01	x0TD01	x0TD01
Gallium	. . 089982 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Cadmium	. . 08 28- / 0TD001 / muvi	**0.0002**	x0TD001	x0TD001	x0TD001	x0TD001
Hafnium	. . 08938o / 0TD1 / muvi	x0TD1	x0TD1	x0TD1	x0TD1	x0TD1
Tellurium	OO9. 18 - 8 / 0TD09 / muvi	x0TD09	x0TD09	x0TD09	x0TD09	x0TD09
Cobalt	. . 08 38 / 0TD01 / muvi	**0.138**	**0.001**	x0TD01	x0TD01	**0.001**
Holmium	. . 08o080 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Uranium	. . 08o181 / 0TD01 / muvi	x0TD01	**0.003**	x0TD01	x0TD01	**0.003**
Caesium	. . 08 o8O / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Chromium	. . 08 82 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Indium	. . 08 . 8o / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Copper	. . 089083 / 0TD01 / muvi	**0.133**	**0.006**	**0.001**	x0TD01	**0.006**
Lanthanum	. 2- 8- 180 / 0TD01 / muvi	**0.006**	x0TD01	x0TD01	x0TD01	x0TD01
Rubidium	. . 081 8 / 0TD01 / muvi	**0.009**	**0.125**	**0.004**	**0.007**	**0.132**
Lithium	. 2- 8- 28O / 0TD01 / muvi	**0.004**	**0.216**	x0TD01	**0.002**	**0.234**
Lutetium	. 2- 8- . 82 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Thorium	. . 08O- 81 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Cerium	. . 08 981 / 0TD01 / muvi	**0.018**	x0TD01	x0TD01	x0TD01	x0TD01
Manganese	. 2- 8- o89 / 0TD01 / muvi	**0.579**	**0.018**	**0.004**	**0.147**	**0.013**
Neodymium	. . 080083 / 0TD01 / muvi	**0.008**	x0TD01	x0TD01	x0TD01	x0TD01
Molybdenum	. 2- 8- 38 / 0TD01 / muvi	x0TD01	**0.012**	x0TD01	x0TD01	**0.014**
Praseodymium	. . 081080 / 0TD01 / muvi	**0.002**	x0TD01	x0TD01	x0TD01	x0TD01
Nickel	. . 080O80 / 0TD01 / muvi	**0.026**	x0TD01	x0TD01	**0.001**	x0TD01
Samarium	. . 081- 8- / 0TD01 / muvi	**0.002**	x0TD01	x0TD01	x0TD01	x0TD01
Lead	. 2- 8- O81 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Terbium	. . 08O 8- / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Antimony	. . 082o80 / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Thulium	. . 08208. / 0TD01 / muvi	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Selenium	3O8 - 8O / 0TD1 / muvi	x0TD1	x0TD1	x0TD1	x0TD1	x0TD1

r Fus P 9eg:eo
, gtkel bdsb P EM1209192
Caisnt P EANUKeSq SUEMSer Uqef UD
r bgjsRt P YI , AY1C0O

Analytical Results

ScL8MFtbi<: WATER (MFtbi<: WATER)			Client sample ID	NOWA 3	NOWA 5	NOWA 6	NOWA 9	NOWA 10
			Client sampling date / time	198MAq8C012el Pl9	198MAq8C012eloP09	198MAq8C012el1P99	1o8MAq8C012el1P09	1o8MAq8C012el1P99
Compound	CAS Number	LOR	Unit	EM1305153-001	EM1305153-002	EM1305153-003	EM1305153-004	EM1305153-005
EG020F: Dissolved Metals by ICP-MS - Continued								
Ytterbium	. . 08o. 8	0TD01	muvv	**0.001**	x0TD01	x0TD01	x0TD01	x0TD01
Tin	. . 082189	0TD01	muvv	x0TD01	x0TD01	x0TD01	x0TD01	x0TD01
Yttrium	. . 08o989	0TD01	muvv	**0.024**	x0TD01	x0TD01	x0TD01	x0TD01
Thallium	. . 08C380	0TD01	muvv	**0.001**	x0TD01	x0TD01	x0TD01	x0TD01
Zirconium	. . 08o 8	0TD09	muvv	x0TD09	x0TD09	x0TD09	x0TD09	x0TD09
Vanadium	. . 08oC8O	0TD1	muvv	x0TD1	x0TD1	x0TD1	x0TD1	x0TD1
Zinc	. . 08oo8o	0TD09	muvv	**0.025**	x0TD09	x0TD09	x0TD09	x0TD09
Iron	. 2- 83- 8o	0TD9	muvv	**0.85**	x0TD9	**0.22**	**0.10**	x0TD9
EG035F: Dissolved Mercury by FIMS								
Mercury	. 2- 8- 8o	0TD001	muvv	x0TD001	x0TD001	x0TD001	x0TD001	x0TD001
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	9 81C89	0TD0.	muvv	x0TD0.	x0TD0.	x0TD0.	x0TD0.	x0TD0.
EK040P: Fluoride by PC Titrator								
Fluoride	1o- 3. 8 383	0Tl	muvv	**0.8**	**1.1**	**0.1**	**0.1**	**1.1**
EK055G: Ammonia as N by Discrete Analyser								
Ammonia as N	oo. 8 18	0TD1	muvv	**0.06**	**0.12**	**0.05**	**0.05**	**0.14**
EK057G: Nitrite as N by Discrete Analyser								
Nitrite as N	8888	0TD1	muvv	x0TD1	x0TD1	x0TD1	x0TD1	x0TD1
EK058G: Nitrate as N by Discrete Analyser								
Nitrate as N	1. - 89983	0TD1	muvv	**0.02**	x0TD1	**0.02**	**0.02**	x0TD1
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser								
Nitrite + Nitrate as N	8888	0TD1	muvv	**0.02**	x0TD1	**0.02**	**0.02**	x0TD1
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser								
Total Kjeldahl Nitrogen as N	8888	0Tl	muvv	x0Tl	**0.1**	**0.3**	**0.4**	**0.2**
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser								
^eTotal Nitrogen as N	8888	0Tl	muvv	x0Tl	**0.1**	**0.3**	**0.4**	**0.2**
EK067G: Total Phosphorus as P by Discrete Analyser								
Total Phosphorus as P	8888	0TD1	muvv	**0.09**	**0.08**	**0.12**	**0.07**	**0.08**
EK071G: Reactive Phosphorus as P by discrete analyser								
Reactive Phosphorus as P	1. Co98 . 8O	0TD1	muvv	x0TD1	x0TD1	x0TD1	**0.01**	x0TD1
EN055: Ionic Balance								
Total Anions	8888	0TD1	ms) vv	**11.8**	**545**	**7.28**	**17.6**	**563**
Total Cations	8888	0TD1	ms) vv	**11.1**	**615**	**6.90**	**18.5**	**630**

r Fus P oeg:eo
, gbkel bdsb P EM1209192
Caisnt P EANUKeSq SUEMSer Uqef UD
r bgjsRt P YI , AY1C0O

Analytical Results

ScL8MFtbi<: WATER (MFtbi<: WATER)			Client sample ID	NOWA 3	NOWA 5	NOWA 6	NOWA 9	NOWA 10
			Client sampling date / time	198MAq8C012el Pl9	198MAq8C012el oPC9	198MAq8C012el1P99	1o8MAq8C012el1PC9	1o8MAq8C012el1P99
Compound	CAS Number	LOR	Unit	EM1305153-001	EM1305153-002	EM1305153-003	EM1305153-004	EM1305153-005
EN055: Ionic Balance - Continued								
Ionic Balance	8888	0T01	%	2.94	6.07	2.67	2.57	5.62
EP020: Oil and Grease (O&G)								
Oil & Grease	8888	9	muw/	x9	x9	x9	x9	x9
VIC-MM507: Total Coliforms by MF								
Total Coliforms by MF	8888	1	gbul w100mf	12	14	70	86	32
VIC-MM518: E.coli & Faecal Coliforms by MF (wastewater)								
Faecal Coliforms	8888	1	gbul w100mf	12	12	60	60	22

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1305908**	Page	: 1 of 4
Client	: **EARTH SYSTEMS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR ROBERT PICCININ	Contact	: Client Services
Address	: SUITE 17 79-83 HIGH STREET KEW VIC, AUSTRALIA 3101	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: robert.piccinin@earthsystems.com.au	E-mail	: Melbourne.Enviro.Services@alsglobal.com
Telephone	: +61 03 9810 7500	Telephone	: +61-3-8549 9600
Facsimile	: +61 03 9853 5030	Facsimile	: +61-3-8549 9601
Project	: NOWAN1202 REBATCH OF EM1305153	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: ----		
C-O-C number	: ----	Date Samples Received	: 04-JUN-2013
Sampler	: ----	Issue Date	: 06-JUN-2013
Site	: Nowa Nowa		
		No. of samples received	: 5
Quote number	: MEBQ/112/12	No. of samples analysed	: 5

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Eric Chau	Metals Team Leader	Melbourne Inorganics

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	NOWA 3	NOWA 5	NOWA 6	NOWA 9	NOWA 10
				Client sampling date / time	15-MAY-2013 17:15	15-MAY-2013 16:25	15-MAY-2013 11:55	16-MAY-2013 11:25	16-MAY-2013 11:55
					EM1305908-001	EM1305908-002	EM1305908-003	EM1305908-004	EM1305908-005
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**8.43**	**0.10**	**0.03**	**0.01**	<0.01
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Arsenic	7440-38-2	0.001	mg/L		**0.001**	**0.006**	<0.001	<0.001	**0.005**
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Boron	7440-42-8	0.05	mg/L		**0.07**	**2.71**	**0.17**	**0.10**	**2.88**
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Strontium	7440-24-6	0.001	mg/L		**0.101**	**8.41**	**0.167**	**0.318**	**9.20**
Barium	7440-39-3	0.001	mg/L		**0.021**	**0.030**	**0.064**	**0.089**	**0.028**
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Beryllium	7440-41-7	0.001	mg/L		**0.008**	<0.001	<0.001	<0.001	<0.001
Gallium	7440-55-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cadmium	7440-43-9	0.0001	mg/L		**0.0004**	<0.0001	<0.0001	<0.0001	<0.0001
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Cobalt	7440-48-4	0.001	mg/L		**0.156**	**0.002**	<0.001	<0.001	**0.001**
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Uranium	7440-61-1	0.001	mg/L		<0.001	**0.003**	<0.001	<0.001	**0.003**
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Chromium	7440-47-3	0.001	mg/L		<0.001	**0.017**	<0.001	<0.001	**0.019**
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	7440-50-8	0.001	mg/L		**0.148**	**0.008**	**0.001**	<0.001	**0.007**
Lanthanum	7439-91-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Rubidium	7440-17-7	0.001	mg/L		**0.009**	**0.129**	**0.004**	**0.007**	**0.138**
Lithium	7439-93-2	0.001	mg/L		**0.006**	**0.269**	**0.004**	**0.004**	**0.282**
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Cerium	7440-45-1	0.001	mg/L		**0.019**	<0.001	<0.001	<0.001	<0.001
Manganese	7439-96-5	0.001	mg/L		**0.631**	**0.023**	**0.003**	**0.106**	**0.014**
Neodymium	7440-00-8	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Molybdenum	7439-98-7	0.001	mg/L		<0.001	**0.014**	<0.001	<0.001	**0.015**
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	NOWA 3	NOWA 5	NOWA 6	NOWA 9	NOWA 10
				Client sampling date / time	15-MAY-2013 17:15	15-MAY-2013 16:25	15-MAY-2013 11:55	16-MAY-2013 11:25	16-MAY-2013 11:55
					EM1305908-001	EM1305908-002	EM1305908-003	EM1305908-004	EM1305908-005
EG020T: Total Metals by ICP-MS - Continued									
Nickel	7440-02-0	0.001	mg/L		**0.028**	<0.001	<0.001	<0.001	<0.001
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Yttrium	7440-65-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	<0.001
Thallium	7440-28-0	0.001	mg/L		**0.001**	<0.001	<0.001	<0.001	<0.001
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	<0.005
Vanadium	7440-62-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	<0.01
Zinc	7440-66-6	0.005	mg/L		**0.042**	<0.005	<0.005	<0.005	**0.009**
Iron	7439-89-6	0.05	mg/L		**0.92**	<0.05	**0.24**	**0.28**	<0.05
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1307156**	Page	: 1 of 7
Client	: **EARTH SYSTEMS PTY LTD**	Laboratory	: Environmental Division Melbourne
Contact	: MR ROBERT PICCININ	Contact	: Client Services
Address	: SUITE 17 79-83 HIGH STREET KEW VIC, AUSTRALIA 3101	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: robert.piccinin@earthsystems.com.au	E-mail	: Melbourne.Enviro.Services@alsglobal.com
Telephone	: +61 03 9810 7500	Telephone	: +61-3-8549 9600
Facsimile	: +61 03 9853 5030	Facsimile	: +61-3-8549 9601
Project	: NOWAN1202	QC Level	: NEPM 1999 Schedule B(3) and ALS QCS3 requirement
Order number	: NOWAN1202		
C-O-C number	: ----	Date Samples Received	: 05-JUL-2013
Sampler	: RP	Issue Date	: 12-JUL-2013
Site	: Nowa Nowa		
		No. of samples received	: 4
Quote number	: MEBQ/112/13	No. of samples analysed	: 4

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. All pages of this report have been checked and approved for release.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

General Comments

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting

- **EA016: Calculated TDS is determined from Electrical conductivity using a conversion factor of 0.65.**
- **Faecal Coliforms MF (MM518) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.**
- **Ionic Balance out of acceptable limits for sample #2 due to analytes not quantified in this report.**
- **Ionic balances were calculated using: major anions - chloride, alkalinity and sulfate; and major cations - calcium, magnesium, potassium and sodium.**
- **It is recognised that total metals are less than dissolved metals for samples EM1307156. However, the difference is within experimental variation of the methods.**
- **Oil and Grease (EP020) conducted by ALS Sydney, NATA accreditation no. 825, site no 10911.**
- **Total Coliforms (MM507) is conducted by ALS Scoresby NATA accreditation no. 992, site no. 989.**

NATA Accredited Laboratory 825

Accredited for compliance with ISO/IEC 17025.

Signatories

This document has been electronically signed by the authorized signatories indicated below. Electronic signing has been carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ashesh Patel	Inorganic Chemist	Sydney Inorganics
Danielle White	Administration Assistant	WRG Subcontracting
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics
		Melbourne Inorganics
		Melbourne Inorganics
Varsha Ho Wing	Non-Metals Team Leader	Melbourne Inorganics
		Melbourne Inorganics
		Melbourne Inorganics

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	Nowa 3	Nowa 5	Nowa 6	Nowa 10	----
				Client sampling date / time	04-JUL-2013 14:50	04-JUL-2013 11:30	04-JUL-2013 13:00	04-JUL-2013 12:40	----
					EM1307156-001	EM1307156-002	EM1307156-003	EM1307156-004	----
EA005: pH									
pH Value	----	0.01	pH Unit		5.19	6.46	6.72	6.82	----
EA006: Sodium Adsorption Ratio (SAR)									
Sodium Adsorption Ratio	----	0.01	-		2.41	5.73	2.23	26.7	----
EA010P: Conductivity by PC Titrator									
Electrical Conductivity @ 25°C	----	1	µS/cm		239	894	281	15900	----
EA016: Non Marine - Estimated TDS Salinity									
Total Dissolved Solids (Calc.)	----	10	mg/L		155	581	183	10300	----
EA025: Suspended Solids									
Suspended Solids (SS)	----	5	mg/L		11	10	5	44	----
EA065: Total Hardness as CaCO3									
Total Hardness as CaCO3	----	1	mg/L		26	90	41	1720	----
ED037P: Alkalinity by PC Titrator									
Hydroxide Alkalinity as CaCO3	DMO-210-001	1	mg/L		<1	<1	<1	<1	----
Carbonate Alkalinity as CaCO3	3812-32-6	1	mg/L		<1	<1	<1	<1	----
Bicarbonate Alkalinity as CaCO3	71-52-3	1	mg/L		<1	9	9	34	----
Total Alkalinity as CaCO3	----	1	mg/L		<1	9	9	34	----
ED041G: Sulfate (Turbidimetric) as SO4 2- by DA									
Sulfate as SO4 - Turbidimetric	14808-79-8	1	mg/L		21	43	14	750	----
ED045G: Chloride Discrete analyser									
Chloride	16887-00-6	1	mg/L		49	257	60	5470	----
ED093F: Dissolved Major Cations									
Calcium	7440-70-2	1	mg/L		2	8	5	102	----
Magnesium	7439-95-4	1	mg/L		5	17	7	357	----
Sodium	7440-23-5	1	mg/L		28	125	33	2550	----
Potassium	7440-09-7	1	mg/L		2	6	2	118	----
EG020F: Dissolved Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		0.61	0.36	0.32	0.15	----
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Boron	7440-42-8	0.05	mg/L		<0.05	0.07	<0.05	1.16	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	Nowa 3	Nowa 5	Nowa 6	Nowa 10	----
				Client sampling date / time	04-JUL-2013 14:50	04-JUL-2013 11:30	04-JUL-2013 13:00	04-JUL-2013 12:40	----
					EM1307156-001	EM1307156-002	EM1307156-003	EM1307156-004	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**0.027**	**0.102**	**0.046**	**1.92**	----
Barium	7440-39-3	0.001	mg/L		**0.054**	**0.036**	**0.034**	**0.046**	----
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Gallium	7440-55-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Cobalt	7440-48-4	0.001	mg/L		**0.006**	<0.001	<0.001	<0.001	----
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		**0.008**	**0.002**	**0.002**	**0.004**	----
Lanthanum	7439-91-0	0.001	mg/L		**0.002**	**0.002**	**0.002**	**0.001**	----
Rubidium	7440-17-7	0.001	mg/L		**0.002**	**0.003**	**0.002**	**0.029**	----
Lithium	7439-93-2	0.001	mg/L		<0.001	**0.002**	<0.001	**0.046**	----
Lutetium	7439-94-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L		**0.005**	**0.004**	**0.004**	**0.002**	----
Manganese	7439-96-5	0.001	mg/L		**0.035**	**0.016**	**0.006**	**0.034**	----
Neodymium	7440-00-8	0.001	mg/L		**0.003**	**0.002**	**0.002**	**0.001**	----
Molybdenum	7439-98-7	0.001	mg/L		<0.001	<0.001	<0.001	**0.003**	----
Praseodymium	7440-10-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L		**0.002**	**0.001**	**0.001**	**0.002**	----
Samarium	7440-19-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Terbium	7440-27-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	Nowa 3	Nowa 5	Nowa 6	Nowa 10	----
				Client sampling date / time	04-JUL-2013 14:50	04-JUL-2013 11:30	04-JUL-2013 13:00	04-JUL-2013 12:40	----
					EM1307156-001	EM1307156-002	EM1307156-003	EM1307156-004	----
EG020F: Dissolved Metals by ICP-MS - Continued									
Ytterbium	7440-64-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Yttrium	7440-65-5	0.001	mg/L		**0.002**	**0.001**	**0.001**	<0.001	----
Thallium	7440-28-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Vanadium	7440-62-2	0.01	mg/L		**0.02**	**0.02**	**0.02**	<0.01	----
Zinc	7440-66-6	0.005	mg/L		<0.005	**0.006**	**0.006**	**0.009**	----
Iron	7439-89-6	0.05	mg/L		**0.55**	**0.65**	**0.43**	**0.35**	----
EG020T: Total Metals by ICP-MS									
Aluminium	7429-90-5	0.01	mg/L		**2.10**	**1.89**	**1.31**	**0.87**	----
Dysprosium	7429-91-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Silver	7440-22-4	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Arsenic	7440-38-2	0.001	mg/L		**0.002**	<0.001	<0.001	**0.002**	----
Bismuth	7440-69-9	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Erbium	7440-52-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Boron	7440-42-8	0.05	mg/L		<0.05	**0.06**	<0.05	**1.05**	----
Europium	7440-53-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Strontium	7440-24-6	0.001	mg/L		**0.028**	**0.097**	**0.045**	**1.86**	----
Barium	7440-39-3	0.001	mg/L		**0.062**	**0.043**	**0.039**	**0.050**	----
Gadolinium	7440-54-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Titanium	7440-32-6	0.01	mg/L		**0.01**	**0.01**	<0.01	<0.01	----
Beryllium	7440-41-7	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Gallium	7440-55-3	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Cadmium	7440-43-9	0.0001	mg/L		<0.0001	<0.0001	<0.0001	<0.0001	----
Hafnium	7440-58-6	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
Tellurium	22541-49-7	0.005	mg/L		<0.005	<0.005	<0.005	<0.005	----
Cobalt	7440-48-4	0.001	mg/L		**0.007**	**0.001**	<0.001	**0.001**	----
Holmium	7440-60-0	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Uranium	7440-61-1	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Caesium	7440-46-2	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Chromium	7440-47-3	0.001	mg/L		**0.001**	**0.002**	**0.001**	**0.002**	----
Indium	7440-74-6	0.001	mg/L		<0.001	<0.001	<0.001	<0.001	----
Copper	7440-50-8	0.001	mg/L		**0.008**	**0.002**	**0.001**	**0.004**	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID: Nowa 3	Nowa 5	Nowa 6	Nowa 10	----
				Client sampling date / time: 04-JUL-2013 14:50	04-JUL-2013 11:30	04-JUL-2013 13:00	04-JUL-2013 12:40	----
				EM1307156-001	EM1307156-002	EM1307156-003	EM1307156-004	----
EG020T: Total Metals by ICP-MS - Continued								
Lanthanum	7439-91-0	0.001	mg/L	**0.002**	**0.002**	**0.002**	**0.001**	----
Rubidium	7440-17-7	0.001	mg/L	**0.004**	**0.006**	**0.004**	**0.032**	----
Lithium	7439-93-2	0.001	mg/L	<0.001	**0.003**	<0.001	**0.045**	----
Lutetium	7439-94-3	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thorium	7440-29-1	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Cerium	7440-45-1	0.001	mg/L	**0.007**	**0.006**	**0.004**	**0.004**	----
Manganese	7439-96-5	0.001	mg/L	**0.038**	**0.019**	**0.009**	**0.037**	----
Neodymium	7440-00-8	0.001	mg/L	**0.003**	**0.002**	**0.002**	**0.002**	----
Molybdenum	7439-98-7	0.001	mg/L	<0.001	<0.001	<0.001	**0.004**	----
Praseodymium	7440-10-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Nickel	7440-02-0	0.001	mg/L	**0.002**	**0.002**	**0.001**	**0.002**	----
Samarium	7440-19-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Lead	7439-92-1	0.001	mg/L	<0.001	**0.002**	<0.001	**0.001**	----
Terbium	7440-27-9	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Antimony	7440-36-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Thulium	7440-30-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	<0.01	<0.01	----
Ytterbium	7440-64-4	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Tin	7440-31-5	0.001	mg/L	<0.001	<0.001	<0.001	**0.001**	----
Yttrium	7440-65-5	0.001	mg/L	**0.002**	**0.002**	**0.002**	**0.001**	----
Thallium	7440-28-0	0.001	mg/L	<0.001	<0.001	<0.001	<0.001	----
Zirconium	7440-67-7	0.005	mg/L	<0.005	<0.005	<0.005	<0.005	----
Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	<0.01	**0.01**	----
Zinc	7440-66-6	0.005	mg/L	<0.005	**0.008**	**0.008**	**0.008**	----
Iron	7439-89-6	0.05	mg/L	**1.74**	**2.07**	**1.16**	**1.02**	----
EG035F: Dissolved Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EG035T: Total Recoverable Mercury by FIMS								
Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	<0.0001	<0.0001	----
EK026SF: Total CN by Segmented Flow Analyser								
Total Cyanide	57-12-5	0.004	mg/L	<0.004	<0.004	<0.004	<0.004	----
EK040P: Fluoride by PC Titrator								
Fluoride	16984-48-8	0.1	mg/L	**0.1**	<0.1	<0.1	**0.4**	----

Analytical Results

Sub-Matrix: **WATER** (Matrix: **WATER**)

Compound	CAS Number	LOR	Unit	Client sample ID	Nowa 3	Nowa 5	Nowa 6	Nowa 10	----
				Client sampling date / time	04-JUL-2013 14:50	04-JUL-2013 11:30	04-JUL-2013 13:00	04-JUL-2013 12:40	----
					EM1307156-001	EM1307156-002	EM1307156-003	EM1307156-004	----
EK055G: Ammonia as N by Discrete Analyser									
Ammonia as N	7664-41-7	0.01	mg/L		<0.01	**0.01**	<0.01	<0.01	----
EK057G: Nitrite as N by Discrete Analyser									
Nitrite as N	----	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
EK058G: Nitrate as N by Discrete Analyser									
Nitrate as N	14797-55-8	0.01	mg/L		<0.01	**0.10**	**0.08**	**0.06**	----
EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser									
Nitrite + Nitrate as N	----	0.01	mg/L		<0.01	**0.10**	**0.08**	**0.06**	----
EK061G: Total Kjeldahl Nitrogen By Discrete Analyser									
Total Kjeldahl Nitrogen as N	----	0.1	mg/L		<0.1	<0.1	<0.1	<0.1	----
EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser									
^ Total Nitrogen as N	----	0.1	mg/L		<0.1	**0.1**	<0.1	<0.1	----
EK067G: Total Phosphorus as P by Discrete Analyser									
Total Phosphorus as P	----	0.01	mg/L		**0.04**	**0.04**	**0.04**	**0.03**	----
EK071G: Reactive Phosphorus as P by discrete analyser									
Reactive Phosphorus as P	14265-44-2	0.01	mg/L		<0.01	<0.01	<0.01	<0.01	----
EN055: Ionic Balance									
Total Anions	----	0.01	meq/L		**1.82**	**8.32**	**2.16**	**171**	----
Total Cations	----	0.01	meq/L		**1.78**	**7.39**	**2.31**	**148**	----
Ionic Balance	----	0.01	%		**1.10**	**5.97**	**3.31**	**6.97**	----
EP020: Oil and Grease (O&G)									
Oil & Grease	----	5	mg/L		<5	<5	<5	<5	----
VIC-MM507: Total Coliforms by MF									
Total Coliforms by MF	----	1	orgs/100mL		**22**	**56**	**10**	**35**	----
VIC-MM518: E.coli & Faecal Coliforms by MF (wastewater)									
Faecal Coliforms	----	1	orgs/100mL		**12**	**38**	**12**	**36**	----

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1307355**	. FPs	q1e oe7
yasSi r	g**EART6 SYSTEMS HTY LTP**	f FL: bFr: bt	gEi nCi v si rFaamCCCi eMsaL: Dbi s
y: i rFur	qMc ec ROEc Be Ty y TT T	y: i rFur	qyasSi reNsbnCsl
SAAbsl l	qNd TBEe17 7 U93e TH- eNBc EEB GEK eWTy VaSd NBc Sf TSe3101	SAAbsl l	q, eK sl rFaec AeN4bCPnFaseWTyeSDl rtFaCFe3171
EUv FCa	qb Lsbr84QuCCCp sFbr@t l rsv l &u: v 8FD	EUv FCa	qMsaL: Dbi s8Ei nCi 8NsbnCsl p FalPa LFa&u: v
Bsas4@i s	qh+1e03e 910e7j 00	Bsas4@i s	qh+1U3U9j , e +00
6Ful V Cas	qh+1e03e 9j 3ej 030	6Ful V Cas	qh+1U3U9j , e +01
. b 2sur	ql RK Sl 1505	Qy ef snsa	ql E. Mel eeNu@ADaseO(3)eFi AeSf NeQy N3ebsqDCCsv si r
RbAsbsé Dv Lsb	ql RK Sl 1505		
y URlyi Dv Lsb	qUUUU	mFrseNFv 4asl ec susCsA	g10UJd f U5013
NFv 4asb	qc.	TI Dsem Frs	q1+UJd f U5013
NCs	ql : wFel : wF		
		l : &e oel Fv 4asl ebsusCsA	g,
QD: rsé Dv Lsb	qMEOQ/115/13	l : &e oel Fv 4asl eFi FalsA	g,

B@Ce bs4: bre l D4sbl sAsl e Fi t e 4bsnC Dl e bs4: br(l)e wCC@e r@Ce bsosbsi us&e c sl Dael e F44ale r: e r@&e l Fv 4as(l)e Fl e l DLv CrsA&e Sae 4FPsl e : oe r@Ce bs4: bre @Fnse Lssi e u@&uksAe Fi Ae F44b: nsAe o t bsasFl s&e

B@Ce ysbrCQFrse oeSi Fal lCeu: i rFCl er@&eo aa wCPeCo bv FrCi g

- Hsi sbFaey: v v si rl
- Si FalrCQFaec sl Dael

. FPs	g 5e: de7
K : bkeRbAsb	g EM1307355
y aGi r	g ESc B- eNYNBEMNe BYef Bm
. b: 2sur	g I RK SI 1505

General Comments

B@ge Fi FatrQFae 4b: usADbsle DlsAe Lte r@ge Ein0: i v si rFae m0CCi e @Fnse Lssi e Asnsa 4sAe db: v e sl rFLaC@gAe Crsbi FrCi Fatle bsu: Pi 2sAe 4b: usADbsle l Du@g Fl e r@lse 4DLaC@gAe Lte r@ge d NE. SVé S. - SVé SNe Fi Ae l E. M8e Tle @Dls Asnsa 4sAe4b: usADbsle Fbses v 4a t sAeCe r@geFLI si use: oeA: uDv si rsAe rFi AFbAl e baLteuaSi redsqDsl r8

K @sbse v : CrDbseAsrsbv CFrCi e@Fl eLssi e4sbo bv sAVebsl Dal le Fbsebs4: brsAe i eFeAbtewsCP@eLFl C8

K @sbse Febs4: brsAeasll er@Fi e(<)ebsl DareCe@CP@sber@Fi er@ef Rc Ve r@Cev Ft eLseADse r: e4b0 Fbt e Fv 4ase xrtbFur/ACPslrFrseA@DrCi eFi A/: baCl Dan0Si re Fv 4ase o baFi Fal C8

K @sbse r@ef Rc e oFebs4: brsAebsl DareA@ebsl eb: v e rFi AFbAef Rc Ve r@Cev Ft eLseADse r: e@CP@ev : CrDbseu: i rsi rVeCl Dan0Si re Fv 4ase(bsADusAewsCP@esv 4a t sA)e bav Frb0eCrsbosbsi us8

K @sie Fv 4aCPeV seCo bv FrCi eCe : re4b: n0AsAeLte r@seuaSi rVe Fv 4aCPeAFrsle Fbse @wi ewC@ DreFerV seu: v 4: i si r8aeTe r@sl seCl rFi usl Ve r@erV seu: v 4: i si re@Fl eLssi eFl l Dv sAeLte r@seFL: bFr: bte o be4b: usl l CPe4Db4: l sl 8

Gsteg y SNel Dv Lsbe=ey SNebsPCrbte i Dv Lsbeb: v eAFrFLFl sev FCrFCsAeLte y @g v 0Fae SLI rbFurl eNsbn0sl 8B@gey @g v 0Fae SLI rbFurl eNsbn0se Ce FeA0CCi e or@geSv sb0Fi ey @g v 0FaeN: uGrt 8
f Rc e=ef V Ce obs4: br CP
ue=eB@Cebsl DareCeu: v 4DrsAeb: v eCA0CADFae Fi Fatrse Asrsur Ci l eFre beFL: nse r@ee snsae obs4: br CP

- **EA01+: Cc^1 t ^cred TPS rD dererl rhed vrol E^ei rrrnc^i of dt i mymg t Drh. c i of yerDnof vci ror ov0(+4(**
- **E) 034F:EM1307307b1 l crrr2 D, rke vcrhed vor l eri t rg dt e ro , oDDrB^e Dcl , ^e l crrr2 rhrrerverefi e(TprD pcDBeef i of vrl ed**
- **Fcei c^Co^hor l DMF #MM418qrD i of dt i red Bg ALS Si oreDBg NATA ci i redrncrnof f o(aa5hDrne f o(a8a(**
- **lof rh wc^cf i e ot novci i e, ncB^e ^rh rD vor Dcl , ^e b9 dt e ro cf c^greDf onj t cf rvred rh rprD re, orr(**
- **lof rh Bc^cf i eD; ere i c^1 t ^cred t Drh. : l cxor cf nof D- i p^orrdehc^kc^hrrg cf d Dt ^creGcf d l cxor i crnof D- i c^1 rhl hl c. f eDrhl h, orcDDrhl cf d Dodrhl (**
- **lnrD rei o. f rDed rpcnrorc^l erc^Dcre ^eDDrpcf drDDo^yed l erc^vor EM1307355(6o; eyerhrpe dnwerefi e rD; rnprh e2, errh ef rc^ycrrrorrof ovrpe l erpodD(**
- **Orh^cf d) recDe #EH050qi of dt i red Bg ALS Sgdf eghNATA ci i redrncrnof f o(854hDrne f o 10a11(**
- **Torc^Co^hor l D#MM407qrD i of dt i red Bg ALS Si oreDBg NATA ci i redrncrnof f o(aa5hDrne f o(a8a(**

l SBSeSuubsA0sAef FL: bFr: bte 95j e
SuubsA0sAeo bau: v 4aEi usewC@e TNR/TEy el 705j 8

Signatories

B@De A: uDv si re @Fl e Lssi e sasurb: i 0Fae l CPi sAe Lte r@ge FDr@b2sAe l CPi Fr: bGl e CA0FrsAe Lsa w8e Easurb: i 0e l CPi CPe @Fl e Lssi e uFbbGAe : Dre C u: v 4aEi usewC@e4b: usADbsle 4su0GAeCe51ey 6c e Fbre118

Signatories	*Position*	*Accreditation Category*
Si k0eJ: l @C	Tf : bPFi 0ey @g v Cr	Nt Ai st eT : bPFi 0l
mFi GaaseK @0s	SAv CCrbFrCi eSl l CrFi r	K c HeNDLu: i rbFurCP
m@Fi G6sb: i Fi A:	Nsi CbeT : bPFi 0ey @g v Cr	Msa: Dbi seT : bPFi 0l
l Ckk@Nrs4i GwlkC	Nsi CbeT : bPFi 0eT l rbDv si rey @g v Cr	Msa: Dbi seT : bPFi 0l Msa: Dbi seT : bPFi 0l Msa: Dbi seT : bPFi 0l
WFb @Fe : eK CP	l : i UMsrFaleBsFv ef sFAsb	Msa: Dbi seT : bPFi 0l Msa: Dbi seT : bPFi 0l Msa: Dbi seT : bPFi 0l

. FPs g 3e: ce7
K : bkeRbAsb g EM1307355
y aGi r g ESc B- eNYNBEMNe BYef Bm
. b: 2sur g I RK SI 1505

Analytical Results

NDLUMFrb2: WATER #MFrb2: WATERq			Client sample ID	5	NOWA 7	NOWA 8	NOWA a	UUUU
			Client sampling date / time	0 UJdf U5013ef j g00	0 UJdf U5013ef j g00	0 UJdf U5013ef j g00	0 UJdf U5013ef j g00	UUUU
Compound	CAS Number	LOR	Unit	EM1307355-001	EM1307355-005	EM1307355-003	EM1307355-009	----
EA004: , 6								
, 6 Vc^t e	UUUU	0801	4- ed i C	+(1+	+(48	+(58	+(+7	UUUU
EA00+: Sodrnl AdDor, mof Rcmo #SARq								
Sodrnl AdDor, mof Rcmo	UUUU	0801	U	5(15	5(75	5(89	3(4+	UUUU
EA010H: Cof dt i myrng Bg HC Tmrcror								
E^ei rrnc^Cof dt i myrng @ 54°C	UUUU	1	µN/uv	54a	33+	5a9	979	UUUU
EA01+: Nof Mcrrhe - EDrh cred TPS Sc^fhrng								
Torc^PrBDo^yed So^rdD #Cc^i (q	UUUU	10	v P/f	1+8	518	1a1	308	UUUU
EA054: St D, ef ded So^rdD								
St D, ef ded So^rdD #SSq	UUUU	j	v P/f	+	<j	8	<j	UUUU
EA0+4: Torc^6 crdf eDD cD CcCO3								
Torc^6 crdf eDD cD CcCO3	UUUU	1	v P/f	38	93	39	49	UUUU
EP037H: A^kc^fhrng Bg HC Tmrcror								
6 gdro2rde A^kc^fhrng cD CcCO3	mMRU510U001	1	v P/f	<1	<1	<1	<1	UUUU
CcrBof cre A^kc^fhrng cD CcCO3	3915U35U+	1	v P/f	<1	<1	<1	<1	UUUU
wrncrBof cre A^kc^fhrng cD CcCO3	71ij 5U3	1	v P/f	+	19	a	14	UUUU
Torc^A^kc^fhrng cD CcCO3	UUUU	1	v P/f	+	19	a	14	UUUU
EP091) : St ^cre #Tt rBrdrh errrhqcD SO9 5- Bg PA								
St ^cre cD SO9 - Tt rBrdrh errrh	1, 909U7 U9	1	v P/f	19	17	15	17	UUUU
EP094) : Cp^orrde PrBi rere cf c^gDer								
Cp^orrde	1+997U00U+	1	v P/f	47	79	+a	15a	UUUU
EP0a3F: PrBDo^yed Mcxor Ccrrof D								
Cc^i rrhl	7, , 0U70U5	1	v P/f	5	9	5	4	UUUU
Mc. f eDrhl	7, 3 U j U	1	v P/f	8	8	7	10	UUUU
Sodrnl	7, , 0U53Uj	1	v P/f	30	91	38	+0	UUUU
HorcDDrhl	7, , 0U0 U7	1	v P/f	5	9	5	3	UUUU
E) 050F: PrBDo^yed Merc^D Bg ICH-MS								
A^t l rfrhl	7, 5 U 0Uj	0801	v P/f	0(34	0(50	0(35	0(53	UUUU
PgD, roDrhl	7, 5 U 1U+	08001	v P/f	<08001	<08001	<08001	<08001	UUUU
Srfyer	7, , 0U55U	08001	v P/f	<08001	<08001	<08001	<08001	UUUU
ArDef rin	7, , 0U39U5	08001	v P/f	<08001	<08001	<08001	<08001	UUUU
wrBl t np	7, , 0U+ U	08001	v P/f	<08001	<08001	<08001	<08001	UUUU
ErBrhl	7, , 0Uj 5U0	08001	v P/f	<08001	<08001	<08001	<08001	UUUU
worof	7, , 0U 5U9	080j	v P/f	<080j	<080j	<080j	<080j	UUUU

. FPs g , e Ob7
K : bkeRbAsb g EM1307355
y aGi r g ESc B- eNYNBEMNe BYef Bm
. b: 2sur g I RK SI 1505

Analytical Results

NDLUMFrb2: **WATER** #MFrb2: **WATERq**

	Client sample ID	5	NOWA 7	NOWA 8	NOWA a	UUU
	Client sampling date / time	0 Ud f U5013ef j g0	0 Ud f U5013ef j g0	0 Ud f U5013ef j g0	0 Ud f U5013ef j g0	UUU
Compound	CAS Number / LOR / Unit	EM1307355-001	EM1307355-005	EM1307355-003	EM1307355-009	----
E) 050F: PrBDo^yed Merc^D Bg ICH-MS - Cof rnf t ed						
Et ro, rnl	7, , 0ij 3U	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Srrof rnl	7, , 0U5, U+	0801 v P/f	**0(058**	**0(034**	**0(05+**	**0(097** UUU
wcrrnl	7, , 0U3 U3	0801 v P/f	**0(050**	**0(059**	**0(057**	**0(031** UUU
) cdo^fnrnl	7, , 0ij , U5	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Tmcf rnl	7, , 0U35U+	0801 v P/f	<0801	<0801	<0801	<0801 UUU
werg^rnl	7, , 0U 1U7	0801 v P/f	<0801	<0801	<0801	<0801 UUU
) c^rnl	7, , 0ij j U3	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Ccdl rnl	7, , 0U 3U	08001 v P/f	<08001	<08001	<08001	<08001 UUU
6 cvf rnl	7, , 0ij 9U+	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Te^t rnl	55j , 1U U7	0800j v P/f	<0800j	<0800j	<0800j	<0800j UUU
CoBc^n	7, , 0U 9U	0801 v P/f	<0801	**0(001**	**0(001**	**0(001** UUU
6 o^l rnl	7, , 0U+0U0	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Urcf rnl	7, , 0U+1U1	0801 v P/f	<0801	<0801	<0801	<0801 UUU
CceDrnl	7, , 0U +U5	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Cprol rnl	7, , 0U 7U3	0801 v P/f	<0801	<0801	<0801	<0801 UUU
lf drnl	7, , 0U7, U+	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Co, , er	7, , 0ij 0U9	0801 v P/f	<0801	**0(001**	**0(001**	**0(005** UUU
Lcf rpcf t l	7, 3 U 1U0	0801 v P/f	**0(003**	**0(001**	**0(005**	**0(001** UUU
Rt Brdrnl	7, , 0U17U7	0801 v P/f	<0801	**0(005**	**0(001**	**0(005** UUU
Lmprnl	7, 3 U 3U5	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Lt rernrnl	7, 3 U , U3	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Tporrnl	7, , 0U5 U1	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Cerrnl	7, , 0U j U1	0801 v P/f	**0(008**	**0(005**	**0(003**	**0(005** UUU
Mcf . cf eDe	7, 3 U +Uj	0801 v P/f	**0(011**	**0(098**	**0(0a9**	**0(047** UUU
Neodgl rnl	7, , 0U00U9	0801 v P/f	**0(009**	**0(005**	**0(003**	**0(005** UUU
Mo^gBdef t l	7, 3 U 9U7	0801 v P/f	<0801	<0801	<0801	<0801 UUU
HrcDeodgl rnl	7, , 0U10U0	0801 v P/f	**0(001**	<0801	<0801	<0801 UUU
Nrnke^	7, , 0U05U0	0801 v P/f	<0801	<0801	**0(005**	**0(005** UUU
Scl crrnl	7, , 0U1 U	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Lecd	7, 3 U 5U1	0801 v P/f	<0801	<0801	<0801	<0801 UUU
TerBrnl	7, , 0U57U	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Af rrh of g	7, , 0U3+U0	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Tpt ^rnl	7, , 0U30U	0801 v P/f	<0801	<0801	<0801	<0801 UUU
Se^ef rnl	7795U U5	0801 v P/f	<0801	<0801	<0801	<0801 UUU

. FPs g j e: Oe7
K : bkeRbAsb g EM1307355
y aGi r g ESc B- eNYNBEMNe BYef Bm
. b: 2sur g I RK SI 1505

Analytical Results

NDLUMFrb2: WATER #MFrb2: WATERq

	Client sample ID	5	NOWA 7	NOWA 8	NOWA a	UUUU
	Client sampling date / time	0 Uldf U5013elj g00	0 Uldf U5013elj g00	0 Uldf U5013elj g00	0 Uldf U5013elj g00	UUUU
Compound	CAS Number LOR Unit	EM1307355-001	EM1307355-005	EM1307355-003	EM1307355-009	----
E) 050F: PrfBDo^yed Merc^D Bg ICH-MS - Cof nfnt ed						
YmerBrthl	7, , 0U-, U 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Trfh	7, , 0U31Uj 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Ymrrthl	7, , 0U-j Uj 08001 v P/f	**0(005**	<08001	**0(005**	**0(001**	UUUU
Tpc^rthl	7, , 0U59U0 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Zmri of rthl	7, , 0U-7U7 0800j v P/f	<0800j	<0800j	<0800j	<0800j	UUUU
Vcf cdrthl	7, , 0U-5U5 0801 v P/f	<0801	<0801	<0801	<0801	UUUU
Zrfhi	7, , 0U-+U- 0800j v P/f	<0800j	<0800j	<0800j	**0(004**	UUUU
Irof	7, 3 U9 U- 080j v P/f	**0(54**	**0(+1**	**1(55**	**1(39**	UUUU
E) 050T: Torc^Merc^D Bg ICH-MS						
A^t I rfnrthl	7, 5 U 0Uj 0801 v P/f	**3(19**	**0(4a**	**0(7a**	**0(74**	UUUU
PgD, roDrthl	7, 5 U 1U- 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Srfyer	7, , 0U55U 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
ArDef rfn	7, , 0U39U5 08001 v P/f	<08001	<08001	<08001	**0(001**	UUUU
wrBI t rp	7, , 0U- U 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
ErBrthl	7, , 0Uj 5U0 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
worof	7, , 0U 5U9 080j v P/f	<080j	<080j	<080j	<080j	UUUU
Et ro, rthl	7, , 0Uj 3U1 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Srrof rthl	7, , 0U5, U- 08001 v P/f	**0(035**	**0(033**	**0(053**	**0(09+**	UUUU
wcrrthl	7, , 0U3 U3 08001 v P/f	**0(05+**	**0(059**	**0(057**	**0(035**	UUUU
) cdo^rfnrthl	7, , 0Uj , U5 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Tmrcf rthl	7, , 0U35U- 0801 v P/f	**0(04**	<0801	<0801	<0801	UUUU
werg^rthl	7, , 0U 1U7 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
) c^rthl	7, , 0Uj j U3 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Ccdl rthl	7, , 0U 3U 080001 v P/f	<080001	<080001	<080001	<080001	UUUU
6 cvf rthl	7, , 0Uj 9U- 0801 v P/f	<0801	<0801	<0801	<0801	UUUU
Te^t rrthl	55j , 1U U7 0800j v P/f	<0800j	<0800j	<0800j	<0800j	UUUU
CoBc^n	7, , 0U 9U 08001 v P/f	<08001	**0(001**	**0(001**	**0(001**	UUUU
6 o^1 rthl	7, , 0U-0U0 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Urcf rthl	7, , 0U-1U1 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
CceDrthl	7, , 0U +U5 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Cprol rthl	7, , 0U 7U3 08001 v P/f	**0(005**	**0(001**	**0(005**	**0(005**	UUUU
If drthl	7, , 0U7, U- 08001 v P/f	<08001	<08001	<08001	<08001	UUUU
Co, , er	7, , 0Uj 0U9 08001 v P/f	<08001	**0(005**	**0(005**	**0(005**	UUUU

. FPs g +e Ob7
K : bkeRbAsb g EM1307355
y aGi r g ESc B- eNYNBEMNe BYef Bm
. b: 2sur g I RK SI 1505

Analytical Results

NDLUMFrb2: WATER #MFrb2: WATERq

	Client sample ID	5	NOWA 7	NOWA 8	NOWA a	UUU
	Client sampling date / time	0 Uldf U5013ef j g00	0 Uldf U5013ef j g00	0 Uldf U5013ef j g00	0 Uldf U5013ef j g00	UUU
Compound	CAS Number / LOR / Unit	EM1307355-001	EM1307355-005	EM1307355-003	EM1307355-009	----
E) 050T: Torc^Merc^D Bg ICH-MS - Cof mft ed						
Lcf rpcf t l	7, 3 U 1U0 08001 v P/f	**0(009**	**0(001**	**0(005**	**0(005**	UUU
Rt Brdrnl	7, , 0U17U7 08001 v P/f	**0(005**	**0(003**	**0(005**	**0(003**	UUU
Lnprnl	7, 3 U 3U5 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Lt rernnl	7, 3 U , U3 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Tporrnl	7, , 0U5 U1 08001 v P/f	**0(001**	<08001	<08001	<08001	UUU
Cerrnl	7, , 0U j U1 08001 v P/f	**0(010**	**0(003**	**0(009**	**0(003**	UUU
Mcf . cf eDe	7, 3 U +Uj 08001 v P/f	**0(014**	**0(099**	**0(085**	**0(0+4**	UUU
Neodgl rnl	7, , 0U00U9 08001 v P/f	**0(009**	**0(005**	**0(003**	**0(005**	UUU
Mo^gBdef t l	7, 3 U 9U7 08001 v P/f	<08001	<08001	<08001	<08001	UUU
HrcDeodgl rnl	7, , 0U10U0 08001 v P/f	**0(001**	<08001	<08001	<08001	UUU
Nrnke^	7, , 0U05U0 08001 v P/f	<08001	**0(005**	**0(005**	**0(003**	UUU
Scl crrnl	7, , 0U1 U 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Lecd	7, 3 U 5U1 08001 v P/f	<08001	<08001	<08001	<08001	UUU
TerBrnl	7, , 0U57U 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Af rnh of g	7, , 0U3+U0 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Tpt ^rnl	7, , 0U30U 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Se^ef rnl	7795U U5 0801 v P/f	<0801	<0801	<0801	<0801	UUU
YrrerBrnl	7, , 0U+, U 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Trfh	7, , 0U31Uj 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Yrrrnl	7, , 0U+j Uj 08001 v P/f	**0(005**	**0(001**	**0(005**	**0(001**	UUU
Tpc^^rnl	7, , 0U59U0 08001 v P/f	<08001	<08001	<08001	<08001	UUU
Zrri of rnl	7, , 0U+7U7 0800j v P/f	<0800j	<0800j	<0800j	<0800j	UUU
Vcf cdrnl	7, , 0U+5U5 0801 v P/f	<0801	<0801	<0801	<0801	UUU
Zrfni	7, , 0U++U+ 0800j v P/f	**0(007**	**0(00a**	**0(00a**	**0(013**	UUU
Irof	7, 3 U9 U+ 080j v P/f	**1(a5**	**1(19**	**1(89**	**5(15**	UUU
E) 034F: PrDo^yed Meri t rg Bg FIMS						
Meri t rg	7, 3 U 7U+ 080001 v P/f	<080001	<080001	<080001	<080001	UUU
E) 034T: Torc^Rei oyercB^e Meri t rg Bg FIMS						
Meri t rg	7, 3 U 7U+ 080001 v P/f	<080001	<080001	<080001	<080001	UUU
EK05+SF: Torc^CN Bg Se. l ef red F^o; Af c^gDer						
Torc^Cgcf rde	j 7U15Uj 0800, v P/f	<0800,	<0800,	<0800,	<0800,	UUU
EK090H: F^t orrde Bg HC Trrcror						
F^t orrde	1+ 9, U 9U9 081 v P/f	<081	<081	<081	<081	UUU

. FPs g 7e ce7
K : bkeRbAsb g EM1307355
y aGi r g ESc B- eNYNBEMNe BYef Bm
. b: 2sur g I RK SI 1505

Analytical Results

NDLUMFrb2: WATER #MFrb2: WATERq			Client sample ID	5	NOWA 7	NOWA 8	NOWA a	UUUU
			Client sampling date / time	0 UJdf U5013ef j g00	0 UJdf U5013ef j g00	0 UJdf U5013ef j g00	0 UJdf U5013ef j g00	UUUU
Compound	CAS Number	LOR	Unit	EM1307355-001	EM1307355-005	EM1307355-003	EM1307355-009	----
EK044) : Al l of rn cDN Bg PrDi rere Af c^gDer								
Al l of rn cDN	7++, U 1U7	0801	v P/f	0(05	0(09	0(08	0(0+	UUUU
EK047) : Nmrme cDN Bg PrDi rere Af c^gDer								
Nmrme cDN	UUUU	0801	v P/f	<0801	<0801	<0801	<0801	UUUU
EK048) : Nmrcre cDN Bg PrDi rere Af c^gDer								
Nmrcre cDN	1, 7 7Ujj U9	0801	v P/f	<0801	0(13	0(09	0(05	UUUU
EK04a) : Nmrme , ^t DNmrcre cDN #NO2q Bg PrDi rere Af c^gDer								
Nmrme | Nmrcre cDN	UUUU	0801	v P/f	<0801	0(13	0(09	0(05	UUUU
EK0+1) : Torc^Kxe^dcp^Nmro. ef wg PrDi rere Af c^gDer								
Torc^Kxe^dcp^Nmro. ef cDN	UUUU	081	v P/f	<081	<081	<081	<081	UUUU
EK0+5) : Torc^Nmro. ef cDN #TKN | NO2qBg PrDi rere Af c^gDer								
^eTorc^Nmro. ef cDN	UUUU	081	v P/f	<081	0(1	<081	<081	UUUU
EK0+7) : Torc^HpoD, port DcDH Bg PrDi rere Af c^gDer								
Torc^HpoD, port DcDH	UUUU	0801	v P/f	0(05	0(09	0(03	0(04	UUUU
EK071) : Reci mye HpoD, port DcDH Bg drDi rere cf c^gDer								
Reci mye HpoD, port DcDH	1, 5+j U, U5	0801	v P/f	<0801	<0801	<0801	<0801	UUUU
EN044: lof rn wc^cf i e								
Torc^Af rof D	UUUU	0801	v sq/f	5(05	5(75	5(38	9(5a	UUUU
Torc^Ccrnof D	UUUU	0801	v sq/f	5(11	5(79	5(38	3(7+	UUUU
lof rn wc^cf i e	UUUU	0801	%	5(5a	0(90	0(07	+(+9	UUUU
EH050: Orn^cf d) recDe #O&) q								
Orn^&) recDe	UUUU	j	v P/f	<j	<j	<j	<j	UUUU
VIC-MM407: Torc^Co^norl DBg MF								
Torc^Co^norl DBg MF	UUUU	1	: bPl /100v f	55	1+	90	a+	UUUU
VIC-MM418: E(i o^rn& Fcei c^Co^norl DBg MF #; cDre; crerq								
Fcei c^Co^norl D	UUUU	1	: bPl /100v f	<5	+	99	8+	UUUU

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM13053H0**	8F. s	P1eg:e7
t ags Cb	P**EARTP SYSTEMS DTY LTs**	oFf gLFtgLr	PECi ylgCn sCbFaev yi yl ygCeMsafgmLCs
t gCbFDb	PMu eu c REu Os8 B t EtEt	t gCbFDb	Pt ags Cbel sLi yDsl
NSSLsl l	PI ABDEel7 75dU3e9 B 9 el Cu EEO HEG eKB VANAI Cu NoBNe8101	NSSLsl l	PVeG sl bFaeu Sel , LyC. i Fase KB eNm bLFayFe8171
Ech Fya	PLgf sLb, yDDyCyC4 sFLbpl r l bsn l Dgn Fm	Ech Fya	PMsafgmLCs ECi ylg l sLi yDsl 4 Fal . agf FaDgn
Osas, pgCs	P@1e03e5U10e7+00	Osas, pgCs	P@1c3cU+V5e5h00
6FDl yn ys	P@1e03e5U+3e+030	6FDl yn ys	P@1c3cU+V5e5h01
8 lgjs Db	PTc G NT1202	Qt eosi sa	PTE8 Mel555el DpsSmaseR(3)eFCSeNol eQt l 3elsqmyLsn sCb
c LSsLeCmn f sL	PTc G NT1202		
t dc: d eCmn f sL	Pdddd	v Fbsel Fn , asl eusDsyi ysS	P11dJAod2013
l Fn , asL	Pu8	Bl mse/ Fbs	P1UdJAod2013
l ys	PTgwFeTgwF		
		Tg eg:el Fn , asl elsDsyi ysS	PV
Qmgbse Cmn f sL	PMERQ/112/13	Tg eg:el Fn , asl e-FCFal sl sS	PV

Cpyl e Ls, gLbe l m, sLl sSsl e FCr e , Lsi ygml e Ls, gLb(l)e wykpe bpyl e Ls:sLs CDs e u sl mdb e F, , are bge bpse l Fn , as(l)e Fl e l mf n ybs S e Nare , F. sl e g:e bpyl e Ls, gLbe pFi se f ssCe DpsDksSe FCSe F, , Lgi s Se :gL Lsas Fl s e

Cpyl el sLbyyDFbs eg:eNCFal l yl eDg CbFyCl ebpse gaag wyC. eyC:gLn Fbyg CP

- - sCs LFael gn n sCb
- NCFal byDFaeu sl mdb

8F. s	P 2eg:e7
G glkec LSsL	P EM1307350
t ajsCb	P ENu C9 el YI OEMI e8 OYeoOv
8 LgjsDb	P T c G NT 1202

General Comments

Opse FCFarbDFae , LgDsSmLsl e ml sSe f r e bpse ECi ygCn sCtFae v yj y ygCe pFi se f ssCe Ssi sag, sSe :Lgn e sl tFf ay psSe yCbsLCFbgCFare LsDg. OyzsSe , LgDsSmLsl e ImDpe Fl e bpgl se , mf ay psSe f r e bpse AI E8NW N8 9 NW NI e FCSe T E8 M e BCe pgml s Ssi sag, sSe LgDsSmLsl eFLsesn , agr s SegCetpseFf l sCDseg:eSgDm sCbsSel tFCSFLSI egLef reDasCbtLsqmsl b

G psLsen gy bmLseSsbsLn yCFbgCepFl ef ssCe sL:gLn sSWsl mab eFLsets, gLbsSegCeFeSLr ewsy pbef Fl y

G psLseFets, gLbsSesl l etpFCe(<)etsl mabey epy psLetpFCetpseoc u Wbpy en Fref seSmsetge Lyn FLrel Fn , asesxtLFDbSy sl tFbseSyarbgCeFCS/gLegCl m:yDysCbel Fn , asegLeFCFarl y

G psLsetpseoc u eg:eFets, gLbsSetsl mabeSy:sLl eLgn el tFCSFLSeoc u Wbpy en Fref seSmsetgepy pen gy bmLseDgCbsCbWgCl m:yDysCbel Fn , ase(LsSmDsSewsy pbesn , agr s S)egLen FLLyxeyCbsL:sLsCDs

G psCel Fn , ajC. etyn seyC:gLn FbgCeyeCgbe Lgi ySsSef r etpseDasCbWFn , ajC. eSFbsl eFLsel pgwCewybpgmbeFetyn seDgn , gCsCbeeBCetpsl segCl tFCDsl Wtpsetyn seDgn , gCsCbepFl ef ssCeFl l m sSef r etpseFf gLFbgLregLe LgDsl l yC. e mL gl sl

HsreP t Nl eTmn f sLe=el Nl ets. y ltLreOm f sLeLgn eSFbFf Fl sen FyCbFyCsSef rel psn yDFaNf l tLFDbl el sLi yDsl eOpsel psn yDFaNf l tLFDbl el sLi yDseyeFeSy i y ygCeg:etpseNn sLyDFCel psn yDFael gDysb oc u e=eoyn ybeg:ets, gLbyC. ue=eOpyetsl mabeyeDgn , mbsSeLgn eyCSy i ySmFaFCFarbseSsbsDbgCl eFbegLeFf gi setpseasi sag:ets, gLbyC.

- EA01-: Cc^l t ^cred Ts S rh dererl rhed vrol E^ei rmc^i of dt i myrmg t | rh. c i of yer| rnf vci ror ov0B 9B
- Es 0358D: EM13053H08001 p 00b re| t ^| vor A^kc^fhmg #c| 2eef i of vml ed 2g re8cf c^g| rhB
- Fcei c^Co^norl | MF qMM914hrh i of dt i red 2g ALS Si ore| 2g NATA ci i redmcmof f oBHHbw| me f oBH4HB
- lof rh j c^cf i e ot novci i e, rc2^e ^rh m| vor | cl , ^e ; 1 dt e ro cf c^gre| f onKt cf mred rh r#rh re, orrB
- lof rh 2c^cf i e| x ere i c^l t ^cred t | rh. : l c(or cf rof | 8i #^ormdewc^kc^fhmg cf d | t ^cre) cf d l c(or i crnof | 8i c^l rhl wl c. f e| rhl w, orc| | rhl cf d | odrhl B
- Inrh rei o. f rhed r#cnrorc^l erc^| cre ^e| | r#cf drh| o^yed l erc^| vor EM13053H0BPox eyerwr#e drwaref i e rh x rr#rh eG errh ef rc^ycrrormof ovr#e l er#od| B
- Orhcf d Vrec| e qED0b0hi of dt i red 2g ALS Sgdf egwNATA ci i redmcmof f oB4b9w| me f o 10H11B
- Torc^Co^norl | qMM905hrh i of dt i red 2g ALS Si ore| 2g NATA ci i redmcmof f oBHHbw| me f oBH4HB

T NONeNDDLs SybsSeoFf gLFbgLreU2+
e
NDDLs SybsSegLeDgn , ajFCDsewybpe
B c /BEt e1702+

Signatories

Opy e SgDm sCbe pFl e f ssCe sasDbgCyDFare l y CsSe f r e bpse FmbpgLyzsSe l y CFbgLysl e yCSyDFbsSe f sagw e EasDbgCyDe l y CyC. e pFl e f ssCe DFLLysSe gmbe yC Dgn , ajFCDsewybpe LgDsSmLsl el , sDyysSeyCe21el 6u e8 FLbe11

Signatories	Position	Accreditation Category
v yFCye6sLCFCSg	I sCygLeBCgL FCyDel psn y b	Msaf gmLCseBCgL FCyD Msaf gmLCseBCgL FCyD Msaf gmLCseBCgL FCyD Msaf gmLCseBCgL FCyD
9 sLn FCeoyC	oFf gLFbgLrel ggLSyCFbgL	G u - el mf DgCbLFDbyC.
9 gFeT. mr sC	I sCygLeBCgL FCyDel psn y b	I r SCsr eBCgL FCyD
KFLl pFe9 geG yC.	T gCdMsbFal eOsFn eosFSsL	Msaf gmLCseBCgL FCyD Msaf gmLCseBCgL FCyD Msaf gmLCseBCgL FCyD

8F. s P 3eg:e7
GglKec LSsL P EM1307350
t ajsCb P ENuO9 e YI OEMI e8OYeoOv
8LgjsDb P Tc GNT1202

Analytical Results

I mf dMFdux: WATER qMFdux: WATERh

Compound	CAS Number	LOR	Unit	Client sample ID: 1	NOWA 1a	NOWA 11	NOWA 1b	dddd
			Client sampling date / time:	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	dddd
				EM13053H08001	EM13053H0800b	EM13053H08003	EM13053H0800a	8888
EA009: , P								
, P 7c^t e	dddd	0 01	, 9 eAOjb	- B4-	- B5H	- B4-	- B35	dddd
EA00-: Sodrnl Ad| or, rnof Rcrno qSARh								
Sodrnl Ad| or, rnof Rcrno	dddd	0 01	d	b8a5	b8a5	38b-	b854	dddd
EA010D: Cof dt i myrng 2g DC Tmrcror								
E^ei rrnhc^Cof dt i myrng @ b9°C	dddd	1	µI /Dn	355	3b-	a53	941	dddd
EA01-: Nof Mcrnhe 8E| nh cred Ts S Sc^fnrng								
Torc^s rh| o^yed So^rd| qCc^1 B	dddd	10	n . /o	ba9	b1b	305	354	dddd
EA0b9: St | , ef ded So^rd|								
St | , ef ded So^rd| qSSh	dddd	+	n . /o	<+	<+	<+	<+	dddd
EA0-9: Torc^Pcrdf e| | c| CcCO3								
Torc^Pcrdf e| | c| CcCO3	dddd	1	n . /o	9a	a5	- -	10-	dddd
Es035D: A^kc^fnrng 2g DC Tmrcror								
PgdroGrde A^kc^fnrng c| CcCO3	v Mc d210d001	1	n . /o	<1	<1	<1	<1	dddd
Ccr2of cre A^kc^fnrng c| CcCO3	3U12d32dh	1	n . /o	<1	<1	<1	<1	dddd
j rncr2of cre A^kc^fnrng c| CcCO3	71d+2d3	1	n . /o	19	-	b9	4	dddd
Torc^A^kc^fnrng c| CcCO3	dddd	1	n . /o	19	-	b9	4	dddd
Es0a1V: St ^cre qTt r2rdrh errrnhc| SOa b82g s A								
St ^cre c| SOa 8Tt r2rdrh errrh	1VU0Ud75dU	1	n . /o	19	15	1-	b3	dddd
Es0a9V: C#^ornde s rh| o^yed Rere cf c^g| er								
C#^ornde	1hUU7d00dh	1	n . /o	H-	45	1b-	15b	dddd
Es0H3F: s rh| o^yed Mc(or Ccrnof |								
Cc^i rnl	7W0d70d2	1	n . /o	5	a	10	4	dddd
Mc. f e| rnl	7V35d5+dV	1	n . /o	H	H	10	b1	dddd
Sodrnl	7W0d23d+	1	n . /o	ab	3H	- 1	- -	dddd
Dorc| | rnl	7W0d05d7	1	n . /o	3	b	3	b	dddd
EV0b0F: s rh| o^yed Merc^| 2g ICD8MS								
A^t l rhrnl	7V25d50d+	0 01	n . /o	0B0	0B3b	0B a	0B-	dddd
sg| , ro| rnl	7V25d51dh	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Srnyer	7W0d22dV	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Ar| ef rn	7W0d3Udd2	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
j rh| t n#	7W0dh5d5	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Er2rnl	7W0d+2d0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
j orof	7W0dV2dU	0 0+	n . /o	<0 0+	<0 0+	<0 0+	<0 0+	dddd

8F. s P Veg:e7
GglkecLSsL P EM1307350
t ajsCb P ENuC9 e YI OEMI e8OYeoOv
8LgjsDb P Tc GNT1202

Analytical Results

I mfdMFduyx: WATER qMFduyx: WATERh

Compound	CAS Number	LOR	Unit	Client sample ID: 1	NOWA 1a	NOWA 11	NOWA 1b	dddd
			Client sampling date / time: 10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	dddd	
				EM13053H08001	EM13053H0800b	EM13053H08003	EM13053H0800a	8888
EV0b0F: s rh| o^yed Merc^| 2g ICD8MS 8Cof mfnt ed								
Et ro, rhl	7VW0d+3d1	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Srrof rhl	7VW0d2Vdh	0 001	n . /o	0B9- 1	0B935	0B9Hb	0B950	dddd
j crrhl	7VW0d35d3	0 001	n . /o	0B9a9	0B9b-	0B95b	0B995	dddd
Vcdo^fhrhl	7VW0d+Vd2	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Tmcf rhl	7VW0d32dh	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
j erg^rhl	7VW0dV1d7	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Vc^rhl	7VW0d++d3	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Ccdl rhl	7VW0dV3d5	0 0001	n . /o	<0 0001	<0 0001	<0 0001	<0 0001	dddd
Pcvf rhl	7VW0d+Udh	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
Te^t rrhl	22+V1dV5d7	0 00+	n . /o	<0 00+	<0 00+	<0 00+	<0 00+	dddd
Co2c^n	7VW0dVUdV	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Po^l rhl	7VW0dh0d0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Urcf rhl	7VW0dh1df	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Cce| rhl	7VW0dVhd2	0 001	n . /o	<0 001	<0 001	<0 001	0B90a	dddd
C#rol rhl	7VW0dV7d3	0 001	n . /o	<0 001	0B901	<0 001	<0 001	dddd
lf drhl	7VW0d7Vdh	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Co, , er	7VW0d+0dU	0 001	n . /o	0B90b	0B903	0B90b	<0 001	dddd
Lcf r#cf t l	7V35d51d0	0 001	n . /o	0B901	0B90b	<0 001	0B901	dddd
Rt 2rdrhl	7VW0df7d7	0 001	n . /o	0B90b	<0 001	0B90b	0B90b	dddd
Lm#rhl	7V35d53d2	0 001	n . /o	<0 001	<0 001	0B901	<0 001	dddd
Lt rerrhl	7V35d5Vd3	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
T#orrhl	7VW0d25df	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Cerrhl	7VW0dV+df	0 001	n . /o	0B90b	0B90a	0B901	0B903	dddd
Mcf . cf e| e	7V35d5hd+	0 001	n . /o	0B91H	0B93H	0B933	0B939	dddd
Neodgl rhl	7VW0d0dU	0 001	n . /o	0B90b	0B903	<0 001	0B90b	dddd
Mo^g2def t l	7V35d5Ud7	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Drc| eodgl rhl	7VW0df0d0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Nrnke^	7VW0d02d0	0 001	n . /o	0B901	0B903	<0 001	<0 001	dddd
Scl crrhl	7VW0df5d5	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Lecd	7V35d52df	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Ter2rhl	7VW0d27d5	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Af rrh of g	7VW0d3hd0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
T#t ^rhl	7VW0d30dV	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Se^efrhl	77U2dV5d2	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd

8F. s P +eg:e7
GglkecLSsL P EM1307350
t ajsCb P ENuC9 el YI OEMI e8OYeoOv
8LgjsDb P Tc G NT1202

Analytical Results

I mfdMFdux: WATER qMFdux: WATERh

Compound	CAS Number	LOR	Unit	Client sample ID: 1	NOWA 1a	NOWA 11	NOWA 1b	dddd
			Client sampling date / time	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	dddd
				EM13053H08001	EM13053H0800b	EM13053H08003	EM13053H0800a	8888
EV0b0F: s rh| o^yed Merc^¶ 2g ICD8MS 8Cof mfnt ed								
Ymer2rnl	7VW0chVdV	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Trfh	7VW0c81d+	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Ymrnl	7VW0ch+d+	0 001	n . /o	0B001	0B00b	<0 001	<0 001	dddd
T#c^nl	7VW0d2Ud0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Zmi of nl	7VW0ch7d7	0 00+	n . /o	<0 00+	<0 00+	<0 00+	<0 00+	dddd
7cf cdrnl	7VW0ch2d2	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
Zrfhi	7VW0chhdh	0 00+	n . /o	<0 00+	0B00-	<0 00+	<0 00+	dddd
lrof	7V35dJ5dh	0 0+	n . /o	0B9a	1B13	0B81	0B93	dddd
EV0b0T: Torc^Merc^¶ 2g ICD8MS								
A^t l rfnrnl	7V25d50d+	0 01	n . /o	1B9a	bB80	0B83	1Bb5	dddd
s g| , ro| rnl	7V25d51dh	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Srfyer	7VW0d22dV	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Ar| ef rh	7VW0d3Ud2	0 001	n . /o	0B00b	0B00b	0B801	<0 001	dddd
j rh| t n#	7VW0ch5d5	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Er2rnl	7VW0d+2d0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
j orof	7VW0dV2dU	0 0+	n . /o	0B85	0B85	0B1a	0B85	dddd
Et ro, rnl	7VW0d+3d1	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Srrof rnl	7VW0d2Vdh	0 001	n . /o	0B89a	0B839	0B84-	0B8-9	dddd
j crrnl	7VW0d35d3	0 001	n . /o	0B8a4	0B83b	0B8-4	0B895	dddd
Vcdo^fnrnl	7VW0d+Vd2	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Tmcf rnl	7VW0d32dh	0 01	n . /o	<0 01	0B8b	<0 01	0B81	dddd
j erg^nl	7VW0dV1d7	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Vc^nl	7VW0d++d3	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Ccdl rnl	7VW0dV3d5	0 0001	n . /o	<0 0001	0B00b	<0 0001	<0 0001	dddd
Pcvf rnl	7VW0d+Udh	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
Te^t rnl	22+V1dV5d7	0 00+	n . /o	<0 00+	<0 00+	<0 00+	<0 00+	dddd
Co2c^n	7VW0dVUdV	0 001	n . /o	<0 001	0B801	<0 001	<0 001	dddd
Po^¶ rnl	7VW0dh0d0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Urcf rnl	7VW0dh1dl	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Cce| rnl	7VW0dVhd2	0 001	n . /o	<0 001	<0 001	<0 001	0B80b	dddd
C#rol rnl	7VW0dV7d3	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
lf drnl	7VW0d7Vdh	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Co, , er	7VW0d+0dU	0 001	n . /o	0B803	0B809	0B80a	0B80b	dddd

8F. s	Phcg:e7
GglkcLSsL	PEM1307350
t ajsCb	PENuO9 el YI OEMI e8OYeoOv
8LgjsDb	PTc GNT1202

Analytical Results

I mfdMFdux: **WATER** qMFdux: **WATERh**

Compound	CAS Number	LOR	Unit	Client sample ID: 1	NOWA 1a	NOWA 11	NOWA 1b	dddd
			Client sampling date / time	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	dddd
				EM13053H08001	EM13053H0800b	EM13053H08003	EM13053H0800a	8888
EV0b0T: Torc^Merc^¶ 2g ICD8MS 8Cof mft ed								
Lcf r#cf t l	7V35c51d0	0 001	n . /o	**0B90b**	**0B903**	**0B901**	**0B90b**	dddd
Rt 2rdrtl	7VW0d17d7	0 001	n . /o	**0B903**	**0B909**	**0B93a**	**0B903**	dddd
Lm#rtl	7V35c53c2	0 001	n . /o	**0B901**	**0B901**	**0B90b**	<0 001	dddd
Lt rertl	7V35c5Vc8	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
T#orrtl	7VW0c25d1	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Cerrtl	7VW0dV+d1	0 001	n . /o	**0B903**	**0B909**	**0B90b**	**0B90a**	dddd
Mcf . cf e| e	7V35c5hd+	0 001	n . /o	**0B9bb**	**0B933**	**0B991**	**0B93b**	dddd
Neodgl rtl	7VW0d0dJ	0 001	n . /o	**0B90b**	**0B903**	**0B901**	**0B90b**	dddd
Mo^g2def t l	7V35c5Ud7	0 001	n . /o	<0 001	<0 001	**0B90b**	<0 001	dddd
Drc| eodgl rtl	7VW0d10d0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Nrnke^	7VW0c02d0	0 001	n . /o	**0B90b**	**0B90a**	**0B90b**	<0 001	dddd
Scl crrtl	7VW0d15c5	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Lecd	7V35c52d1	0 001	n . /o	**0B90b**	**0B901**	**0B903**	<0 001	dddd
Ter2rtl	7VW0d27c5	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Af rrh of g	7VW0c3hd0	0 001	n . /o	**0B913**	**0B905**	**0B90a**	**0B903**	dddd
T#t ^rtl	7VW0c30dV	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Se^efrtl	77U2dV5d2	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
Yrrer2rtl	7VW0chVdV	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Trfh	7VW0c31d+	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Yrrrtl	7VW0ch+d+	0 001	n . /o	**0B901**	**0B90b**	<0 001	**0B901**	dddd
T#c^^rtl	7VW0d2Ud0	0 001	n . /o	<0 001	<0 001	<0 001	<0 001	dddd
Zrri of rtl	7VW0ch7d7	0 00+	n . /o	<0 00+	<0 00+	<0 00+	<0 00+	dddd
7cf cdrtl	7VW0ch2d2	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
Zrfhi	7VW0chhdh	0 00+	n . /o	**0B910**	**0B930**	**0B9-9**	**0B9b9**	dddd
Irof	7V35dJ5dh	0 0+	n . /o	**1B14**	**bB9b**	**0BHH**	**1B95**	dddd
EV039F: s rh| o^yed Meri t rg 2g FIMS								
Meri t rg	7V35c57dh	0 0001	n . /o	<0 0001	<0 0001	<0 0001	<0 0001	dddd
EV039T: Torc^Rei oyerc2^e Meri t rg 2g FIMS								
Meri t rg	7V35c57dh	0 0001	n . /o	<0 0001	<0 0001	<0 0001	<0 0001	dddd
E&0b-SF: Torc^CN 2g Se. l ef red F^ox Af c^g| er								
Torc^Cgcf rde	+7d12d+	0 00V	n . /o	<0 00V	<0 00V	<0 00V	<0 00V	dddd
E&0a0D: F^t orrde 2g DC Trrcror								
F^t orrde	1h5UVdVUdJ	0 1	n . /o	<0 1	<0 1	<0 1	<0 1	dddd

8F. s P 7eg:e7
GglkecLSsL P EM1307350
t ajsCb P ENuC9 el YI OEMI e8OYeoOv
8LgjsDb P Tc GNT1202

Analytical Results

I mfdMFdyx: WATER qMFdyx: WATERh

Compound	CAS Number	LOR	Unit	Client sample ID: 1	NOWA 1a	NOWA 11	NOWA 1b	dddd
			Client sampling date / time	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	10dJAod2013e10P30	dddd
				EM13053H08001	EM13053H0800b	EM13053H08003	EM13053H0800a	8888
E&099V: Al l of rn c| N 2g s rhi rere Af c^g| er								
Al l of rn c| N	7hhVdV1d7	0 01	n . /o	0B89	<0 01	0B8a	<0 01	dddd
E&095V: Nmrrne c| N 2g s rhi rere Af c^g| er								
Nmrrne c| N	dddd	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
E&094V: Nmrcre c| N 2g s rhi rere Af c^g| er								
Nmrcre c| N	1V757d++dJ	0 01	n . /o	0B85	0B8b	0B84	0B8b	dddd
E&09HV: Nmrrne , t| Nmrcre c| N qNOGh 2g s rhi rere Af c^g| er								
Nmrrne 6 Nmrcre c| N	dddd	0 01	n . /o	0B85	0B8b	0B84	0B8b	dddd
E&0- 1V: Torc^&(e^dc#^Nmro. ef j g s rhi rere Af c^g| er								
Torc^&(e^dc#^Nmro. ef c| N	dddd	0 1	n . /o	<0 1	<0 1	0B9	0B8	dddd
E&0- bV: Torc^Nmro. ef c| N qT&N 6 NOGh2g s rhi rere Af c^g| er								
^eTorc^Nmro. ef c| N	dddd	0 1	n . /o	<0 1	<0 1	0B8	0B8	dddd
E&0- 5V: Torc^D#o| , #ort | c| D 2g s rhi rere Af c^g| er								
Torc^D#o| , #ort | c| D	dddd	0 01	n . /o	0B8b	0B8a	0B83	0B8a	dddd
E&051V: Reci mye D#o| , #ort | c| D 2g drhi rere cf c^g| er								
Reci mye D#o| , #ort | c| D	1V2h+dVd2	0 01	n . /o	<0 01	<0 01	<0 01	<0 01	dddd
EN099: lof rn j c^cf i e								
Torc^Af rof |	dddd	0 01	n sq/o	3B8b	bB83	aB8H	98aH	dddd
Torc^Ccrnof |	dddd	0 01	n sq/o	bB8H	bB8 H	aB89	98B9	dddd
lof rn j c^cf i e	dddd	0 01	%	98B4	aB84	38H4	aB8H	dddd
ED0b0: Orncf d Vrec| e qOpVh								
Ornp Vrec| e	dddd	+	n . /o	<+	<+	<+	<+	dddd
7IC8MM905: Torc^Co^norl | 2g MF								
Torc^Co^norl | 2g MF	dddd	1	gL l /100n o	4	a	4-	9a	dddd
7IC8MM914: EB o^np Fcei c^Co^norl | 2g MF qx c| rex crerh								
Fcei c^Co^norl |	dddd	1	gL l /100n o	-	<2	-0	34	dddd

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1308893**	. FPs	q1e oef
Caisnt	g **EARTH SYSTEMS PTY LTD**	LFb: rFt: ry	g Envir: nmsntFaeDivil i: neMsab: urns
C: ntFct	q MReOREBBeDTI NS	C: ntFct	q CaisnteSsrvicsl
TAArsl l	q Sd NBEel 7 7U953e NH- eSBREEB GEK el NCVaTd SBRTLNTe3101	TAArsl l	q VeK sl tFaeRAeS, rinPvFasel NCeTul trFaiFe3171
E9mFia	q brstt8AFvil 4 sFrtpl yl tsml 8c: m8Fu	E9mFia	q Msab: urns8Envir: 8Ssrvicsl 4 FalPa bFa8c: m
Bsas, p: ns	q @ 1e03eU510e7f 00	Bsas, p: ns	q @ 19395f VUdU 00
6Fcl imias	q @ 1e03eU5f 3ef 030	6Fcl imias	q @ 19395f VUdU 01
. r: hsct	q + j K T + 1202	QCeLsvsa	q + E. Me2013eeScpsAuaseO(3)eFnAeTLSeQCS3ersquirsmsnt
j rAsrenumbsr	q + j K T + 1202		
Cg 9Cenumbsr	q 9999	DFtseSFm, asl eRscsivsA	g 239Jd L92013
SFm, asr	q + w	NIl useDFts	q 2U9Jd L92013
Sits	q + : / Fe+ : / F		
		+ : 8e oel Fm, asl erscsivsA	g 2
Qu: tsenumbsr	q MEOQk112k13	+ : 8e oel Fm, asl eFnFayl sA	g 2

Bpil e rs, : rte l u, srl sAsl e Fnye , rsvi: ul e rs, : rt(l)e / itpe tpil e rsosrsncs8e RsI ual e F, , aye t: e tpse l Fm, as(l)e Fl e l ubmittsA8e Tae , FPsl e : oe tpil e rs, : rte pFvse bssne cpscYsAe FnAe F, , r: vsAe o r rsasFl s8e

Bpil eCsrtiocFtse oeTnFayl il ec: ntFinl etpseo aa / inPeino rmFti: ng

- HsnsrFaeC: mmsntl
- TnFayticFaeRsI ual

. FPs g 2e Of
K : rYe rAsr g EM1307753
Caisnt g ETRB- eSwSBEMSe BweLBD
. r: hsct g +j K T+1202

General Comments

Bpse FnFayticFae , r: csAursl e ul sAe bye tpse Envir: nmsntFae Divil i: ne pFvse bssne Asvsa , sAe or: me sl tFbal psAe intsrnFti: nFaye rsc: PnizsAe , r: csAursl e l ucpe Fl e tp: l se , ubal psAe bye tpse d SE. TW T. - TW TSe FnAe + E. M8e Nle p: ul s Asvsa , sAe r: csAursl eFrsesm, a ysAeinetpseFbl sncse oeA: cumsntsAel tFnAFrAl e rebyecaisntersqusl t8

K psrsem: il turseAstsrminFti: nepFl ebssne sro rmsAWsl ual eFrsers, : rtsAe neFeAryel siPptebFl il 8

K psrseFers, : rtsAeasl l etpFne(<)ersl uatel epiPpsretpFnetpseLj RWpil emFyebseAuset: e rimFryel Fm, asesxtrFctkAiPsl tFtseAiauti: neFnAk reinl uoicisntel Fm, aseo reFnFayl il 8

K psrsetpseLj Re oeFers, : rtsAersl uateAiocsrl eor: mel tFnAFrAeLj RWpil emFyebseAuset: epiPpem: il tursec: ntsntWhl uoicisntel Fm, ase(rsAucsAel siPptesm, a ysA)e remFtrixeintsrosrsncs8

K psnel Fm, ainPetimseino rmFti: nel en: te r: viAsAebyetpsecaisntWFm, ainPeAFtsl eFrsel p: / nel itp: uteFetimsec: m, : nsnt8eNetpsl seinl tFncsl Wpsetimsec: m, : nsntepFl ebssneFl l umsAebyetpseFb: rFt: ryeo re r: csl l inPe ur, : l sl 8

Gsyeg CTSe+ umbsre=eCTSersPil tryenumbsreor: meAFtFbFl semFintFinsAebyeCpsmicFaeTbl trFctl eSsrvicsl 8eBpseCpsmicFaeTbl trFctl eSsrvicseil eFeAivil i: ne oetpseTmsricFneCpsmicFaeS: cisty8
Lj Re=eLimite oers, : rtinP
ue=eBpil ersl uatel ec: m, utsAeor: meinAiviAuFaeFnFaytseAstscti: nl eFte reFb: vsetpseasvsae oers, : rtinP

- **EA016: Cc^l t ^cred TDS m derer l med vol E^ei rrnc^i of dt i mynrg t srh. c i of yersrof vci ror ov0K65K**
- **E7 0G6SF : EM1308893-00GI crrrh sbrke vcrted vor TCN dt e ro bossrp^e scl b^e mrerveref i eKTBra Bcs peef i of vnl ed pg re-cf c^gsraK**
- **E7 068w: LOR Bcs peef rcrsed vor Torc^PBosbBort s cs P dt e ro ^cporcrorg pci k. rot f d opseryed m rBe MerBod j ^cf k**
- **lof m pc^cf i es , ere i c^l t ^cred t srh. : l c;or cf rof s - i B^ornde(c^kc^fmg cf d st ^vcre) cf d l c;or i crnof s - i c^l ml (l c. f esml (borcssml cf d sodml K**

+TBTeTccrsAitsAeLFb: rFt: rye52f e TccrsAitsAeo rec: m, aiFncsel itpe NSj KNECe1702f 8

Signatories

Bpil e A: cumsnte pFl e bssne sasctr: nicFaye l iPnsAe bye tpse Futp: rizsAe l iPnFt: risl e inAicFtsAe bsa / 8e Easctr: nice l iPninPe pFl e bssne cFrrisAe : ute in c: m, aiFncsel itpe r: csAursl el , sciois Aeine21eC6Re Frtel18

Signatories	Position	Accreditation Category
DiaFnie6srnFnA:	Ssni: reNl: rPFniceCpsmil t	Msab: urnseNl: rPFnicl
		Msab: urnseNl: rPFnicl
+iYYieSts, nis/ l Yi	Ssni: reNl: rPFniceNl trumsnteCpsmil t	Msab: urnseNl: rPFnicl
		Msab: urnseNl: rPFnicl
		Msab: urnseNl: rPFnicl
		Msab: urnseNl: rPFnicl

. FPs g 3e: Gf
K : rYej rAsr g EM1307753
Casnt g ETRB- 6SwSBEMSe BweLBD
. r: hsct g +j K T+1202

Analytical Results

Sub9MFtrix: **WATER** 2MFtrix: **WATERV**

				Client sample ID	NOWAN1G0Gj oreBo^e G	NOWAN1G0Gj oreBo^e 3	9999	9999	9999
				Client sampling date / time	179Jd L92013e12g0	179Jd L92013e10gf 1	9999	9999	9999
Compound	*CAS Number*	*LOR*	*Unit*		**EM1308893-001**	**EM1308893-00G**	----	----	----
EA005: bH									
bH @c^t e	9999	0801	, - ed nit		**8K8a**	**6K49**	9999	9999	9999
EA006: Sodrtnl Adsorbrnof Rcnro 2SARV									
Sodrtnl Adsorbrnof Rcnro	9999	0801	9		**3K04**	**5K8G**	9999	9999	9999
EA010P: Cof dt i rnyrng pg PC Tnrrcror									
E^ei rrrnc^Cof dt i rnyrng ° G5xC	9999	1	µSlcm		**GaG0**	**4050**	9999	9999	9999
EA016: Nof Mcrrfie - Esrrh cred TDS Sc^frnrg									
Torc^Dnaso^yed So^rds 2Cc^i W	9999	10	mPkL		**1a00**	**G630**	9999	9999	9999
EA065: Torc^Hcrdf ess cs CcCO3									
Torc^Hcrdf ess cs CcCO3	9999	1	mPkL		**a94**	**a35**	9999	9999	9999
ED038P: A^kc^frnrg pg PC Tnrrcror									
Hgdrohrnde A^kc^frnrg cs CcCO3	DMj 92109001	1	mPkL		<1	<1	9999	9999	9999
Ccrpof cre A^kc^frnrg cs CcCO3	35129329	1	mPkL		<1	<1	9999	9999	9999
j rncrpof cre A^kc^frnrg cs CcCO3	719f 293	1	mPkL		**G9a**	**119**	9999	9999	9999
Torc^A^kc^frnrg cs CcCO3	9999	1	mPkL		**G9a**	**119**	9999	9999	9999
ED041w: St ^cre 2Tt rprdrh errrnVcs SO4 G- pg DA									
St ^cre cs SO4 - Tt rprdrh errrn	1V5059 7U95	1	mPkL		**GG0**	**1a0**	9999	9999	9999
ED045w: CB^orrde Dnai rere cf c^gser									
CB^orrde	1 5579009	1	mPkL		**819**	**11G0**	9999	9999	9999
ED0a3F: Dnaso^yed Mc;or Ccrrof s									
Cc^i rtnl	7W097092	1	mPkL		**140**	**G0**	9999	9999	9999
Mc. f esrtnl	7V3U9Uf 9V	1	mPkL		**154**	**G15**	9999	9999	9999
Sodrtnl	7W09239f	1	mPkL		**G1a**	**40G**	9999	9999	9999
Porcssrtnl	7W090U97	1	mPkL		**16**	**16**	9999	9999	9999
Ew0G0F: Dnaso^yed Merc^s pg ICP-MS									
A^t l rfrtnl	7V2U9U09f	0801	mPkL		<0801	**0K01**	9999	9999	9999
Dgsbrosrtnl	7V2U9U19	08001	mPkL		<08001	<08001	9999	9999	9999
Srfyer	7W09229V	08001	mPkL		<08001	<08001	9999	9999	9999
Arsef rin	7W093592	08001	mPkL		**0K00G**	**0K00G**	9999	9999	9999
j rnal t rnB	7W09 U8U	08001	mPkL		<08001	<08001	9999	9999	9999
Erprtnl	7W09f 290	08001	mPkL		<08001	<08001	9999	9999	9999
j orof	7W09V295	080f	mPkL		**0K84**	**0KG3**	9999	9999	9999
Et robrtnl	7W09f 391	08001	mPkL		<08001	<08001	9999	9999	9999
Srrof rrtnl	7W092V9	08001	mPkL		**0K641**	**0K039**	9999	9999	9999

. FPs g Ve of
K : rYe rAsr g EM1307753
Casnt g ETRB- 6SwSBEMSe BweLBD
. r: hsct g +j K T+1202

Analytical Results

Sub9MFtrix: **WATER** 2MFtrix: **WATERV**

	Client sample ID	NOWAN1G0Gj oreBo^e G	NOWAN1G0Gj oreBo^e 3	9999	9999	9999
	Client sampling date / time	179Jd L92013e12g0	179Jd L92013e10gf 1	9999	9999	9999
Compound	CAS Number / LOR / Unit	EM1308893-001	EM1308893-00G	----	----	----
Ew0G0F: Dsso^yed Merc^s pg ICP-MS - Cof rnt ed						
j crnhl	7W093U93 08001 mPkL	**0K18a**	**0K05a**	9999	9999	9999
wcdo^fnrnhl	7W09f V92 08001 mPkL	<08001	<08001	9999	9999	9999
Tmcf rhl	7W09329 0801 mPkL	<0801	<0801	9999	9999	9999
j erg^rhl	7W09V197 08001 mPkL	<08001	<08001	9999	9999	9999
wc^rhl	7W09f f 93 08001 mPkL	<08001	<08001	9999	9999	9999
Ccdl rhl	7W09V39U 080001 mPkL	<080001	<080001	9999	9999	9999
Hcvf rhl	7W09f 59 0801 mPkL	<0801	<0801	9999	9999	9999
Te^t rrhl	22f V19VU97 0800f mPkL	<0800f	<0800f	9999	9999	9999
Copc^n	7W09V59V 08001 mPkL	**0K003**	**0K01G**	9999	9999	9999
Ho^l rhl	7W09 090 08001 mPkL	<08001	<08001	9999	9999	9999
Urcf rhl	7W09 191 08001 mPkL	**0K009**	**0K00G**	9999	9999	9999
Ccesrhl	7W09V 92 08001 mPkL	<08001	<08001	9999	9999	9999
CBrol rhl	7W09V793 08001 mPkL	<08001	<08001	9999	9999	9999
lf drhl	7W097V9 08001 mPkL	<08001	<08001	9999	9999	9999
Cobber	7W09f 095 08001 mPkL	**0K001**	**0K00G**	9999	9999	9999
Lcf rBcf t l	7V3U9U190 08001 mPkL	<08001	<08001	9999	9999	9999
Rt prdrhl	7W091797 08001 mPkL	**0K0G3**	**0K013**	9999	9999	9999
LmBrhl	7V3U9U392 08001 mPkL	**0K018**	**0K016**	9999	9999	9999
Lt rernhl	7V3U9UV93 08001 mPkL	<08001	<08001	9999	9999	9999
TBorrhl	7W092U91 08001 mPkL	<08001	<08001	9999	9999	9999
Cerrhl	7W09Vf 91 08001 mPkL	<08001	<08001	9999	9999	9999
Mcf . cf ese	7V3U9U gf 08001 mPkL	**0KG56**	**0K83a**	9999	9999	9999
Neodgl rhl	7W090095 08001 mPkL	<08001	<08001	9999	9999	9999
Mo^gpdef t l	7V3U9U597 08001 mPkL	**0K0G0**	**0K003**	9999	9999	9999
Prcseodgl rhl	7W091090 08001 mPkL	<08001	<08001	9999	9999	9999
Nrnke^	7W090290 08001 mPkL	**0K003**	**0K0G6**	9999	9999	9999
Scl crrhl	7W091U8U 08001 mPkL	<08001	<08001	9999	9999	9999
Lecd	7V3U9U291 08001 mPkL	<08001	<08001	9999	9999	9999
Terprhl	7W09279U 08001 mPkL	<08001	<08001	9999	9999	9999
Af rrh of g	7W093 90 08001 mPkL	**0K00G**	<08001	9999	9999	9999
TBt ^rhl	7W09309V 08001 mPkL	<08001	<08001	9999	9999	9999
Se^ef rhl	77529VU92 0801 mPkL	<0801	<0801	9999	9999	9999
Yrrerprhl	7W09 V9V 08001 mPkL	<08001	<08001	9999	9999	9999

. FPs g f e Gf
K : rYej rAsr g EM1307753
Casnt g ETRB- 6SwSBEMSe BwLBD
. r: lsct g +j K T+1202

Analytical Results

Sub9MFtrix: **WATER** 2MFtrix: **WATERV**

			Client sample ID	**NOWAN1G0Gj oreBo^e G**	**NOWAN1G0Gj oreBo^e 3**	9999	9999	9999
			Client sampling date / time	179Jd L92013e12g0	179Jd L92013e10gf 1	9999	9999	9999
Compound	*CAS Number*	*LOR*	*Unit*	**EM1308893-001**	**EM1308893-00G**	----	----	----
Ew0G0F: Dnaso^yed Merc^s pg ICP-MS - Cof nfit ed								
Trfh	7VV0981gf	0801	mPkL	<0801	<0801	9999	9999	9999
Ynrrnhl	7VV09 f gf	0801	mPkL	<0801	<0801	9999	9999	9999
TBc^fnhl	7VV092590	0801	mPkL	<0801	<0801	9999	9999	9999
Znri of nhl	7VV09 797	080f	mPkL	<080f	<080f	9999	9999	9999
@cf cdnhl	7VV09 292	0801	mPkL	<0801	<0801	9999	9999	9999
Znhi	7VV09 9	080f	mPkL	**0K10G**	**0K039**	9999	9999	9999
lrof	7V3U95U9	080f	mPkL	**0K90**	**3K44**	9999	9999	9999
E7 0G6SF: Torc^CN pg Se. l ef red F^o, Af c^gser								
Torc^Cgcf nde	f 79129f	080V	mPkL	<080V	<080V	9999	9999	9999
E7 040P: F^t ornde pg PC Tnrrcror								
F^t ornde	1 U5V9V595	081	mPkL	**1K6**	**0K6**	9999	9999	9999
E7 055w: Al l of rn cs N pg Dnai rere Af c^gser								
Al l of rn cs N	7 V9V197	0801	mPkL	**0K01**	**0K06**	9999	9999	9999
E7 058w: Nnrrne cs N pg Dnai rere Af c^gser								
Nnrrne cs N	9999	0801	mPkL	<0801	<0801	9999	9999	9999
E7 059w: Nnrrcre cs N pg Dnai rere Af c^gser								
Nnrrcre cs N	1V7U79f f 95	0801	mPkL	**0KG1**	**0K06**	9999	9999	9999
E7 05aw: Nnrrne b^t s Nnrrcre cs N 2NOhV pg Dnai rere Af c^gser								
Nnrrne + Nnrrcre cs N	9999	0801	mPkL	**0KG1**	**0K06**	9999	9999	9999
E7 061w: Torc^7 ;e^dcB^Nnrro. ef j g Dnai rere Af c^gser								
Torc^7 ;e^dcB^Nnrro. ef cs N	9999	081	mPkL	<081	<081	9999	9999	9999
E7 06Gw: Torc^Nnrro. ef cs N 2T7 N + NOhVpg Dnai rere Af c^gser								
^eTorc^Nnrro. ef cs N	9999	081	mPkL	**0KG**	<081	9999	9999	9999
E7 068w: Torc^PBosbBort s cs P pg Dnai rere Af c^gser								
Torc^PBosbBort s cs P	9999	0801	mPkL	**0K05**	**0K06**	9999	9999	9999
E7 081w: Reci nrye PBosbBort s cs P pg dnai rere cf c^gser								
Reci nrye PBosbBort s cs P	1V2 f 9VV92	0801	mPkL	<0801	<0801	9999	9999	9999
EN055: lof rn j c^cf i e								
Torc^Af rof s	9999	0801	msqkL	**30K6**	**38K6**	9999	9999	9999
Torc^Ccnrof s	9999	0801	msqkL	**GaK6**	**36K6**	9999	9999	9999
lof rn j c^cf i e	9999	0801	%	**1K69**	**1K69**	9999	9999	9999

Environmental Division

CERTIFICATE OF ANALYSIS

Work Order	: **EM1308088**	g6: l	o 1sf Lse
CFl nt	o **EART9 SYSTEMS HTY LTP**	b6r f .6tf .y	o Envi.f nml nt6FsDiviaif nsMl Ff f P.nl
Cf nt6ut	o Mc sg ROBsBCTMIEDEc	Cf nt6ut	o CFl ntsBl .viul a
RNN.l aa	o BOI8Es1S SAd73sTIUTsB8c EE8 9E- sHICGROB8c RbIRs3101	RNN.l aa	o Ks- l at6Ffsc NsBWin: v6lf sHICsRPat.6ff6s31S1
Edm6iF	o W6PFauVmil Nl ., l 6.tVayatl ma uf m 6P	Edm6iF	o Ml Ff f P.nl Envi.f Bl .viul a, 6fa: lf r 6Fuf m
8l lF VWf nl	o 4p1s03sA710sSe00	8l lF VWf nl	o 4p1c3d7eKAsAp00
56uaimiF	o 4p1s03sA7e3se030	56uaimiF	o 4p1c3d7eKAsAp01
g.f @ut	o h + - Rh 1j 0j	2 Csbl vl F	o h Eg Msj 013ssBuVl NPFf sQ(3)s6nNsRbBs2 CB3sl qPi.l ml nt
+ .Nl .snPmr l .	o dddd		
Cd+ dCsnPmr l .	o dddd	D6tl sB6mWFascl ul ivl N	o 31dJObcj 013
B6mWF .	o g B	laaPl sD6tl	o 0SdROUcj 013
Bitl	o h f w6shf w6		
		hf sf Lsa6mWFasl ul ivl N	o 1
2 Pf tl snPmr l .	o MEQ2 /11j /13	hf sf Lsa6mWFas6n6Fyal N	o 1

8Vias .l Wf .ts aPWf .al Nl as 6nys Wl vif Pas .l Wf .t(a)s witVs tVias .l LL .l nul s c l aPlfas 6WWys tf s tVl s a6mWF (a)s 6as aPr mittl Nl s RFfs W6: l as f Ls tVias .l Wf .ts V6vl s r l l ns uVl ukl Nls 6nNs 6WWf vl Nls Lf . .l Ff 6al s

8ViasCl .tiLiu6tl sf LsRn6Fyaiasuf nt6inastVl sLf Fff win: sinLf .m6tif no

- Ul nl .6FsCf mml nta
- Rn6Fytiu6Fsc l aPlfa

h R8 RsRuu.l Nitl Nsb6r f .6tf .ys7j e
s
Ruu.l Nitl Nslf .suf mWF6nul switVs
IB+ /IECsl S0j e

Signatories

8Vias Nf uPml nts V6as r l l ns l Ff ut.f niu6Ffys ai: nl Nls r ys tVl s 6PtVf .iYl Nls ai: n6tf .il as inNiu6tl Nls r l Ff w s EFf ut.f nius ai: nin: s V6as r l l n u6..il Nsf Ptsinsuf mWF6nul switVsWf ul NP.l assaWuiLil Nsinsj 1sC5c sg 6.ts11

Signatories	*Position*	*Accreditation Category*
Dif6nis5l .n6nNf	Bl nif .slnf .: 6niusCVl miat	Ml Ff f P.nl slnf .: 6niua
E.iusCV6P	Ml t6Fas8l 6msbl 6Nl .	Ml Ff f P.nl slnf .: 6niua
H6.aV6sTf s- in:	h f ndMl t6Fas8l 6msbl 6Nl .	Ml Ff f P.nl slnf .: 6niua
H6.aV6sTf s- in:	h f ndMl t6Fas8l 6msbl 6Nl .	Ml Ff f P.nl slnf .: 6niua
H6.aV6sTf s- in:	h f ndMl t6Fas8l 6msbl 6Nl .	Ml Ff f P.nl slnf .: 6niua

g6: l	o j sf Lse
- f .ks+ .Nl .	o EM1307077
CfFl nt	o ERc 8TsBz B8EMBsg 8z sb8D
g.f @.t	o h + - Rh 1j 0j

General Comments

8Vl s 6n6Fytiu6fs Wf ul NP.l as Pal Nls r ys tVl s Envi.f nml nt6fs Diviaif ns V6vl s r l l ns Nl vl ff W Ns Lf ms l at6r FaVl Ns intl .n6tif n6ffys .l uf : niYl Ns Wf ul NP.l as aPuVs 6as tVf al s WPr FaVl Ns r ys tVl s OBEgRG Rg T RG RBs 6nNs h Eg M s Ins Vf Pal s Nl vl ff W Ns Wf ul NP.l as6.l sl mWf yl Nsinst Vl s6r al nul sf LsNf uPml ntl Nsat6nN6.Nasf .sr ysuFl nts.l qPl at

- Vl .l smf iatP.l sNl tl .min6tif nsV6asr l l nsW.Lf .ml NGl aPffas6.l sl Wf .tl Nsf ns6sN.ysw i: Vtsr 6aia
- Vl .l s6s.l Wf .tl NsF aastV6ns(<)sl aPffsiasVi: Vl .stV6nstVl sb+ c GtVlasm6ysr l sNPl stf sVim6.ysa6mWFs xt.6ut/Ni: l at6tl sNFPtif ns6nN/f .sinaPLLiuil ntsa6mWFs Lf .s6n6Fyaia
- Vl .l stVl sb+ c sf Ls6s.l Wf .tl Ns.l aPffsNLLL .asLf msat6nN6.Nsb+ c GtVlasm6ysr l sNPl stf sVi: Vsmf iatP.l suf ntl ntGsinaPLLiuil ntsa6mWFs(.l NPul Nswl i: Vts mWf yl N)sf .sm6t.ixsintl .LL .l nul
- Vl nsa6mWFn: stiml sinLf .m6tif nsiasmf ts/Wf viNl Nsr ystVl suFl ntGa6mWFn: sN6tl as6.l saVf wnswitVf Pts6stiml suf mWf nl nt ssInstVl al sinat6nul aGtVl stiml suf mWf nl ntsV6asr l l ns6aaPml Nsr ystVl s6r f .6tf .ysLf .s/Wf ul aain: s/WP.Wf al a

9l yso CRBsh Pmr l .s=sCRBs l : iat.ysnPmr l .sLf msN6t6r 6al sm6int6inl Nsr ysCVl miu6FsRr at.6utasBl .viul a s8Vl sCVl miu6FsRr at.6utasBl .viul sias6sNiviaif nsf LstVl sRml .iu6nsCVl miu6FsBf uil ty
b+ c s=sbimitsf Ls l Wf .tin:
^s=s8Vlas l aPffsiasuf mWPtl NsLf msinNiviNP6Fs6n6FytI sNl tl utif nas6tsf .s6r f vl st/Vl sF vl Fsf Ls l Wf .tin:

- **EA01+: Calculated TPS iDdetermined from Electrical conductivity uDing a converDion factor of 0.+-.**
- **EK07+SF : EM13080-76007 matriGDhike failed for TCN due to hoDDible Damhle interference. TpiD paD been confirmed by re6analyDiD.**
- **Ionic balanceD Bere calculated uDing: mawor anionD6cploridej alkalinity and Dulfate, and mawor cationD6calciumj magneDiumj hotaDDium and Dodium.**

Analytical Results

BPr dM6t.ix: **WATER** (M6t.ix: **WATER**)				Client sample ID	**NW; 1**	dddd	dddd	dddd	dddd
				Client sampling date / time	30dJObdj 013s1pdKe	dddd	dddd	dddd	dddd
Compound	*CAS Number*	*LOR*	*Unit*		**EM13080886001**	6666	6666	6666	6666
EA00- : h9									
h9 2alue	dddd	0 01	WTsOnit		**V.- 8**	dddd	dddd	dddd	dddd
EA00+: Sodium AdDorhtion Ratio (SAR)									
Sodium AdDorhtion Ratio	dddd	0 01	d		**3.3-**	dddd	dddd	dddd	dddd
EA010H: Conductivity by HC Titrator									
Electrical Conductivity @ 7- °C	dddd	1	µB/um		**7010**	dddd	dddd	dddd	dddd
EA01+: Non Marine 6EDtimated TPS Salinity									
Total PiDDolved SolidD (Calc.)	dddd	10	m: /b		**1310**	dddd	dddd	dddd	dddd
EA0+- : Total 9 ardneDD aD CaCO3									
Total 9 ardneDD aD CaCO3	dddd	1	m: /b		**- +5**	dddd	dddd	dddd	dddd
EP03VH: Alkalinity by HC Titrator									
9ydroGide Alkalinity aD CaCO3	DM+ dj 10d001	1	m: /b		<1	dddd	dddd	dddd	dddd
Carbonate Alkalinity aD CaCO3	371j dBj dp	1	m: /b		<1	dddd	dddd	dddd	dddd
; icarbonate Alkalinity aD CaCO3	S1dej d3	1	m: /b		**38+**	dddd	dddd	dddd	dddd
Total Alkalinity aD CaCO3	dddd	1	m: /b		**38+**	dddd	dddd	dddd	dddd
EP038A: Acidity									
Acidity aD CaCO3	dddd	1	m: /b		**15**	dddd	dddd	dddd	dddd
EP051x : Sulfate (Turbidimetric) aD SO5 76by PA									
Sulfate aD SO5 6Turbidimetric	1K707dSAd7	1	m: /b		**7+**	dddd	dddd	dddd	dddd
EP05- x : Cploride PiDcrete analyDer									
Cploride	1p77Sd0dp	1	m: /b		**53V**	dddd	dddd	dddd	dddd
EP043F: PiDDolved Mawor CationD									
Calcium	SKK0dS0dj	1	m: /b		**V+**	dddd	dddd	dddd	dddd
MagneDium	SK3AdAedK	1	m: /b		**41**	dddd	dddd	dddd	dddd
Sodium	SKK0dj 3de	1	m: /b		**183**	dddd	dddd	dddd	dddd
HotaDDium	SKK0d0AdS	1	m: /b		**-**	dddd	dddd	dddd	dddd
Ex 070F: PiDDolved MetalD by ICH6MS									
Aluminium	SKj AdA0de	0 01	m: /b		<0 01	dddd	dddd	dddd	dddd
PyDhroDium	SKj AdA1dp	0 001	m: /b		<0 001	dddd	dddd	dddd	dddd
Silver	SKK0dj j dK	0 001	m: /b		<0 001	dddd	dddd	dddd	dddd
ArDenic	SKK0d37dj	0 001	m: /b		<0 001	dddd	dddd	dddd	dddd
; iDmutp	SKK0dpAdA	0 001	m: /b		<0 001	dddd	dddd	dddd	dddd
Erbium	SKK0dej d0	0 001	m: /b		<0 001	dddd	dddd	dddd	dddd
; oron	SKK0dKj d7	0 0e	m: /b		<0 0e	dddd	dddd	dddd	dddd

Analytical Results

BPr dM6t.ix: WATER (M6t.ix: WATER)			Client sample ID	NW; 1	dddd	dddd	dddd	dddd
			Client sampling date / time	30dJObdj 013s1pdKe	dddd	dddd	dddd	dddd
Compound	CAS Number	LOR	Unit	EM1308088 6001	6666	6666	6666	6666
Ex 070F: PiDDolved MetalD by ICH6MS 6Continued								
Eurohium	SKK0de3df	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Strontium	SKK0dj Kdp	0 001	m: /b	**0.314**	dddd	dddd	dddd	dddd
; arium	SKK0d8Ad3	0 001	m: /b	**0.77+**	dddd	dddd	dddd	dddd
x adolinium	SKK0deKdj	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Titanium	SKK0d3j dp	0 01	m: /b	<0 01	dddd	dddd	dddd	dddd
; eryllium	SKK0dK1dS	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
x allium	SKK0deed3	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Cadmium	SKK0dK3dA	0 0001	m: /b	<0 0001	dddd	dddd	dddd	dddd
9 afnium	SKK0de7dp	0 01	m: /b	<0 01	dddd	dddd	dddd	dddd
Tellurium	j j eK1dKAdS	0 00e	m: /b	<0 00e	dddd	dddd	dddd	dddd
Cobalt	SKK0dK7dK	0 001	m: /b	**0.00-**	dddd	dddd	dddd	dddd
9 olmium	SKK0dp0d0	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Uranium	SKK0dp1df	0 001	m: /b	**0.005**	dddd	dddd	dddd	dddd
CaeDium	SKK0dKpdj	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Cpromium	SKK0dKSd3	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Indium	SKK0d5Kdp	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Cohher	SKK0de0d7	0 001	m: /b	**0.00V**	dddd	dddd	dddd	dddd
Lantpanum	SK3AdA1d0	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Rubidium	SKK0df SdS	0 001	m: /b	**0.003**	dddd	dddd	dddd	dddd
Litpium	SK3AdA3dj	0 001	m: /b	**0.004**	dddd	dddd	dddd	dddd
Lutetium	SK3AdAKd3	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Tporium	SKK0dj Adf	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Cerium	SKK0dKedf	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
ManganeDe	SK3AdApde	0 001	m: /b	**0.08V**	dddd	dddd	dddd	dddd
Neodymium	SKK0d0d7	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Molybdenum	SK3AdA7dS	0 001	m: /b	**0.077**	dddd	dddd	dddd	dddd
HraDeodymium	SKK0df 0d0	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Nickel	SKK0dj d0	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Samarium	SKK0df AdA	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Lead	SK3AdAj df	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Terbium	SKK0dj SdA	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Antimony	SKK0d3pd0	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Tpulium	SKK0d30dK	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Selenium	SS7j dKAdj	0 01	m: /b	<0 01	dddd	dddd	dddd	dddd

Analytical Results

BPr dM6t.ix: WATER (M6t.ix: WATER)			Client sample ID	NW; 1	dddd	dddd	dddd	dddd
			Client sampling date / time	30dJObcj 013s1pdKe	dddd	dddd	dddd	dddd
Compound	CAS Number	LOR	Unit	EM13080886001	6666	6666	6666	6666
Ex 070F: PiDDolved MetalD by ICH6MS 6Continued								
Ytterbium	SKK0cpKdK	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Tin	SKK0c81de	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Yttrium	SKK0cpede	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Tpallium	SKK0cj 7d0	0 001	m: /b	<0 001	dddd	dddd	dddd	dddd
Zirconium	SKK0cpSdS	0 00e	m: /b	<0 00e	dddd	dddd	dddd	dddd
2anadium	SKK0cpj cj	0 01	m: /b	**0.01**	dddd	dddd	dddd	dddd
Zinc	SKK0cppdp	0 00e	m: /b	**0.01V**	dddd	dddd	dddd	dddd
Iron	SK3Ad7Acp	0 0e	m: /b	<0 0e	dddd	dddd	dddd	dddd
EK07+SF: Total CN by Segmented FloB AnalyDer								
Total Cyanide	eSdIj de	0 00K	m: /b	<0 00K	dddd	dddd	dddd	dddd
EK050H: Fluoride by HC Titrator								
Fluoride	1pA7KdK7d7	0 1	m: /b	**0.+**	dddd	dddd	dddd	dddd
EK0- -x : Ammonia aDN by PiDcrete AnalyDer								
Ammonia aDN	SppKdK1dS	0 01	m: /b	**0.08**	dddd	dddd	dddd	dddd
EK0- Vx : Nitrite aDN by PiDcrete AnalyDer								
Nitrite aDN	dddd	0 01	m: /b	<0 01	dddd	dddd	dddd	dddd
EK0- 8x : Nitrate aDN by PiDcrete AnalyDer								
Nitrate aDN	1KSASdeed7	0 01	m: /b	**0.0-**	dddd	dddd	dddd	dddd
EK0- 4x : Nitrite hluD Nitrate aDN (NOG) by PiDcrete AnalyDer								
Nitrite | Nitrate aDN	dddd	0 01	m: /b	**0.0-**	dddd	dddd	dddd	dddd
EK0+1x : Total Kweldapl Nitrogen ; y PiDcrete AnalyDer								
Total Kweldapl Nitrogen aDN	dddd	0 1	m: /b	<0 1	dddd	dddd	dddd	dddd
EK0+7x : Total Nitrogen aDN (TKN | NOG) by PiDcrete AnalyDer								
^sTotal Nitrogen aDN	dddd	0 1	m: /b	<0 1	dddd	dddd	dddd	dddd
EK0+Vx : Total HpoDhporuD aDH by PiDcrete AnalyDer								
Total HpoDhporuD aDH	dddd	0 01	m: /b	**0.05**	dddd	dddd	dddd	dddd
EK0V1x : Reactive HpoDhporuD aDH by diDcrete analyDer								
Reactive HpoDhporuD aDH	1Kj pedKKcj	0 01	m: /b	<0 01	dddd	dddd	dddd	dddd
EN0- -: Ionic ; alance								
Total AnionD	dddd	0 01	ml q/b	**70.+**	dddd	dddd	dddd	dddd
Total CationD	dddd	0 01	ml q/b	**14.5**	dddd	dddd	dddd	dddd
Ionic ; alance	dddd	0 01	%	**3.05**	dddd	dddd	dddd	dddd