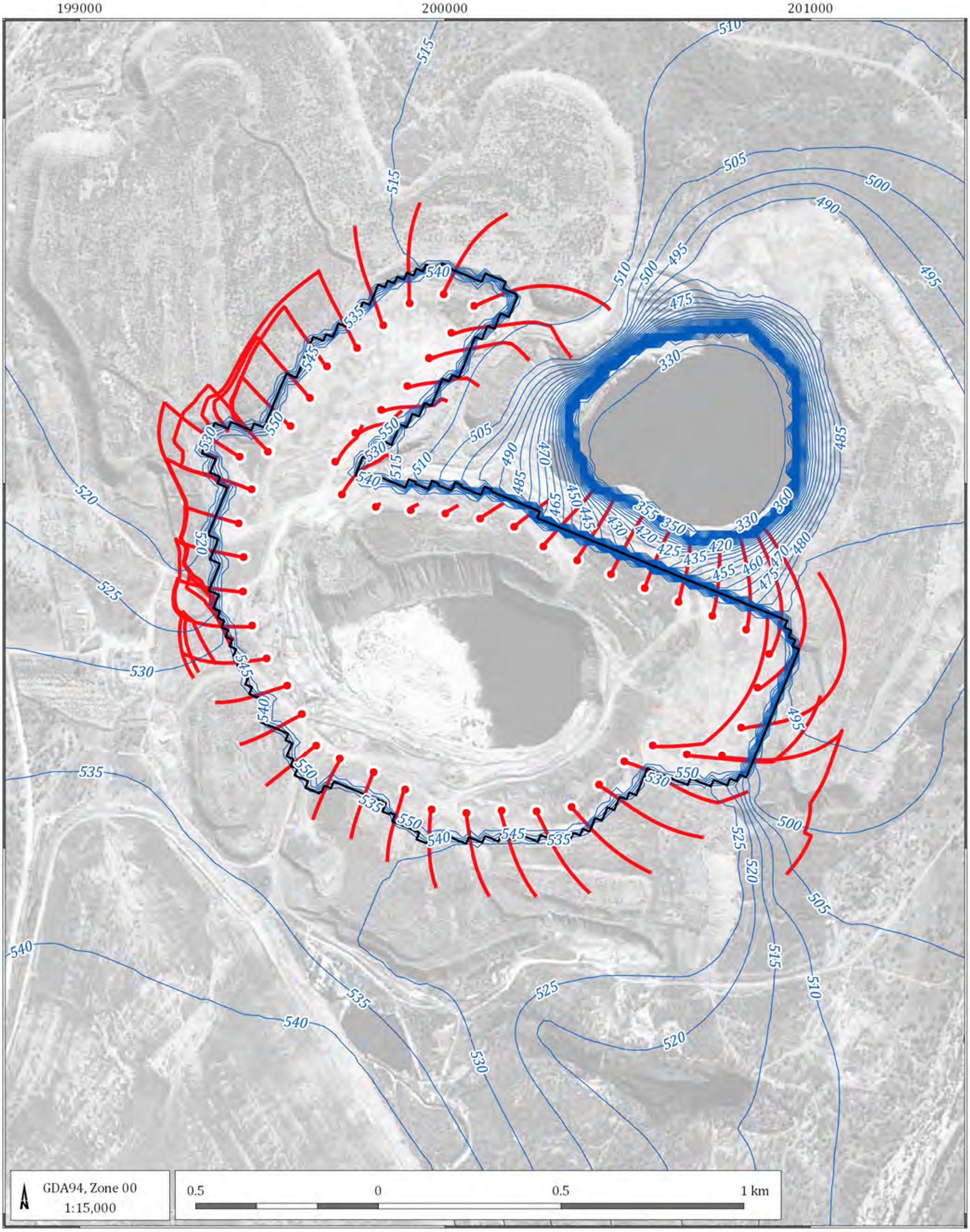



LEGEND

- horizontal flow barrier
- contour - groundwater head
- initial particle position
- particle trace

Kidston K2-Hydro (G1789C)

**Particle tracking - 100 years**

AGE

DATE 10/01/2019

FIGURE No: **5**


Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
G:/Projects/G1789B.Kidston K2-Hydro/3_GIS/Workspaces/001_Deliverable1/3_particles.qgs

## 4.3 Predicted water balance for the pits

Under current conditions (pre-development baseline), both pits act as sinks because their water level sits slightly below the observed regional water table. Shallower Wises Pit receives approximately 19 $m^3$/day, while deeper Eldridge pit receives approximately 270 $m^3$/day (see Table 5). Under operating conditions (Scenario A), the water level in Wises Pit will be above regional groundwater table and becomes water source as the pit will be losing 350 $m^3$/day, while Eldridge Pit (lower reservoir) will remain sink with potential inflows of 770 $m^3$/day. In net terms, the operational conditions increase the inflow to pits from 290 $m^3$/day (pre-development baseline) up to 420 $m^3$/day (K2-Hydro project in place with maximum groundwater gradient).

**Table 5 Water balance for Wises and Eldridge pits**

| Scenario | Predicted groundwater inflows ($m^3$/day) | | |
|---|---|---|---|
| | Wises (upper, shallow) | Eldridge (lower, deep) | Net interception of groundwater |
| Baseline | 19 | 271 | 290 |
| K2-Hydro | -350 | 770 | 420 |

What has been demonstrated through pathline analysis and groundwater level change is that the increased inflow into Eldridge pit during the operational phase will be sourced from both Wises pit seepage and inflow from surrounding groundwater in all directions around the pit.

## 4.4 Predicted interaction with Copperfield River

The boundary condition representing Copperfield River was set up as a potential water source with capability to both remove water from the environment in the form of baseflow, as well as contribute to the groundwater system via river bed recharge.

In order to estimate the impact of the Project on the Copperfield River, the model domain was divided into water balance zones as presented in Figure 6. The water balances were calculated separately for the "northern" (red) and "southern" (green) sections of the river, as it is expected the impact will be different in these sections: the northern part will be more influenced by lowering the groundwater levels in the vicinity of Eldridge Pit, the southern part will be potentially impacted by additional baseflow from elevated groundwater levels due to Wises Pit and the tailings dam south of Wises Pit. The water balances (net flow rates) are presented in Table 6.


LEGEND

- bedrock - west
- bedrock - east
- river - north
- river - south

horizontal flow barrier

Kidston K2-Hydro (G1789C)

**Water balance zones - Copperfield River**

AGE

DATE 10/01/2019

FIGURE No: **6**


Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
G:/Projects/G1789B.Kidston K2-Hydro/3_GIS/Workspaces/001_Deliverable1/4_budget_zones_river.qgs

### Table 6 Zone water balances for Copperfield River

| Scenario | | From west ($m^3$/day) | From east ($m^3$/day) | Net inflows ($m^3$/day) |
|---|---|---|---|---|
| Baseline | Northern section | 157 | 337 | 690 |
| | Southern section | 64 | 132 | |
| K2-Hydro | Northern section | 88 | 257 | 543 |
| | Southern section | 65 | 133 | |

The analysis of the zone water balance is showing that the Copperfield River is both losing water in the form of river bed recharge and gaining water in the form of baseflow, with the baseflow dominant of the two. The river generally acts as a conduit removing water from the groundwater system. The extreme operational conditions (low water level in Eldridge pit, high water level in Wises pit) impact on the groundwater system by the following way:

- Overall, the baseflow to the river will decrease by 150 $m^3$/day from 690 $m^3$/day (current baseline condition) to 540 $m^3$/day.
- The northern section of river within the model domain will see a decrease of baseflow due to the increased gradient towards the nearby Eldridge Pit. The decrease of baseflow impacts flows from both west and east. The decrease of baseflow from the western side of the river (Eldridge Pit) was estimated to be ~70 $m^3$/day (44% of the baseflow predicted to occur in the model domain).
- The southern section of the river is predicted to see a very slight increase of flow from the west (caused by increased gradient towards the Copperfield River due to the mounding in tailings dam area). The flows from the east remain more or less unchanged (increase of 1.1 $m^3$/day). The increase of baseflow from the western side (tailings dam) presents an additional 1 $m^3$/day, which is ~1.6% increase over the baseline predicted baseflow.

The reduced inflow (baseflow) for the western side of the northern zone is expected during the Project operation because of its proximity to Eldridge pit that draws the water table down increasing the groundwater inflow to the pit. There is also a reduced baseflow from the east of Copperfield River due to the cone of depression extending under the river immediately adjacent to the Eldridge Pit.

There is a relatively minor increase in the flow to the southern zone of the Copperfield River through the model domain. This slight increase of just under 2 $m^3$/day from the west, is due to slightly higher groundwater levels due to the damming effect of the Wises Pit on the regional groundwater flow.

## 4.5 Predicted impact on groundwater potentially associated with Groundwater Dependent Ecosystems (GDEs)

The National Atlas of Groundwater Dependent Ecosystems (BoM, 2018[1]) maps locations of potential terrestrial groundwater dependent ecosystems that rely on the subsurface presence of groundwater to meet all or some of their water requirements based on national scale mapping. The GDE atlas also includes potential areas of GDEs which use groundwater after it has been discharged to surface (aquatic GDEs).

[1] Bureau of Meteorology, 2018. Groundwater Dependent Ecosystem Atlas, Website: http://www.bom.gov.au/water/groundwater/gde/ downloaded November 2018.

Permanent springs are recorded in the Queensland Springs database (DES, 2018[2]). The database also includes details of non-permanent springs, although the information on these can be limited.

Figure 7 shows the location of the potential GDEs and identified springs around the Kidston site, along with the predicted changes in groundwater level resulting from the extreme operational limits of the K2 Hydro scheme. It is important to remember that water levels are predicted to rise around Wises Pit and fall around Eldridge Pit.

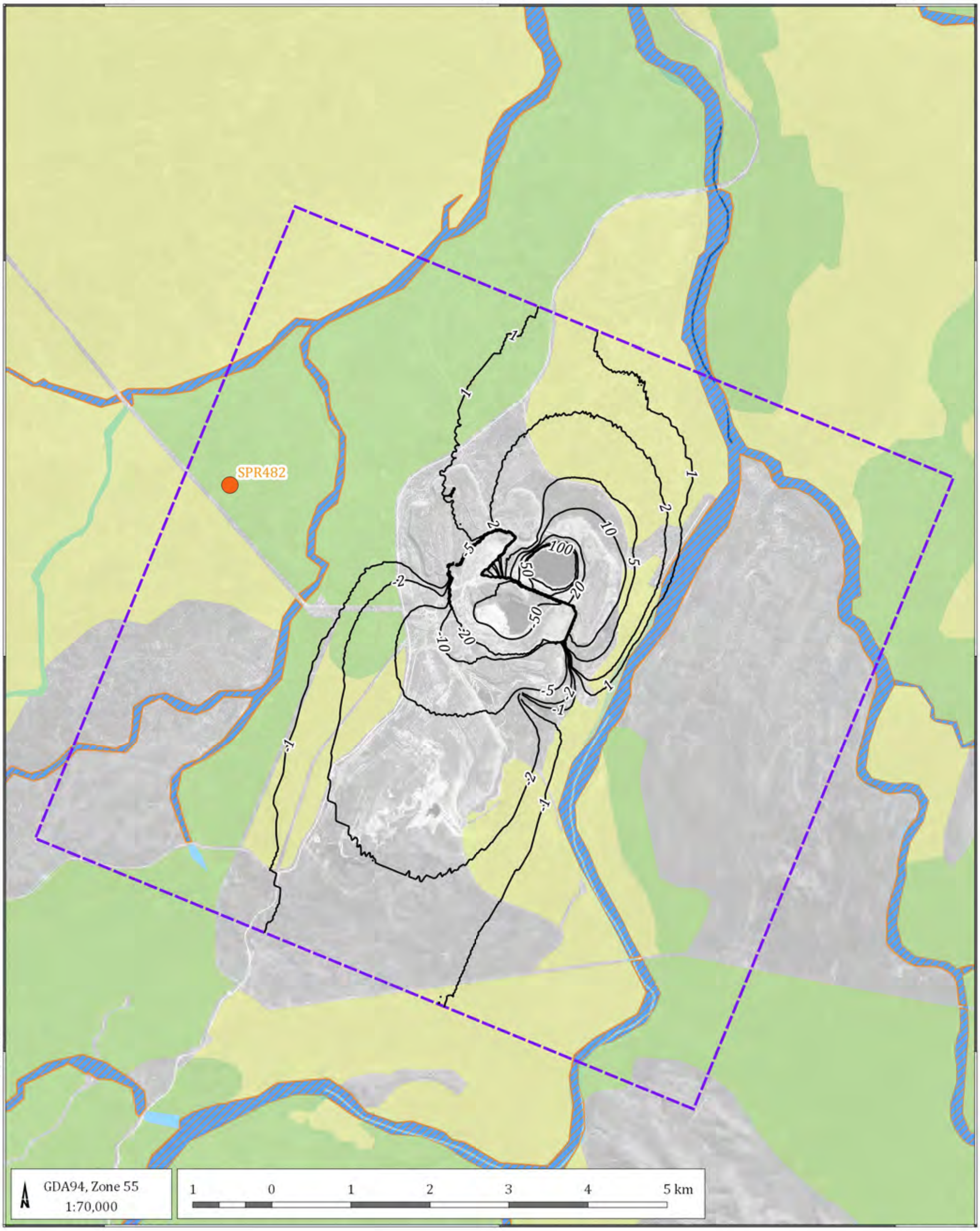
The figure indicates that terrestrial GDEs may be present over large areas of land close to the K2-Hydro Project. Areas of highest potential are located along the drainage lines. It is possible that high potential GDEs along the Copperfield River could see a reduction in groundwater as a result of the Project. The majority of the area predicted to draw down by more than 1 m is unclassified over the historically disturbed mining areas, or at low potential for terrestrial GDEs.

Potential aquatic GDEs are located along many of the nearby drainage lines, with the locations correlating strongly with the high potential terrestrial GDE mapping. The majority of aquatic GDEs are classified as moderate or low potential, with a small area of high potential along the Copperfield River to the northeast of the K2-Hydro Project. It is possible that GDEs along the Copperfield River could see a reduction in groundwater inputs as a result of the K2-Hydro Project.

Although there are potential changes in groundwater levels predicted in the vicinity of several potential GDEs additional work will be required to determine if the changes could result in a negative impact to the vegetation communities.

There is one permanent spring (SPR482 – Middle Spring), located approximately 4.8 km west-northwest of the Project. This is close to the edge of the model domain and is predicted to be impacted by less than 0.2 m from a very conservative steady state assessment.

[2] Department of Environment and Science, Queensland Government, 2018. Springs database, version 11/09/2018.




LEGEND

- Springs
- Drawdown contour
- Model extent

**Terrestrial GDEs**

- High potential GDE
- Moderate potential GDE
- Low potential GDE

**Aquatic GDEs**

- High potential GDE
- Moderate potential GDE
- Low potential GDE

Kidston K2-Hydro (G1789C)

**Predicted drawdown and nearby GDEs**

AGE

DATE 10/01/2019

FIGURE No: 7


Source: 1 second SRTM Derived DEM-S - © Commonwealth of Australia (Geoscience Australia) 2011.; GEODATA TOPO 250K Series 3 - © Commonwealth of Australia (Geoscience Australia) 2006.;
G:/Projects/G1789C.Kidston K2H/3_GIS/Workspaces/001_Deliverable1/05.00_G1789C_Predicted drawdown and nearby GDEs.qgs

# 5 Conclusion

## 5.1 Impacts of the project

Impacts of the projects were described in terms of lowering or raising water levels in the groundwater system and changing the baseflow and recharge rates with respect to the surface drainage, namely Copperfield River.

If the increased groundwater gradient caused by the difference of water levels between Wises and Eldridge pits remained in place indefinitely, the groundwater regime would be altered in the following way: groundwater table below the tailings dam would rise by 2 m to 5 m due to Wises pit damming up and reducing regional groundwater movement to the north of the spoil, while groundwater levels surrounding the Eldridge pit would be lowered. The mounding in the southern tailings area would marginally increase the baseflow to the Copperfield River. The cone of depression developed around Eldridge pit would extend up to 3000 m in the north-eastern direction (from the Eldridge Pit) and approximately 1300 m towards the Copperfield River and decrease the baseflow contribution adjacent to the Eldridge Pit.

These predictions are however conservative as they are based on the steady state model. The particle tracking exercise demonstrated that in the short timeframe that spans the lifetime of the project, the drawdown and mounding impacts will not have time to develop to the same extent as the steady state model predictions indicate.

During the Project operation, the increased inflow of groundwater to Eldridge pit will reduce the baseflow occurring to Copperfield River. This water will be collected by the pit and become part of the operation. When an opportunity of increased flow in Copperfield River occurs (due to a rainfall event), the poorer quality water could be released back to the river (if required) and the dilution would result in better overall water quality in the river than it being baseflow in low flow conditions.

The flow to the west, south and southwest should be considered temporary during the Project life. This seepage from Wises pit is not predicted to travel far during the life of the Project as indicated by the conservative 100 year pathlines. At the end of the project, when the head in Wises is no longer maintained, the capture zone of Eldridge pit will increase and it is entirely likely that the drawdown cone of depression for Eldridge will be recharged by the water lost from Wises during the project operation. Water levels in both pits can be expected to return to their pre-project elevations.

## 5.2 Limitations of the model

The model in its current form (steady state) with its simplifying assumptions is satisfactory for understanding the conceptual issues surrounding the Project, however it is not capable of quantifying the impacts on the timescale of the project. In this sense, the model is very conservative when considering the extent of impacts.

# 6 References

AGE (2001) "*Kidston gold mine – Eldridge Pit final void hydrology*"; Project no. G1080; Brisbane, Queensland, January 2001.

AGE (2016) "*Kidston voids modelling – preliminary results*"; project no. G1789; Brisbane, Queensland, January 2016.

CSIRO (2013) "*Agricultural resource assessment for the Gilbert catchment*". An overview report to the Australian Government from the CSIRO Flinders and Gilbert Agricultural Resource Assessment, part of the North Queensland Irrigated Agriculture Strategy. CSIRO Water for a Healthy Country and Sustainable Agriculture flagships, Australia.

Entura (2015) "*Kidston pumped storage project – geology report 1*"; Cambridge, Tasmania, December 2015.

Queensland Government Water Monitoring Information Portal (2016) "*Station dataset for 917115A Copperfield River at Spanner Waterhole*". Accessed from: https://water-monitoring.information.qld.gov.au/, on 4th May 2016.

# Appendix I

Draft REMP

Integrated Assessment Report
Genex Power Ltd
10-Jan-2019

D R A F T

# Kidston Pumped Storage Hydro Project

## Receiving Environment Monitoring Program

**D R A F T**

# Kidston Pumped Storage Hydro Project

Receiving Environment Monitoring Program

Client: Genex Power Ltd

ABN: 18 152 098 854

Prepared by

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10-Jan-2019

Job No.: 60544566

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**D R A F T**

## Quality Information

Document Kidston Pumped Storage Hydro Project

Ref 60544566

Date 10-Jan-2019

Prepared by Reece Fraser & Nicky Lee

Reviewed by James Tuff

Revision History

| Rev | Revision Date | Details | Authorised | |
|---|---|---|---|---|
| | | | Name/Position | Signature |
| 0 | 31-Aug-2018 | For Client Review | | |
| 1 | 10-Jan-2019 | Revised following OCG Comments - Issued for Client Review | | |
| | | | | |
| | | | | |

DRAFT

# Table of Contents

# Appendix A
## REMP Monitoring Locations and Frequencies

A

**D R A F T**

# 1.0 Aims and Objectives

Genex Power Ltd (Genex) commissioned AECOM Australia Pty Ltd (AECOM) to prepare this Receiving Environment Monitoring Program (REMP) for the Kidston Pumped Storage Hydro Project (the Project), which proposes to develop the former Kidston Gold Mine pit voids to store water and use it to generate a form of gravitationally-driven hydroelectric power. The main objective of the REMP is to report against relevant water quality objectives (WQOs) for receiving waters potentially affected by controlled releases of pit water and to verify water quality assumptions presented in the Impact Assessment Report (IAR) for the Project (AECOM 2018).

Insert reference to relevant conditions of approval when available.

This document has been prepared in accordance with the requirements of the Queensland Government Department of Environment and Science (DES, formerly DEHP) technical guideline entitled '*Wastewater release to Queensland waters*' (ESR/2015/1654, Version 2, September 2015) and the '*Receiving environment monitoring program guideline*' (ESR/2016/2399, Version 2.01, June 2015) .

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# 2.0 Activity Description

## 2.1 Project Overview

The Project involves storing water within an elevated upper reservoir, allowing energy to be stored in the form of gravitational potential energy. During periods of peak electrical demand, the water will be released from the upper reservoir into a lower reservoir via a turbine-generator system that produces electricity. At the end of the electricity-generating cycle, the turbines will be reversed and, powered by electricity from the nearby Kidston Solar Farm, will be used to pump the water from the lower reservoir back to the upper reservoir to begin the electricity generation cycle again. The Project proposes to utilise two existing mining pits, Wises (upper reservoir) and Eldridge (lower reservoir), at the decommissioned Kidston Gold Mine. The Wises Pit will be modified via the construction of a perimeter dam to increase its storage volume.

The Project generation capability is 250 MW with a storage capacity of 1,870 MWh. The Project forms a component of the wider Kidston Renewable Energy Hub. Once completed, the Project will be the first in the world to utilise two disused mine pits for hydroelectric power generation, and the first hybrid large-scale solar photovoltaic and pumped hydro storage plant.

A major component of the Project is the ability to control the stored water, both in the initial phase of construction of site infrastructure (e.g., the power generating facilities, access tunnels etc.), and during operations, when water will be transferred from the upper reservoir (the Wises Pit) to the lower reservoir (the Eldridge Pit). Crucial to this control will be the potential to release additional volumes of water that may arise following periods of high water ingress, such as wet season rainfall events and storms. Water release may be required to maintain operations during power generation.

## 2.2 Water Releases

As described above, the Project may need to release water in order to maintain reservoir levels during the power generation cycle, to prevent inundation of key infrastructure, and/or to mitigate possible water quality deterioration. It is proposed that water will be released from the Project via one of two different strategies depending on the nature of the causal event. These two release strategies are described as follows:

### 2.2.1 Event-Based Discharge of Water to Maintain Water Levels and Quality

Additional water added to the reservoirs through rainfall/runoff ingress during either critical construction stages or normal operations may, at times need to be released. The preferred method is via the controlled release of Project water during periods of naturally-occurring streamflow in the Copperfield River (herein referred to as an event-release). This type of release has a number of advantages, including:

- Releases are conducted within a set of licenced conditions and under pre-determined operating rules to ensure potential impacts are appropriately mitigated.
- Releases are independent of the normal operation of the Project (e.g., the power generation and pump-back phases).

By limiting event-releases to periods of medium to high flow and appropriately managing the release, relevant environmental values (EVs) will be protected.

### 2.2.2 Pass-Through Discharge

In the event of the forecast of a significant rainfall event (e.g. cyclonic or regional monsoonal trough[1]), Project operations may opt to conduct a pass-through discharge of event-induced incident rainfall, either during specific phases of construction, or during normal operations. This would be achieved by maintaining the upper reservoir at spillway elevation such that any incident rainfall would simply pass through the reservoir and discharge to the Copperfield River via the spillway chute. Depending on the

[1] The Australian BOM estimates that ~ 4.7 cyclones per year affect the Queensland Tropical Cyclone Warning Centre Area of Responsibility (http://www.bom.gov.au/cyclone/about/eastern.shtml)

duration and timing of the event, the power generation cycle may be required to cease in order to hold the upper reservoir at the required level.

This type of release is not the preferred approach to release water from the Project because:

- Total or partial cessation of power generation may be required.
- The rate of water released would be dependent on rainfall intensity and any attenuation provided by the upper reservoir.
- The water quality discharged during the event would be a function of the extent to which the fresh rainwater mixes with the existing upper reservoir water body.

It is noted however that during a pass-through discharge, Genex would still retain the ability to cease the release by lowering the level of water in the upper reservoir and allowing water to flow back into the lower reservoir.

For both types of releases the protection of EVs will be determined by assessment against:

- Any relevant local water quality objectives (WQOs).
- ANZECC/ARMCANZ 2000 (Australian and New Zealand Environment Conservation Council/Agriculture and Resource Management Council of Australia and New Zealand) *Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*
- The Environmental Protection (Water) Policy 2009, and the National Water Quality management strategy.
- The hydrological characteristics of the receiving environment (e.g. flows regime, riparian structure etc.).

The Project layout including the release location is shown on Figure 1.


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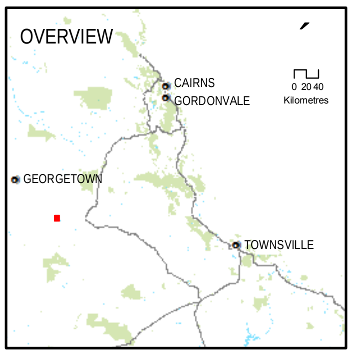
Legend
- Boundary Points
- Watercourses
- Major Roads
- Minor Roads
- Water Intake Pipeline
- Key Project Infrastructure Footprint
- Spillway Options Corridor
- Mining Lease Boundary
- Cadastral Parcel

Coordinate System: GDA 1994 MGA Zone 55
Projection: Transverse Mercator

0 100 200 300 400
Meters
1:17,000 (when printed at A3)




Data sources:
Roads and Tracks, Cadastre, Watercourses - DNRM 2017
Electrical Network - Ergon Energy 2017
SISP Imagery 2017

Disclaimer:
While every care is taken to ensure the accuracy of the Information Product, the Department of Natural Resources and Mines makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

# Kidston Solar Farm
# Genex Power Limited

## Indicative Project Area

| | |
|---|---|
| PROJECT ID | 60544566 |
| CREATED BY | JR |
| LAST MODIFIED | LB - 13/06/2018 |
| VERSION: | 1 |

**Figure** 1

A3 size

# 3.0 Receiving Environment Description

The Copperfield River is a large ephemeral, braided watercourse which runs through the Einasleigh Uplands bioregion in Far North Queensland, approximately 250km southwest of Cairns North. It is situated within the Gilbert River basin, draining towards the Gulf of Carpentaria. The Copperfield River forms the eastern boundary to the site, and is the receiving water body for pit water releases associated with the Project. There are various downstream inflows, including East Creek, Charles Creek, Oak River, Soda Creek and Chinaman Creek. The Copperfield River discharges to the Einasleigh River approximately 50 km downstream of the release location (Figure 1).

During the dry season the Copperfield River typically becomes a series of disconnected pools with reduced water quality. These pools experience large diurnal fluctuations which limit the diversity of remnant flora and fauna communities. The pools can be heavily impacted by cattle and feral pigs as they become the final refuges for these exotic species to water.

The high flow rates experienced in the Copperfield River over the wet season limits the establishment of aquatic flora and small bodied fauna communities. Successful recruitment in these systems can then occur once peak flows have subsided.

The Project area and surrounds consist predominately of agricultural land and are primarily used for grazing (AECOM Australia, 21 December 2017). The Project site, comprising of relatively flat terrain, adjoins lease land to the west and north and is bordered by the Gilberton Road to the south and east.

## 3.1 Ecosystem Condition Classification

### 3.1.1 Water Type

The ANZECC (2000) guidelines separate upland and lowland freshwaters at an elevation of 150m AHD. The guidelines also define upland freshwaters as small (first or second order) streams that are moderate to fast flowing as a result of steep gradients and which have cobble, gravel or sand beds. Lowland streams are defined as larger streams (greater than 3$^{rd}$ order) that meander with generally slower flows and beds comprised of sand, silt and mud. The Copperfield River falls into both of these classifications as it is above an elevation of 150m AHD but is a large 5$^{th}$ order stream with a bed of sand, silt, rock and mud. For the purposes of this REMP the Copperfield River in the vicinity of the project has been classified as upland freshwater.

### 3.1.2 Management Intent

Generally the condition of aquatic ecosystems in the vicinity of the proposed release falls within the category of “Slightly to Moderately Disturbed” as outlined in the ANZECC (2000) and QWQG (2009). However the EPP Water (2009) allows for the separation of slightly disturbed waters from moderately disturbed waters. As presented in the IAR, the macroinvertebrate data for the Project supports the distinction of a ‘Slightly Disturbed’ aquatic ecosystem condition. The definition of slightly disturbed waters is “*waters that have the biological integrity of high ecological value waters with slightly modified physical or chemical indicators but effectively unmodified biological indicators – the measures for the slightly modified physical or chemical indicators are progressively improved to achieve the water quality objectives for high ecological value water*”.

The management intent of slightly disturbed waters is to gradually improve water quality and to aim to achieve a HEV waterway classification, however it is noted that HEV WQOs may not be achievable in the Copperfield River as there are a number of regionally based negative influences on water quality, including:

- Large-scale historical clearing;
- Cattle grazing and direct access to the river by cattle; and
- Flow regulation by the Copperfield Dam.

## 3.2 Environmental Values

EVs are qualities designed to provide requirements to make water suitable for supporting aquatic ecosystems and human uses. They require protection from the effects of habitat alteration, waste releases, contaminated runoff and changed flows to ensure healthy aquatic ecosystems and waterways that are safe for community use. The EVs of waters are protected under EPP Water. The policy sets WQOs, which are physical and chemical measures of the water (i.e. pH, nutrients, salinity etc.) to achieve the EVs set for a particular waterway or water body. EVs define the suitable uses of the water (i.e. aquatic ecosystems, human consumption, industrial use etc.).

An evaluation of site specific EVs that are relevant to the proposed release regime and the local receiving environment is provided in Table 1 and is based on the mapping exercise undertaken as part of the IAR.

**Table 1 Surface Water Environmental Values Relevant to the Project Site**

| Environmental Value | Relevance to Copperfield River | Justification |
|---|---|---|
| Aquatic ecosystems (incorporating Habitat value) | ✓ | The macroinvertebrate field survey and desktop assessment supports the definition of a ‘Slightly Disturbed’ aquatic ecosystem condition (waters that have the biological integrity of high ecological value waters with slightly modified physical or chemical indicators but effectively unmodified biological indicators) as discussed in Section 3.1.2 |
| Irrigation (Short Term < 20 years) | ✓ | There are no known irrigation operations within the receiving environment. There are no current water allocations. However there is the potential for irrigation subject to economic feasibility (Petheram, Watson, & Stone, 2013). Therefore this EV is considered relevant. |
| Irrigation (Long Term ~100 years) | ✓ | There are no known established irrigation operations within the receiving environment, and there are no current water allocations. However, following an assessment of the feasibility of irrigation occurring in the catchment, economic factors were found to be the main limiting factor. These may change within the next 100 years, and may allow irrigation projects within the receiving environment, sourcing water from the Copperfield Dam, to become feasible. Subsequently this environmental value has been applied. |
| Farm supply (e.g. fruit washing, milking sheds, intensive livestock yards) | ✓ | There are no intensive farm uses within the downstream receiving environment, and there are no water allocations within the receiving environment. There are a number of farm dams that *could* obtain water via unlicensed extraction from the Copperfield River. Therefore this EV is considered applicable. |
| Stock watering (e.g. grazing cattle) | ✓ | The majority of the land use in the downstream receiving environment comprises cattle grazing. Cattle are able to directly access the river upstream and downstream of the proposed release location. |

| Environmental Value | Relevance to Copperfield River | Justification |
|---|---|---|
| Aquaculture | ✓ | Whilst this EV has been assessed and is potentially relevant to the larger catchment, it is not considered to be relevant to the receiving environment immediately downstream. The ephemeral nature of the Copperfield River catchment means that future use for aquaculture is highly unlikely. |
| Human consumption (e.g. of wild or stocked fish) | ✓ | As outlined in the site specific assessment contained in the IAR, there are a number of locations where the Copperfield River could be accessed. |
| Primary recreation (fully immersed in water e.g. swimming) | ✓ | As outlined in the site specific assessment contained in the IAR, there are a number of locations where the Copperfield River could be accessed.<br>The most likely location for primary and secondary recreation is at the Einasleigh Gorge, approximately 44km downstream.<br>Although outside the expected area of impact, this EV has been nominated as applicable to the receiving environment. |
| Secondary recreation (possibly splashed with water, e.g. sailing) | ✓ | |
| Visual appreciation (no contact with water, e.g. picnics) | ✓ | Visual appreciation is applicable downstream at Einasleigh in the Einasleigh Gorge. It could be applicable at possible access points. |
| Drinking water (raw water supplies taken for drinking) | ✓ | The closest location that could potentially extract water from the Copperfield River for potable supply is at the Oaks Homestead, 11.2km downstream from the proposed release point; however this has not been confirmed.<br>There is no municipal water supply to Einasleigh township. Personal communications with Etheridge Shire Council on 16 May 2018 indicated that there are a number of unlicensed spears into the river in the vicinity of Einasleigh township; it is assumed that these could be used for domestic supply. |
| Industrial use (e.g. power generation, manufacturing, road maintenance) | ✓ | The only industrial user of water in the receiving environment is the Project and its co-located solar projects. There is a potential for industrial use in the Einasleigh township. |
| Cultural and spiritual values | ✓ | There are a large number of indigenous artefacts identified in the Copperfield River catchment. The Copperfield and Einasleigh Rivers were focuses of indigenous occupation of the area. |

The EV for Aquaculture refers to commercial aquaculture operations that produce a multitude of aquatic species for human consumption. Currently there are no such ventures in the receiving environment for the operation, and the potential for such a venture is extremely low. Therefore parameters for Aquaculture will not be considered for the development of WQOs for the Project.

The ANZECC (2000) guidelines do not provide quantitative measures to protect cultural or spiritual values. Consideration is given to cultural and spiritual values of a watercourse by the development of site specific guideline values as recommended for aquatic ecosystem protection.

## 3.3 Guideline Values

### 3.3.1 Default Water Quality Objectives

The QWQG and EPP Water do not specify WQOs for the Gulf Rivers region or the Gilbert Basin. Instead they recommend the use of the ANZECC (2000) guidelines, cautioning that these values may not be appropriate for intermittent and ephemeral inland streams. In cases where more than one WQO is available for a particular parameter, the most stringent value from all EVs is applicable. As outlined above, the WQOs for Aquaculture (specifically referring to commercial aquaculture operations) have not been incorporated into the assessment of the lowest WQO from all EVs.

The simplified decision tree for assessing toxicants in ambient waters from the ANZECC (2000) guidelines was applied to select and refine WQO's for the Project. Figure 2 describes application of the decision tree.

Appropriate guidelines and trigger values (WQOs) were assembled for the applicable EVs that are outlined in Table 1. The default WQOs for the Project are provided below in Table 2.

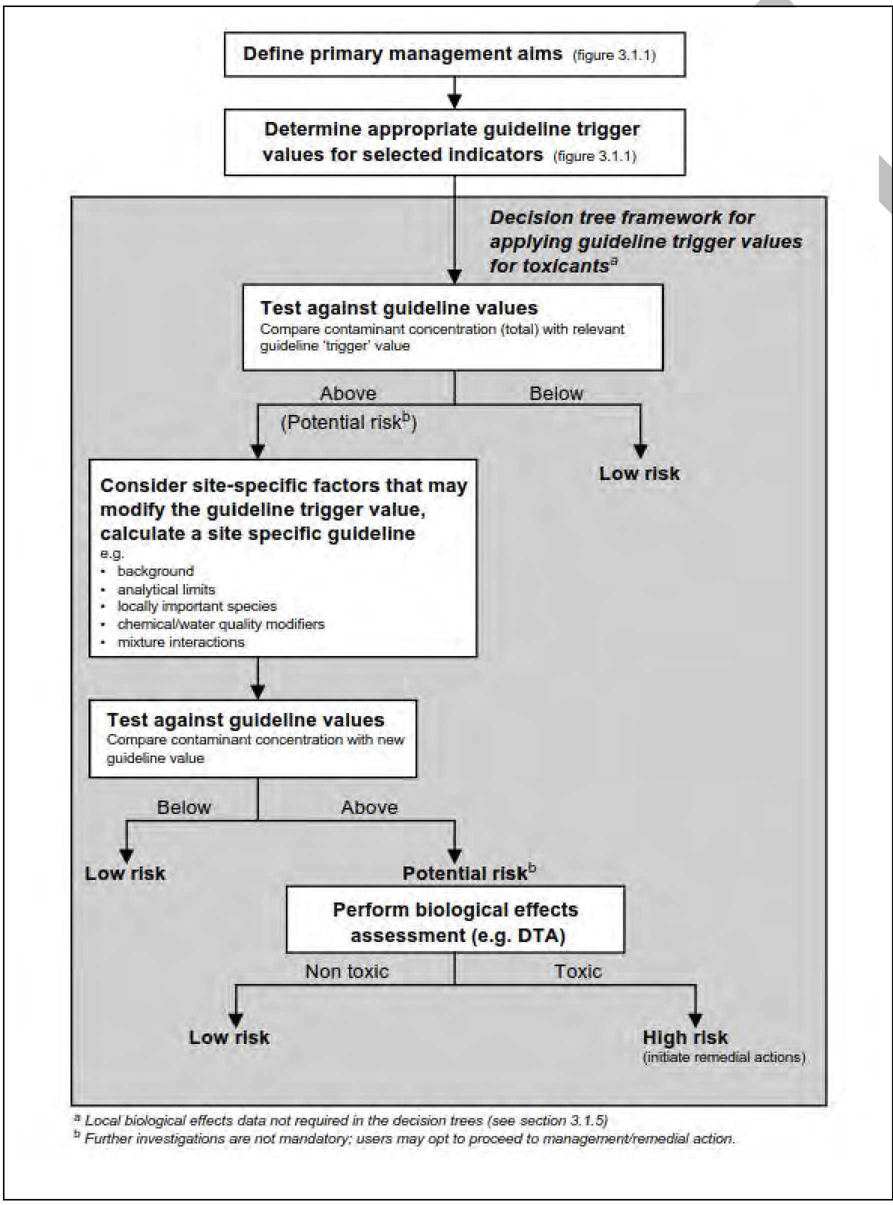



**Figure 2 Simplified decision tree for assessing toxicants in ambient waters (from ANZECC (2000))**

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**Table 2 WQOs adopted for the project**

| Parameter | Unit | LOR | Applicable WQO |
|---|---|---|---|
| **pH value** | pH unit | 0.01 | 6.0 – 8.4* |
| **Electrical Conductivity** | (µS/cm) | 1 | 500 |
| **Sulfate as $SO_4^{2-}$** | mg/L | 1 | 250 |
| **Aluminium (total)** | mg/L | 0.01 | 1.52* |
| **Aluminium (dissolved)** | mg/L | 0.01 | 0.57* |
| **Arsenic (total)** | mg/L | 0.001 | 0.01 |
| **Arsenic (dissolved)** | mg/L | 0.001 | 0.013 |
| **Cadmium (total)** | mg/L | 0.0001 | 0.002 |
| **Cadmium (dissolved)** | mg/L | 0.0001 | 0.0003* |
| **Cobalt (total)** | mg/L | 0.001 | 0.05 |
| **Cobalt (dissolved)** | mg/L | 0.001 | 0.0028 |
| **Chromium (total)** | mg/L | 0.001 | 0.05 |
| **Chromium (dissolved)** | mg/L | 0.001 | 0.0017* |
| **Copper (total)** | mg/L | 0.001 | 0.2 |
| **Copper (dissolved)** | mg/L | 0.001 | 0.003* |
| **Manganese (total)** | mg/L | 0.001 | 0.1 |
| **Manganese (dissolved)** | mg/L | 0.001 | 1.9 |
| **Molybdenum (total)** | mg/L | 0.001 | 0.01 |
| **Nickel (total)** | mg/L | 0.001 | 0.02 |
| **Nickel (dissolved)** | mg/L | 0.001 | 0.019* |
| **Lead (total)** | mg/L | 0.001 | 0.01 |
| **Lead (dissolved)** | mg/L | 0.001 | 0.0075* |
| **Zinc (total)** | mg/L | 0.005 | 2* |
| **Zinc (dissolved)** | mg/L | 0.005 | 0.014 |
| **Total Cyanide** | mg/L | 0.004 | 0.08 |
| **Iron (total)** | mg/L | 0.05 | 0.43* |
| **Iron (dissolved)** | mg/L | 0.05 | 0.3 |
| **Chloride** | mg/L | 1 | 175* |
| **Sodium** | mg/L | 1 | 115 |
| **Boron (total)** | mg/L | 0.05 | 0.5 |
| **Boron (dissolved)** | mg/L | 0.05 | 0.37 |
| **Barium (total)** | mg/L | 0.001 | 1.0 |
| **Beryllium (total)** | mg/L | 0.001 | 0.06 |
| **Beryllium (dissolved)** | mg/L | 0.001 | 0.00013 |
| **Mercury (total)** | mg/L | 0.00004 | 0.001 |

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| Parameter | Unit | LOR | Applicable WQO |
|---|---|---|---|
| **Mercury (dissolved)** | mg/L | 0.00004 | 0.00005 |
| **Selenium (total)** | mg/L | 0.01 | 0.01 |
| **Selenium (dissolved)** | mg/L | 0.01 | 0.011 |
| **Uranium (total)** | mg/L | 0.001 | 0.01 |
| **Uranium (dissolved)** | mg/L | 0.001 | 0.0005 |
| **Vanadium (total)** | mg/L | 0.01 | 0.1 |
| **Vanadium (dissolved)** | mg/L | 0.01 | 0.006 |
| **Fluoride** | mg/L | 0.1 | 1 |
| **Ammonia as N** | mg/L | 0.005 | 0.5 |
| **Nitrate as N** | mg/L | 0.002 | 0.7 |
| **Nitrite as N** | mg/L | 0.002 | 1 |
| **Total N** | mg/L | 0.01 | 0.15 |
| **Total P** | mg/L | 0.005 | 0.01 |

[#] Low reliability trigger for 95% species protection as outlined in Volume 2 of ANZECC (2000)
* derived from a TDS concentration for cattle drinking water by using a conversion of EC to TDS = EC x 0.64
[1] Sourced from ANZECC (2000) Aquatic Ecosystem Guidelines for Upland & Lowland Rivers for Tropical Australia – Table 3.3.4
[2] Sourced from Table G.1 of the Queensland Water Quality Guidelines for the Gulf Rivers region (75$^{th}$ percentile value)
[3] A cyanide value of 0.007mg/L (as un-ionised hydrogen-cyanide) is recommended by the ANZECC (2000) guidelines. However the Leading Practice Sustainable Development Program for the Mining Industry publication on Cyanide Management (2008) states:
"Measurement of total cyanide values below 0.1 mg/L and Weak Acid Dissociable (WAD) cyanide below 0.05 mg/L present in mining related discharges may be unreliable and should be reported as 'less than' and not used for compliance purposes… The possible reasons for reporting measured levels of cyanide in surface waters or treated effluent needs to be taken into account when interpreting results of a monitoring program. The first is analytical error; the second is naturally produced cyanide excreted by plants, micro-organisms and insects; and the third is manufactured cyanide. Incorrect conclusions can easily be drawn, with potentially serious consequences if valid measurements are not used" pp 14
Following from these conclusions it is recommended that a total cyanide WQO of 0.1mg/L is set for the Project. If this value is exceeded further investigation may be warranted.
[4] The default WQO for beryllium (0.00013 mg/L) is below the standard LOR of 0.001 mg/L, therefore it is not possible to accurately assess concentrations against the WQO.
[5] There is no scheduled default physico-chemical stressor guideline value for nitrate in the Gulf Rivers region. There is currently insufficient data available to establish a site-specific value for nitrate and there is a lack of published data available for an adjacent similar catchment, therefore the ANZECC (2000) trigger value for the protection of 95% species is applied. Nitrate monitoring in the receiving environment will form part of the REMP in order to gather sufficient information to establish a site-specific WQO for nitrate.

#### 3.3.1.1 Hardness Modified Trigger Values

The default trigger values outlined in Table 2 can be modified to account for water hardness. Hardness influences the biological uptake of toxicity of dissolved cadmium, chromium (III), copper, nickel, lead and zinc. Subsequently the above trigger values can be adjusted to allow for water hardness. Trigger values for these parameters should be adjusted for hardness based on the equations outlined in Table 3. HMTV's should only be calculated if the hardness in the water exceeds 25mg/L as $CaCO_3$.

Where a HMTV is calculated it should be recorded in the water quality database and an assessment on a sample by sample basis undertaken to determine if dissolved concentrations in the sample exceed the hardness modified trigger value.

**Table 3 Equations to calculate hardness modified trigger values (from ANZECC, 2000)**

| Parameter | Equation |
|---|---|
| Cadmium | $TV * (Hardness / 30)^{0.89}$ |
| Chromium (III) | $TV * (Hardness / 30)^{0.82}$ |
| Copper | $TV * (Hardness / 30)^{0.85}$ |
| Lead | $TV * (Hardness / 30)^{1.27}$ |
| Nickel | $TV * (Hardness / 30)^{0.85}$ |
| Zinc | $TV * (Hardness / 30)^{0.85}$ |



### 3.3.2 Sediment Quality Guidelines

Sediment trigger level and contaminant limits are based upon ANZECC/ARMCANZ (2013) Sediment Quality Guidelines and are presented, where present, for relevant parameters in Table 4. The recommended approach is to calculate the median background concentration and multiply this by a certain factor (typically two) (Simpson, Graeme, & Chariton, 2013). This approach is applied to EAs of mine sites throughout Queensland and allows site-specific concentrations of the above contaminants to be provided.

Where replicate samples are taken at a monitoring site, an exceedance is taken to be where the 95$^{th}$ percentile of the replicate samples exceeds the guideline value as outlined in Table 4. Where the replicate samples from an impact site are compared to replicate samples from a reference site, an exceedance is taken to be where the 95$^{th}$ percentile of the impact site exceeds the maximum at the reference site.

**Table 4 Trigger levels and contaminant limits for stream sediments**

| | Units | Trigger Level~ | Contaminant Limit |
|---|---|---|---|
| Arsenic | mg/kg | 20[1] | 70[2] |
| Cadmium | | 1.5[1] | 10[2] |
| Chromium | | 80[1] | 370[2] |
| Copper | | 65[1] | 270[2] |
| Lead | | 50[1] | 220[2] |
| Mercury | | 0.15[1] | 1.0[2] |
| Nickel | | 21[1] | 52[2] |
| Zinc | | 200[1] | 410[2] |
| Other Parameters | As relevant | Where there is no guideline provided specifically, the trigger level is to be the value of the reference site and the contaminant level is to be three times the value at the reference site. | |

~ Trigger values can be those found in this column or the value from the reference site, whichever is higher

[#] Contaminant limits can be the values found in this column, or three times the reference value, whichever is higher

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[1] Value from "Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines (Simpson, Graeme, & Chariton, 2013) "Guideline Value"
[2] Value from "Revision of the ANZECC/ARMCANZ Sediment Quality Guidelines (Simpson, Graeme, & Chariton, 2013) "SQG-High"

## 3.4 Summary of Receiving Environment

The following summary of the receiving environment is presented from the IAR for the K2H Project:

***Surface Water Quality***

- EVs for the Gilbert River basin have not been defined under the EPP Water. In this instance, the EPP Water prescribes the application of all default EVs. EVs have been described for the Copperfield River over a 44km stretch downstream from the former Kidston mine site to the confluence of the Einasleigh River.
- Macroinvertebrate data supports the distinction of a 'Slightly Disturbed' aquatic ecosystem condition under the EPP Water. The management intent for this water type is to gradually improve water quality and to aim to achieve a HEV waterway classification, however HEV WQOs may not be achievable in the Copperfield River as there are a number of regionally based negative influences on water quality.
- The QWQG and EPP Water do not specify WQOs for the Gulf Rivers region or the Gilbert Basin. Instead they recommend the use of the ANZECC (2000) guidelines, cautioning that these values may not be appropriate for intermittent and ephemeral inland streams. In cases where more than one WQO is available for a particular parameter, the most stringent value from all EVs is applicable. Where applicable, site-specific trigger values were derived based on the upstream dataset for monitoring location WB. HMTVs were developed for the area in the immediate vicinity of the release point, using the median baseline hardness values at monitoring location W2.
- Some anomalies in the receiving environment water quality datasets were noted and led to the exclusion of samples collected prior to 2012 (providing an adequate dataset size for analysis of 40 to 60 samples). Ongoing monitoring is recommended for parameters with limited dataset sizes.
- The baseline assessment indicated that a number of parameters are elevated above WQOs in the receiving environment. Monitoring site W2 has indicated potential impacts from seepage.

***Hydrology***

- In the absence of stream gauging, hydrological modelling was used to undertake a flow spells analysis which showed a definite seasonal distribution with a distinct high flow season occurring from December through April.
- Cease to flow conditions (less than 1 ML/d) are present on approximately 55% of all days for any day and reduce to approximately 32% during the wet season (November through April).

***Hydrogeology***

- The groundwater flow regime of the Project has been modified by the construction of the tailings dam, interception drains, and by dewatering of the two pits. In their current state, Wises Pit and Eldridge Pit are both understood to function as groundwater 'sinks', as groundwater levels in the surrounds of both pits are higher than the surface water level in the pits.
- One confirmed wetland spring, Middle Spring, lies within the vicinity of the mine area. This spring is located west-northwest of the former mine and is not considered to be hydraulically connected to the groundwater regime of the proposed release area.

***Sediment Quality***

- The braided nature of the Copperfield River results in sediment transport that is limited to a few months per year during the wet season when discharge is high enough. Very little fine sediment is stored in the channel bed in the upper to mid catchments.

- Sediment samples have been collected annually between 2009 and 2013. No whole-sediment samples exceeded the SQG, indicating that sediment within the Copperfield River is considered to be unaffected by the historical mining processes. Although the <0.063 mm samples reported a number of SQG exceedances, this fraction is considered less useful for comparison to guideline values.
- For toxicants in the <0.063 mm fractions, exceedances reported around the potential release sites (e.g., W1 and W2) are also reported in the upstream and downstream monitoring sites (e.g., WB and W3, respectively) suggesting that there are no widespread impacts from historical mining activities evident within the Copperfield River and that the concentrations of metals found are a result of the overall catchment drainage. Additional sampling and monitoring is recommended in accordance with the REMP.

***Aquatic Ecology***

- The macroinvertebrate assessment determined that communities inhabiting the Copperfield River both upstream and within the receiving environment are in good condition. AusRivAS modelling determined that assemblages at some locations were considered to be significantly impacted. However these scores may be typical of the region and PET scores and taxa richness determined sensitive taxa were well represented.

***Dry Season Survey***

- Six semi-permanent waterholes were identified within the floodplain of the Copperfield River through a drone flyover in September 2018. These waterholes were sampled in late September 2018, along with monitoring locations W1 and W3.
- Previous significant rainfall in the catchment occurred in March 2018, therefore the water in the pools is assumed to have been standing for a long duration and were likely subjected to evapo-concentration.
- Total manganese, total iron, total nitrogen and total phosphorus recorded results above their respective WQOs both upstream and downstream of the proposed release point.
- A comparison against the long-term (post 2011) dataset for W1 and W3 did not indicate any clear trends with regards to water quality.

# 4.0 Monitoring Program Design

The aims of the monitoring program are to detect changes to the natural environment downstream of the K2H project as a result of controlled releases. The following sections outline requirements for the following types of monitoring to achieve this aim:

1. Water quality;
2. Sediment;
3. Biological,
4. Flow, and
5. Groundwater.

An overview of the monitoring program for the Project, including monitoring locations and frequencies is presented in Appendix A. Further detail regarding methodologies and parameters for water quality, sediment, biological monitoring and flow is presented in Sections 4.1, 4.2, 4.3, 4.4 and Section 4.5 respectively.

Monitoring locations and sampling regimes (Appendix A) have been designed to appropriately monitor environmental variables from areas upstream of any impact from historical mining activities, as well as near-field and far-field monitoring. Sample locations have been added downstream beyond the historical REMP monitoring locations to evaluate potential impacts to the Einasleigh River as a result of water releases from the Project. Water quality is to be monitored at the Einasleigh Gorge in order to record water quality trends in this location.

## 4.1 Water Quality Monitoring

### 4.1.1 Routine Sampling Locations and Frequency

Water quality sampling locations and frequencies are listed in Appendix A.

### 4.1.2 Field Quality Control

The collection of quality control samples is essential in order to provide confidence in the results of a sampling program, and is part of the overall quality assurance program. Quality control samples are listed in Table 5.

**Table 5 Quality Control Samples**

| Quality Control Sample | Number of quality control samples to be collected | Notes |
|---|---|---|
| Rinsate/Equipment Blank | One per field team per trip | The equipment blank assesses the potential for cross contamination of samples due to insufficient decontamination of sampling equipment. |
| Duplicates | One per 10 samples | Assesse the precision of results within a laboratory and between laboratories. |

*Source: Adapted from DES 2018*

### 4.1.3 Sampling Equipment

- Field meter capable of reading pH, EC, temperature, TDS, turbidity and dissolved oxygen. ORP is preferential but not required;
- Sample bottles;
- Extendable sampling pole;
- Field filters for metals;
- Laboratory equipment;

- Adequate field sheets;
- Rinsate for field blanks;
- Deionised water for decontamination;
- Disposable nitrile gloves.

#### 4.1.4 Water Quality Monitoring Parameters and Limits of Reporting

Each water quality sample should be analysed for the parameters listed in Table 6 and at the Limit of Reporting (LOR) specified.

**Table 6 Water quality monitoring parameters and limits of reporting**

| Parameter | Units | LOR |
|---|---|---|
| **Physico-Chemical** | | |
| pH (field + laboratory) | pH | 0.1 pH units |
| EC (field + laboratory) | µS/cm | 1 µS/cm |
| Total Suspended Solids (laboratory) | mg/L | 5 mg/L |
| Turbidity (field + laboratory) | NTU | 0.1 NTU |
| Dissolved Oxygen (field) | mg/L and % saturation | |
| Redox Potential (field) | mV | 0.1 mV |
| Temperature (field) | °C | 0.1 °C |
| **Cations / Anions** | | |
| Calcium | mg/L | 1 mg/L |
| Magnesium | | 1 mg/L |
| Sodium | | 1 mg/L |
| Potassium | | 1 mg/L |
| Sulfate as $SO_4$ | | 2 mg/L |
| Chloride | | 1 mg/L |
| Alkalinity | | 1 mg/L |
| Hardness | | 1 mg/L as $CaCO_3$ |
| Fluoride | | 0.1 mg/L |
| **Metals (total and dissolved)** | | |
| Aluminium | mg/L | 0.01 mg/L |
| Arsenic | | 0.001 mg/L |
| Barium | | 0.001 mg/L |
| Beryllium | | 0.001 mg/L |
| Boron | | 0.001 mg/L |
| Cadmium | | 0.0001 mg/L |
| Chromium | | 0.001 mg/L |
| Cobalt | | 0.001 mg/L |
| Copper | | 0.001 mg/L |
| Manganese | | 0.001 mg/L |
| **Mercury#** | | **0.00006 mg/L#** |

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| Parameter | Units | LOR |
|---|---|---|
| Nickel | | 0.001 mg/L |
| Lead | | 0.001 mg/L |
| Selenium | | 0.01 mg/L |
| **Vanadium#** | | **0.006 mg/L#** |
| **Uranium#** | | **0.0005 mg/L#** |
| **Zinc#** | | **0.002 mg/L#** |
| Iron | | 0.05 mg/L |
| **Nutrients** | | |
| Total Phosphorous | mg/L | 0.01 mg/L |
| Organic Nitrogen as N | | 0.01 mg/L |
| Total Nitrogen | | 0.01 mg/L |
| Ammonia as N | | 0.01 mg/L |
| Nitrate | | 0.01 mg/L |
| Nitrite | | 0.01 mg/L |
| **Other** | | |
| Dissolved Organic Carbon | mg/L | 1 mg/L |
| Cyanide - Total | | 0.004 mg/L |
| Cyanide – Free | | 0.004 mg/L |
| Total Organic Carbon | | 1 mg/L |
| Chlorophyll a | $mg/m^3$ | 1 $mg/m^3$ |

# These parameters require “ultra-trace” analysis to reach the recommended LOR. This will require larger sample containers and higher volumes of water and must be specifically marked on the Chain of Custody (COC) form.



### 4.1.5 Sampling Method

The following methodology should be employed to collect all in situ and grab water samples (Barrack Australia, 2013):

1. Ensure that the field meter is appropriately calibrated before starting fieldwork. Calibrate to manufacturer’s specifications and maintain a calibration record.
2. Upon arrival at a sample site, turn on the field meter and place the probes in the stream, pond etc. to be sampled. This will allow the probes to equilibrate with the sample conditions while performing the other sampling tasks. Once having completed all other sampling tasks and just prior to leaving the site, record the readings from the field meter.
3. Using a new pair of disposable nitrile gloves, open the zip-lock plastic bag containing the sample bottles and write the necessary details on the bottle label.
4. While still wearing the disposable nitrile gloves and using the green labelled 1L plastic sample bottle, without removing the lid submerge the bottle into the stream or pond to a depth of approximately 10-15 cm (half-way up the forearm). Facing upstream, to ensure the bottle is upstream of your body or any disturbance caused to the stream bottom by your presence. Open the lid with your free hand, allow the bottle to fill and then close the lid whilst still under water. Withdraw the sample from the water.

5. The same procedure in Step 3 is to be followed with the 50ml red/green bottle for “total” metal analysis. However, using a permanent ink marking pen, place a “tick” in the “Total Metals” box on the red/green sample bottle label.
6. The following sample bottle types contain preservative chemicals and or have been specially treated and must not be used as in Step 3:
    a) 50ml red/green sample bottle for “filtered” (dissolved) metal analysis;
    b) 250ml blue sample bottle for cyanide analysis;
    c) 50ml blue sample bottle for chromium analysis;
    d) 50ml clear sample bottle for arsenic analysis.
7. If one of the bottle types from (b) to (d) listed in Step 5 is required, while still wearing the disposable plastic gloves, remove the lid from the bottle and place it thread facing up on the ground (to avoid any soil/sediment etc. entering the bottle when the lid is later replaced). With the sample collected in the green labelled 1L plastic sample bottle from Step 3, carefully fill the bottle to nearly full but ensuring that the bottle does not overflow. Since bottle types from (b) to (d) listed in step 5 have various chemical preservatives added, if the lids from these bottles are swapped this will introduce gross contamination. Ensure that the correct lid from each bottle is used when being replaced.
8. After filling any necessary bottles, Step 3 is to be repeated with the green labelled 1L plastic sample bottle.
9. For “dissolved” (“filtered”) metal analysis , while still wearing the disposable nitrile gloves, with a new 50ml plastic syringe:
    a) Submerge the syringe into the stream or pond to a depth of approximately 10-15 cm (half-way up the forearm). While facing upstream, ensuring the syringe is upstream of your body or any disturbance caused to the stream bottom by your presence, draw back the plunger to fill the syringe. Remove the syringe from the stream or pond and dispose of the sample downstream.
    b) Repeat this twice to ensure the syringe has been thoroughly rinsed.
    c) With a syringe full of water sample as per step 7a, rinse the outside of the syringe and your gloved hands with rinse water. Then gently shake the syringe and your gloved hands to remove as much adhering water droplets as possible. This is to ensure no unfiltered droplets of water containing sediment/soil are accidently allowed to enter the 50ml red/green sample bottle for “filtered” metal analysis.
    d) Remove a 0.45µm filter disc from the wrapper and attach the filter disc to the bottom of the syringe prepared in step 7b. Press the plunger to filter the sample allowing the first approximately ten (10) drops to be discarded onto the ground. Filter the remaining volume in the syringe into the 50ml red/green sample bottle for “filtered” (dissolved) metal analysis. The syringe/filter disk is then discarded (do not reuse between sites).
    e) Using a permanent ink marking pen, place a “tick” in the “Dissolved Metals” box on the red/green sample bottle label.
10. Once all the necessary bottles have been filled, each is to be externally washed with rinse water to ensure any adhering soil or sediment is removed. Gently shake to remove as much adhering water as possible, and then return to the sample bottle to zip-lock plastic bag.
11. The samples are to be sent to a National Association Of Testing Authorities (NATA) Australia accredited laboratory in an iced plastic sample esky for analysis as soon as possible after collection.

For each sampling event, a photographic record of the following should be taken:

1. Upstream of the sample point;
2. Downstream of the sample point;

3. Any erosion present at the sample point;
4. Significant aquatic and riparian vegetation or noted changes in vegetation at the sample point; and
5. Anything else that is observed to potentially contribute to the water quality conditions at the site.

Once the parameter readings have stabilised they should be recorded on a field sheet, along with the following information:

- Site name;
- Brief site description (e.g. location and obvious environmental elements);
- Date and time of sampling;
- Weather at the time of and preceding sampling;
- General site observations including presence of weeds, animal tracks, site degradation and environmental health;
- The presence and / or state of any inflows or outflows to the site;
- Estimated maximum depth and width of the water body/watercourse at the point of sampling;
- Depth at which the parameters were recorded;
- Appearance of the water, including water clarity and colour;
- Water odour; and
- Substrate material at the site.

#### 4.1.6 Data Handling and Reporting

Upon receipt of samples from the laboratory, the following methods should be employed:

1. If quality characteristics of any downstream samples exceed the WQOs specified in Table 2, compare downstream results to the upstream results, and:
    a. Where the downstream results are lower than the upstream results, no action is to be taken
    b. Where the downstream results are higher than the upstream results, notify the administering authority within 24 hours of receipt of the results; AND
    c. Complete an investigation into the potential for environmental harm and provide a written report to the administering authority within 90 days of receiving the result, outlining:
        i. Details of the investigation carried out;
        ii. Actions taken to prevent environmental harm.

## 4.2 Sediment Monitoring

### 4.2.1 Initial Sediment Investigation

Existing sediment quality data suggests that levels of zinc and arsenic in the <0.063mm fraction are elevated above trigger values in the receiving environment at W1 and W2, and that other metals are elevated at multiple sites including the upstream monitoring site (AECOM, 2018).

An initial stream sediment investigation is proposed to be undertaken prior to the commencement of the Project to characterise the metal concentrations and behaviour in the Copperfield River prior to the commencement of releases.

There is inherent variability in sediment sampling results, particularly in metals analyses. Subsequently the aims of this initial investigation are to:

- Undertake sufficient sediment sampling for suitable parameters and analyse the <0.063mm fraction;
- Undertake sufficient replication of samples to characterise a 'true' sediment level and remove uncertainty regarding variability of results arising from the nature of stream sediment sampling; and,
- Characterise elements that may be above trigger and contaminant limits from upstream sampling sites.

This initial study should collect at least five (5) replicate samples from each monitoring site using the collection methods outlined in Section 4.2.3. Sample locations are identified in Appendix A.

Each sample should be separated into a <0.063mm fraction and a <2mm fraction and each fraction analysed for the parameters outlined in Table 7 by a NATA accredited laboratory. Samples should be taken in the dry season prior to the onset of the wet season when the majority of waterholes have dried up.

The aim of the initial sediment study is to characterise variability of concentrations in sediment from replicate samples, to determine if there is a consistent trend found at each site, or whether there is inherent variability in the sediment results. The outcomes of the initial sediment study will govern whether replicate samples are required for ongoing sediment monitoring. In addition the replicate sediment study will also aim to determine the pre-existing concentrations in sediment along the Copperfield River before releases commence.



### 4.2.2 Routine Sampling Locations and Frequency

Sediment sampling locations and frequencies are listed in Appendix A. Samples should be taken from areas of fine sediment deposition. This can include scour holes or at the upstream or downstream end of naturally occurring waterholes. Sediment samples should always be targeted in the mobile-bed of the river in sediment has recently been deposited. Sediment samples should not be obtained from areas where there has been no sediment movement in years.

### 4.2.3 Sampling Method

Field sampling for sediments will be undertaken in accordance with the Sediment Quality Assessment Guidelines as well as the Australian Standard (AS/NZS 5667.12:1999). A plastic (HDPE or PTFE) sampling trowel will be used to scoop sediments into a suitable sample container ready for sieving. At least 2kg of sample will be collected prior to sieving.

There is significant risk that the samples submitted to the laboratory will not have enough volume to analyse the <0.063mm fraction. If the NATA accredited laboratory does not have enough volume to analyse the <0.063mm fraction, the laboratory LOR will be artificially raised. Instructions on handling laboratory results with artificially raised LORs are provided in Section 4.2.5.

Sediment samples are to be collected from the top 0.3m of sediment on the bed using a plastic trowel. Sediment sampling locations should target areas of fine sediment, such as at the downstream end of scour holes or depressions within the bed. Sampling is to target newly deposited sediment whereever possible. The location of the sediment sample should be recorded and photographed and effort

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should be made to take future samples from the same location in order to determine changes over time.

A photographic record of the monitoring location will be taken during each sampling event, including upstream, downstream and the actual sample site.

### 4.2.4 Field Quality Control

As specified in DES 2018, one duplicate sample should be collected per 20 samples (minimum of one per field trip).

### 4.2.5 Sediment Quality Monitoring Parameters and Limits of Reporting

As discussed above, each sample should be sieved to <0.063mm and <2mm fractions. Each fraction should be analysed for the parameters outlined in Table 7.

Following the collection of five years of sediment quality data post releases, the data will be evaluated. If any of the monitored parameters have not been recorded at levels above the LOR for more than 80% of the record, and the concentrations of those parameters do not exceed trigger levels, SQG-High or reference site concentrations, they can be removed from the analysis.

**Table 7 Sediment quality monitoring parameters and limits of reporting**

| Parameter | Units | LOR (for both the <0.063mm fraction) |
|---|---|---|
| **Physical Parameters** | | |
| Particle Size Distribution | % | 1 |
| pH | pH units | 0.1 |
| Cation Exchange Capacity (CEC) including exchangeable aluminium | mg/kg | 1 |
| Total fluoride | mg/kg | 1 |
| Sulfate – Total as SO4 | mg/kg | 1 |
| **Metals** | | |
| Aluminium | mg/kg | 50 |
| Arsenic | mg/kg | 5 |
| Barium | mg/kg | 10 |
| Beryllium | mg/kg | 1 |
| Boron | mg/kg | 50 |
| Cadmium | mg/kg | 1 |
| Chromium | mg/kg | 2 |
| Cobalt | mg/kg | 2 |
| Copper | mg/kg | 5 |
| Nickel | mg/kg | 2 |
| Manganese | mg/kg | 5 |
| Mercury | mg/kg | 0.1 |
| Lead | mg/kg | 5 |
| Selenium | mg/kg | 5 |
| Vanadium | mg/kg | 5 |
| Zinc | mg/kg | 5 |

| Parameter | Units | LOR (for both the <0.063mm fraction) |
|---|---|---|
| **Other** | | |
| Cyanide - Total | mg/kg | 1 |
| Total Nitrogen | mg/kg | 20 |
| Total Phosphorous | mg/kg | 2 |

## 4.3 Biological Monitoring

### 4.3.1 Routine Sampling Locations and Frequency

Biological monitoring locations and frequencies are listed in Appendix A.

### 4.3.2 Aquatic Habitat and Flora

Aquatic ecology can be greatly influenced by habitat factors at the time of sampling. For this reason a detailed habitat assessment will be undertaken at each site where macroinvertebrate sampling or sampling for higher-order aquatic fauna is undertaken. The habitat assessment will be undertaken in accordance with the AusRivas methodology (DNRM, 2001). Care must be maintained to sufficiently describe the bed and edge habitat separately as well as any gradients between the two.

The habitat assessment will focus on rating:

- Bottom substrate / available cover;
- Embeddedness;
- Velocity / depth category;
- Channel alteration;
- Bottom scouring and deposition;
- Pool / riffle, run/band ratio;
- Bank stability;
- Bank vegetative stability;
- Streamside cover.

The condition of the above elements is to be scored in accordance with the Queensland AusRivas Sampling and Processing Manual. For each site, each element above must be scored either as “Poor”, “Moderate”, “Good” or “Excellent” and provided a score in accordance with the AusRivas Sampling and Processing Manual. The score of each element is then added to provide an overall habitat assessment score for each site to allow comparison.

### 4.3.3 Macroinvertebrate monitoring

The composition and abundance of macroinvertebrates is a key indicator of the health of aquatic ecosystems. There are various methods to sample and analyse macroinvertebrates. In ephemeral environments the life-history strategies of aquatic fauna have evolved in response to seasonal flow regimes. Therefore the timing of rainfall, floods and the persistence of pools are the main driving forces for macroinvertebrate community composition and abundance.

There are two methods nationally used for collecting aquatic macroinvertebrates. Both methods involve sampling a defined length of habitat using a dip net. However the samples that are collected can be live picked, or stored for laboratory picking of the sample. This method has been used throughout Queensland to set WQOs for various macroinvertebrate indices and is suitable for comparison of sample results to these WQOs.

As outlined in the 2018 Aquatic Ecology Study (C&R Consulting, 2018) there are no WQOs defined for the Gilbert River catchment. Instead the initial aquatic ecology characterisation of the area compared macroinvertebrate indices to those from the Central Queensland region given that the geomorphology and aquatic habitats in the Copperfield River are similar to those in Central Queensland. This approach is not sufficient for ongoing monitoring of potential impacts from the Kidston project.

The approach for ongoing macroinvertebrate monitoring of the Kidston Project is to undertake quantitative analysis of macroinvertebrate samples. This involves field collection of macroinvertebrates in accordance with the AusRivas method but excludes live picking of macroinvertebrates in the field. Instead all macroinvertebrates collected are preserved and sent for laboratory analysis. This allows quantitative analysis of the sample and comparison between sample sites using multivariate analyses.

The field picking method as outlined by AusRivas is not quantitative as it does not identify and quantify all individuals in the sample; instead the results are used in a presence-absence AusRivas model to broadly indicate ecosystem health. Laboratory picking involves transport of the entire sample to a laboratory for identification of all collected macroinvertebrates. Mutlivariate analysis is then undertaken on the results and the similarity of sample sites can be quantitatively defined. This approach is preferred for the detection of impacts from point source pollution (Smith, Jeffree, John, & Clayton, 2004). Downstream sites are compared to upstream sites, rather than all sites being compared to regional WQOs (which, for the Kidston site, may not be representative as the WQOs are for Central Queensland).

#### 4.3.3.1 Quantitative Macroinvertebrate Sampling Methodology

Three replicates of edge habitat and three replicates of bed habitat samples will be collected using the following methods which are broadly in accordance with AusRivas protocols, but modified for the quantitative macroinvertebrate analysis technique.

**In areas of fast flowing water**

- Use a surber sampler with an area of 0.3m by 0.3m and fitted with 250µm mesh.
- Disturb the 0.3m by 0.3m area to a depth of 5cm for a total of 5 seconds and then sweep the 250µm mesh through the disturbed area 5 times.

**In areas of slow flowing water or still water**

- Place a 0.3m by 0.3m quadrat and disturb the area to a depth of 5cm.
- Sweep a standard 250µm triangular mesh through the disturbed area 5 times.

**Following Sample Collection**

- Preferably wash all samples collected through nested sieves (8mm and 250mm) to remove excess organic matter and detritus. However this will be at the discretion of the sampler. It should be noted whether this was conducted within the reporting.
- Transfer the sample to screw top jars and preserve with 70% ethanol for laboratory analysis.
- Laboratory analysis is to identify all individuals to the family level taxonomic level consistent with AusRivas taxonomic resolution. The exception is the microcrustacean taxa (Cladocera, Copepoda, Ostracoda).

Each replicate should be collected from a homogenous macrophyte habitat with greater than 50% cover at all sites for edge habitat to reduce false positives in impact detection as a result of different habitat characteristics. Generally edge and bed habitat sample replicates should be taken from the same location each year. Variations can be added from year to year based on changing habitat conditions such as macrophyte cover. As the Copperfield River is braided, macroinvertebrate samples should be collected from the braid that is known to contain release waters in all near-field sites. Specific sample locations at upstream monitoring sites should target the braid which will receive release water. Far-field sites should be sampled in the same manner year after year (i.e. the same number of replicates should be collected from the same side of the bank as the previous year).

#### 4.3.3.2 Coincident Macroinvertebrate and Water Quality Analysis

Water quality analysis should occur at the same time as macroinvertebrate monitoring. If scheduled, routine water quality samples (as scheduled in Appendix A) are not gathered at the same time as macroinvertebrate monitoring, water quality samples should be collected and analysed for the following parameters:

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**Table 8 Minimum water quality analyses to be undertaken with macroinvertebrate monitoring**

| Grouping | Parameter | Units |
|---|---|---|
| In-Situ water quality parameters (field meter) | pH | pH unit |
| | Electrical conductivity | µS/cm |
| | Turbidity | NTU |
| | Dissolved Oxygen | mg/L and % saturation |
| | Temperature | $^0$C |
| Cations/Anions (laboratory analysis) | Sulfate as $SO_4$ | mg/L |
| | Calcium | mg/L |
| | Magnesium | mg/L |
| Total and dissolved metals | Aluminium | mg/L |
| | Copper | mg/L |
| | Iron | mg/L |
| | Manganese | mg/L |
| | Lead | mg/L |
| | Uranium | mg/L |
| | Zinc | mg/L |

## 4.4 Flow

Continuous (i.e. 15 minute intervals) flow monitoring will be undertaken in the Copperfield River upstream (at monitoring site US1) and downstream of the proposed release location (at monitoring site DS1). The monitoring station and associated equipment will be maintained and calibrated in accordance with manufacturer's instructions. A rating curve for the gauge will be established and regularly updated. In situ water quality parameters including temperature, pH, EC and DO will also be continuously measured at the stations.

## 4.5 Groundwater

The Copperfield River, at the proposed release area, drains through Quaternary alluvial sediments which directly overlie the Einasleigh Metamorphics.

The alluvial sediments (comprising clay, silt, sand, and gravel) extend laterally from the river bed as flood-plain alluvium. Drilling indicates limited thickness of alluvial sediments within the Copperfield River, some 5 to 6 m. The Einasleigh Metamorphics, predominantly biotite gneisses, outcrop adjacent to, and in some sections within, the Copperfield River.

Regional groundwater flow within the alluvium is considered to mimic the topography of the Copperfield River and subsequent flow direction, generally north. The hydrological regime of the Copperfield River is ephemeral; flows are highly episodic and likely sustained only during and immediately after significant rainfall events and the wet season. The locations of semi-permanent waterholes within the floodplain of the Copperfield River were identified through flyover with a drone by Genex in September 2018. Six locations were identified. Standing water was present at long term monitoring points W1 and W3 as well.

The majority of waterholes found were minor remnant pools occurring in-channel. Only two substantial pools were noted downstream of the Project site (Pond 5 near W3 and the Sandy Creek site). These two pools have the potential to persist year round, providing refuge to aquatic fauna. The longevity of these pools would be highly correlated with the hydrology of the system on a yearly basis.

The presence of semi-permanent pools suggests the river is, at least for some parts of the year, fed by groundwater discharge. The fact that the pools do not persist throughout the year indicates that the

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groundwater source aquifer (likely the alluvium in the surrounds of the river) has limited storage. Groundwater inflows to the river are potentially sourced from surface water that has infiltrated the alluvium when the river is in flood.

Limited hydrochemistry data for the alluvium associated with the Copperfield River is available. Groundwater quality monitoring data provided by Genex was assessed and bore reports from the DNRME registered GWBD were interrogated for groundwater quality data in proximity to the proposed release area.

Two registered bores are reported to be constructed to intersect the floodplain alluvial sediments of the Copperfield River, RN139937 (BA06) and RN139938 (BA07) located adjacent to the mine pits and north and south of the proposed release area.

The available groundwater quality data for these bores, provided by Genex, comprises monitoring from October 2008 through October 2017, which includes some seasonal variability (wet and dry season monitoring) and spatial variability.

- The available data from monitoring bore BA06 indicates magnesium/calcium-sulphate-rich water quality. Sulphate concentrations have varied throughout the monitoring period but generally ranged between ~ 2,500 and 3,000 mg/L, although a marked increase was observed in January 2017, to ~ 5,000 mg/L.
- The available quality data for monitoring bore BA07 indicates a greater proportion of dissolved sodium and chloride, and lower dissolved sulphate concentrations (< 1,000 mg/L) than bore BA06. The January 2017 sulphate 'spike' observed in BA06 was also observed in water quality from BA07 sampled on the same date; however, sulphate concentrations reported subsequently decreased in both bores (to < ~ 1,000 mg/L). Electrical conductivity trends mirror sulphate concentrations.

Samples from both bores record relatively high alkalinity (~ 200-500 mg/L) and pH has remained consistently between 7 - 8 for both bores throughout the monitoring period. Recorded dissolved metal concentrations are generally at or below laboratory LOR in samples from both monitoring bores.

The location of BA07 (just east and down topographic gradient from the former mine pits) and the marked variation in water quality from bore BA06, suggest that seepage from the former mine area may be acting as artificial recharge to the alluvial sediments in proximity to the proposed release area.

Monitoring of these two bores (BA06 and BA07) is to occur as part of the REMP to quantify any linkages between the pits and the Copperfield River. The locations of these bores as well as monitoring frequencies are found in Appendix A.



### 4.5.1 Sampling Methods

#### 4.5.1.1 Water Level Monitoring

Sampling should be undertaken in accordance with the following method:

1. Assess the monument and/or casing and cap for any signs of damage or changes.
2. Open the monument or remove the casing and cap.
3. Use a water quality dipper such as a Solinst Water Level Meter. Turn it on and gently lower the probe into the water column. Take care to prevent the tape from rubbing on the edge of the casing or monument as this will make it fray and can disrupt the electrical signal used to indicate water.
4. Once the alarm sounds, gradually raise the probe again until the alarm stops. Lower again slowly until the alarm sounds to record the water level.
5. Enter the Standing Water Level from the reference location (top of casing) into the field sheet.
6. If no further monitoring is to take place, ensure the cap is placed tightly back on the bore casing.

This is to be undertaken prior to any groundwater sampling to record the standing water level prior to disturbance.

#### 4.5.1.2 Groundwater quality sampling

Groundwater quality sampling is to be undertaken with *Groundwater Sampling and Analysis – A Field Guide* (Geoscience Australia, 2009). Generally there are two different methods to sample bores, including:

- Bore purge method;
- Low flow sampling.

Please refer to the latest copy of the above document for further information regarding sampling using these methods. The choice of method will be at the discretion of the sampler. However, once a bore is sampled using one method, future samples should also use the same method to provide as consistent results as possible.

Water quality samples cannot be collected using either method until field parameters have reached stabilisation limits. The stabilisation limits are provided in Table 9. Three consecutive samples, taken at least 2 minutes apart, must be within the tolerances outlined in Table 9 until sample bottles for laboratory analysis can be filled.

**Table 9 Stabilisation parameters for low flow sampling**

| pH | ORP | EC | DO | Temperature |
|---|---|---|---|---|
| ± 0.1 | ± 10mV | ± 5% | ± 10% | ± 0.2 degree |

### 4.5.2 Sample Parameters

All groundwater samples should be analysed for the parameters outlined in Appendix A to provide as consistent results as possible.

# 5.0 Data Interpretation

## 5.1 Overview

All data collected for the REMP is to be analysed and discussed in an annual REMP Assessment Report to be submitted in October of each year. The REMP Assessment Report will review all data collected for the receiving environment and assess against current triggers and guidelines. The REMP Assessment Report will also determine whether the current release regime is suitable and will outline what impacts are occurring in the receiving environment.

## 5.2 Water Quality

### 5.2.1 Values below the Limit of Reporting

Values that are returned from the laboratory below the LOR should be transformed to 50% of the LOR. For example, a value of <0.001 mg/L becomes 0.0005mg/L.

### 5.2.2 Data Requirements for Background Data

The QWQG 2009 provides a framework for developing locally relevant WQOs. Background data can be used if samples are collected from a suitable location and there are enough samples collected over a relevant time period. It is preferable to have 18 samples over 24 months. (Claus, Dunlop, & Ramsay, 2017). Until minimum data requirements have been established, comparison of test site medians should be made with reference to the default guidelines. A discussion of the water quality monitoring sites and data suitability is outlined below.

### 5.2.3 Assessing compliance with WQOs

Compliance assessment is not as simple as comparing individual water quality samples to the WQOs listed in Table 2,. The method to assess whether a WQO has been exceeded depends on the parameter type. These are summarised below (for Slightly to Moderately Disturbed waters):

- **Physical and chemical stressors**[2]

  Trigger values are exceeded when the median of at least 8 samples (preferably 24 collected over a 2 year period) at a test site exceed the WQO. Or if suitable background data exist, when the median of the 8 to 24 samples exceeds the 80$^{th}$ percentile of the reference site (from the same number of samples), the trigger investigation level is exceeded (ANZECC (2000) Guidelines, Section 7.4.4.1).

- **Toxicants**[3]

  A trigger value is exceeded when the 95$^{th}$ percentile of the test distribution exceeds the default value; no action is triggered if 95% of all values fall within the default WQO.

  If background data exists, compare the 80$^{th}$ percentile of background data (calculated over at least 10 to 24 samples gathered over the previous 24 months) to the default WQO. If the 80$^{th}$ percentile exceeds the WQO, then the 80$^{th}$ percentile becomes the new WQO and exceedance occurs if the running median (from the same period of samples) of the test site exceeds the running 80$^{th}$ percentile of background data. (EHP, 2013).

Statistical measures (medians, 80$^{th}$ percentiles, 95$^{th}$ percentiles) should be calculated from the most recent 10 to 24 samples. Where an exceedance of the default WQO applies, the entire dataset should be investigated in further detail.

With reference of comparison of site data to ANZECC (2000) WQOs for Aquatic Ecosystems it is important to note that Section 3.4.3.2 of the ANZECC (2000) guidelines states:

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[2] Includes nutrients, biodegradable organic matter, dissolved oxygen, turbidity, suspended particulate matter, temperature, salinity, pH.
[3] Includes ammonia, heavy metals and other toxic compounds

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*"… Comparison of total concentrations will, at best, overestimate the fraction that is bio-available. The major toxic effect of metals comes from the dissolved fraction so it is valid to filter samples (e.g. to 0.45μm) and compare the filtered concentration against the trigger value"* (pp 3.4-15)

Site data from 'filtered' samples are compared to default WQOs for Aquatic Ecosystems; however, if the WQO is sourced from an alternate EV (such as recreation or cattle drinking etc.) the 'total' concentration from site data is compared.

### 5.2.4 Dissolved and Total Metals

A comparison should be made between dissolved and total concentrations of metals in each sample. Where the dissolved concentration exceeds the total concentration, the laboratory should be queried for possible reasons.

If the dissolved concentration is greater than the total, the following checks will be undertaken:

1. Assess the precision of the method and compare concentrations in duplicate samples.
2. Check total suspended solids concentrations. If concentrations are low, this indicates that total and dissolved concentrations will be the same or very similar.
3. If the results of Steps 1 and 2 above are inconclusive, ask the laboratory to check their results.

### 5.2.5 Data Analysis

Water quality test site results will be compared with both WQOs and control site water quality. As a minimum, a condition assessment will be conducted over an annual cycle to allow sufficient time to gather data for statistical analysis over various flows (base flow and high flow) and to take into account seasonal periods. Any raw data used in the analysis will also be included in the reporting, along with suitable reporting statistics (e.g. 20th, 50th, 80th, 95th percentiles).

Potential causes for any exceedances of WQOs and potential effects on EVs will be assessed. Long-term trends will be assessed once sufficient data has been accumulated.

## 5.3 Sediment Quality

### 5.3.1 Values below the Limit of Reporting

Where the standard LOR is achieved, values that are returned from the laboratory below the LOR should be transformed to 50% of the LOR. For example, a value of <1 mg/kg becomes 0.5 mg/kg.

Since the <0.063mm fraction is being analysed, there is a significant risk that the volume of each sample <0.063mm is not sufficient for the laboratory to obtain suitable LORs. For example if there is not enough sediment volume, the sample in the <0.063mm fraction may show <10 mg/kg instead of <1 mg/kg. In these instances the following hierarchy should be followed:

1. If the value below the LOR is below SQG Trigger Levels or SQG High, transform the value to 50% of the LOR. For example, if the concentration of lead is returned as <40 mg/kg, transform the value to 20mg/kg.
2. If the value below the LOR is above SQG Trigger Levels and SQG High, record the sample as exceeding the SQG Trigger Level. For example, if the concentration of lead for a sample is returned as <60mg/kg (and the SQG Trigger Level is 50mg/kg), record the sample as exceeding the SQG Trigger Level.
3. If the value below the LOR is above the SQG-High, record the sample as possibly exceeding the SQG High. For example if the concentration of lead for a sample is returned as <300 mg/kg (and the SQG-High value is 220mg/kg), record the sample as possibly exceeding the SQG High value. Re-sampling may be required in this instance as there was a very low volume of sediment provided to the laboratory in the <0.063mm fraction.

### 5.3.2 Site Variability

The nature of stream sediment sampling means that there is a high degree of uncertainty regarding the composition of sediment and the subsequent results of metals analysis. Stream sediment is comprised of a number of different weathering products from a range of host geologies. Any given

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sample of sediment will have different relative compositions of mineral particles, potentially altering the results of subsequent metals analysis by a NATA accredited laboratory.

In addition the grain size distribution will affect results. Total sediment samples (comprising all grain sizes) as well as samples sieved to the <0.063mm fraction (clays and silts) were analysed between 2009 and 2013 at the former Kidston mine. The total samples recorded zinc concentrations in the order of 5 to 70mg/kg with the majority of values around 10 to 15mg/kg. The <0.063mm fraction recorded concentrations in the order of 100-300 mg/kg with one sample showing a value of 431 mg/kg. The higher values are a result of the higher surface area available for adsorption and desorption in the finer fraction of sediment. This fraction is also the most bio-available to aquatic organisms as it is often ingested with food or passed through gills.

The variability of sediment sampling for the <0.063mm fraction is shown below in Figure 3, which shows zinc concentrations over five sampling events from the former Kidston mine site. At WB, the upstream reference site, zinc concentrations fluctuated between 88 mg/kg to 188 mg/kg between successive sampling events (29/11/2014 and 28/05/2015). The 19/11/2013 sampling event appears to show higher concentrations than previous or successive events, while the 23/05/2013 event generally shows the second-highest levels of concentrations. These factors introduce a high degree of uncertainty when interpreting the results below in Figure 3.

Subsequently replication of sediment samples is required to more adequately detect the variability of sediment and metals at each site. Three replicates are proposed for each site of the <0.063mm fraction. However the initial sediment study will undertake 5x replicates at each site to characterise the nature of variability. The recommended number of replicates for ongoing monitoring will be provided as an outcome of the Initial Sediment Study.

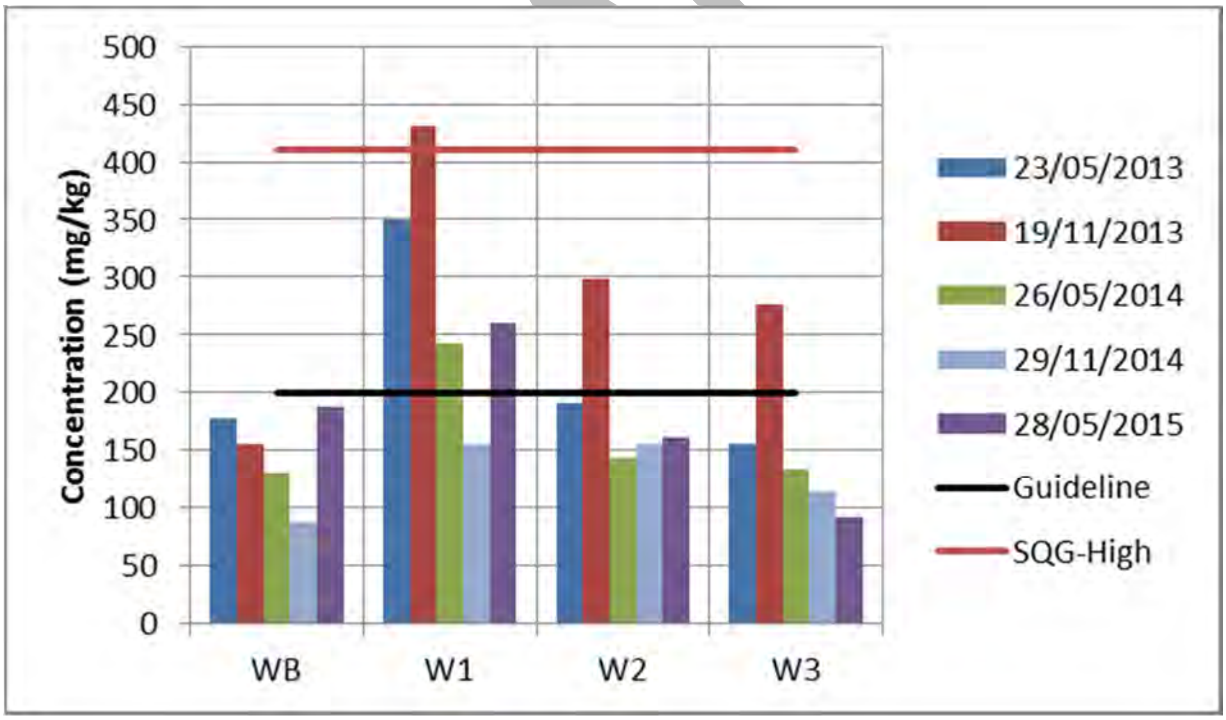


**Figure 3** **Results for zinc concentrations at monitoring sites form the former Kidston mine**

### 5.3.3 Accumulation of Reference Site Data

The REMP recommends an initial sediment study (refer Section 4.2.1) be undertaken to quantify concentrations of parameters that are outlined in Table 7 in the receiving environment with sufficient replication to remove errors that may be present as a result of the inherent variability of targeted sediment sampling in a river system.

It is recommended that values from reference sites in the Copperfield River are accumulated over a number of years and used to calculate suitable statistics for comparison to impact sites. This will allow a measure of Before-After-Control-Impact (BACI) analysis as outlined in the ANZECC (2000) guidelines. In the case of ongoing sediment sampling, statistics from reference sites should contain preferably 15 replicates from each site. This is approximately 5 years' worth of data.

Statistics from impact sites, based on three replicate samples, will then be compared to the 15 replicates from the reference sites. The previous 15 replicates should always be chosen for the reference site, including the current sampling event.

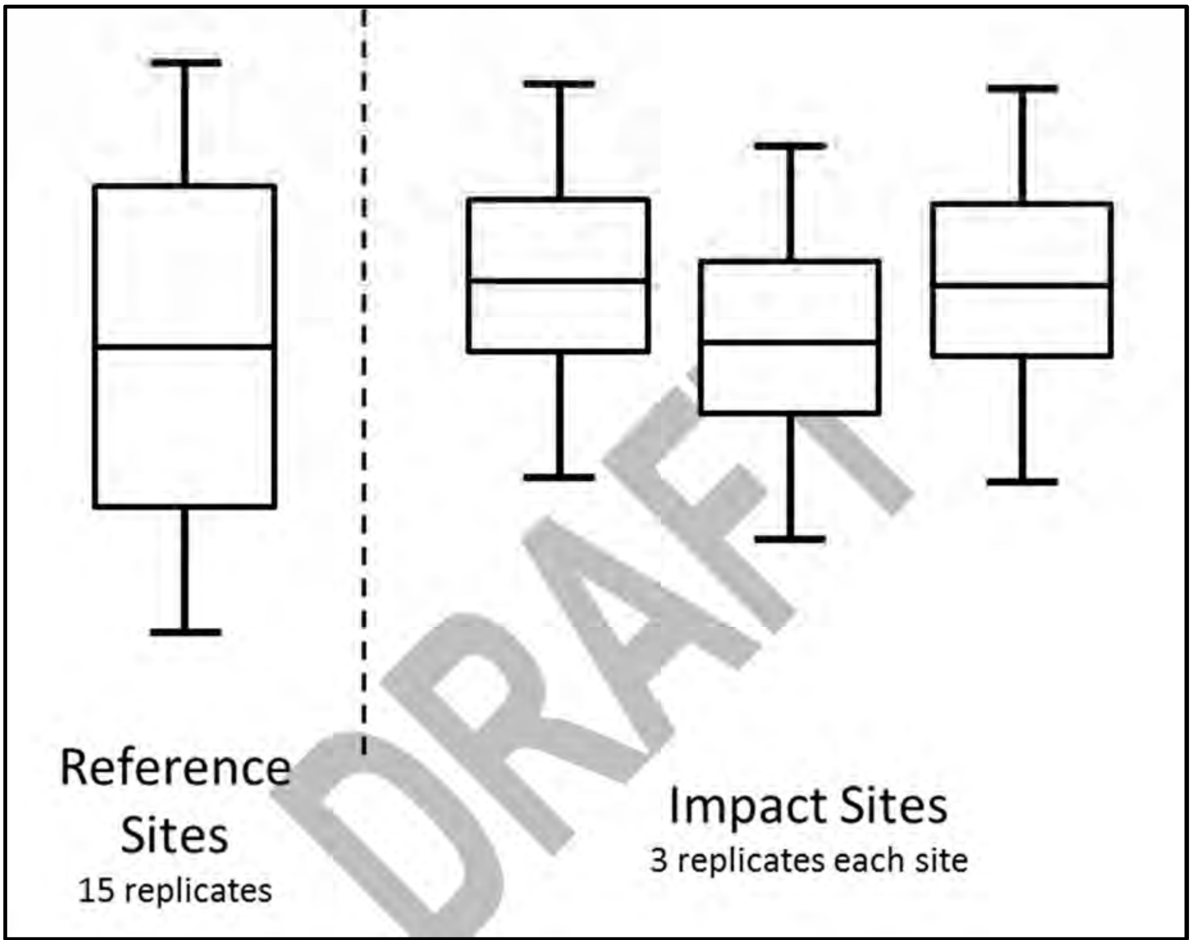


**Figure 4** **Example box plot comparison of multi-year reference site dataset to single-year impact site data.**

### 5.3.4 Assessment against guideline values

As outlined in the ANZECC (2000) guidelines, a sediment trigger level or guideline is said to be exceeded when the 95th percentile of the dataset is above the trigger level or guideline value. Initially the sediment quality sample data is to be compared to the guidelines outlined in Table 4. If the sediment values exceed the trigger levels, then the data should be compared to upstream data.

The recommended approach is to calculate the median (background) concentration and multiply it by a certain factor (typically two) (Simpson, Graeme, & Chariton, 2013). This approach is applied to EAs of mine sites throughout Queensland and allows site-specific concentrations of the above contaminants to be provided.

Where replicate samples are taken at a monitoring site, an exceedance is taken to be where the 95th percentile of the replicate samples exceeds the guideline value as outlined in Table 4. Where the replicate samples from an impact site are compared to replicate samples from a reference site, an exceedance is taken to be where the 95th percentile of the impact site exceeds the maximum at the reference site.

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## 5.4 Biological Monitoring

### 5.4.1 Aquatic Habitat

Aquatic habitat scores are to be compiled using methods outlined in the AusRivas Sampling Manual and an overall habitat score provided for each site. The overall habitat scores for all sites should be compared side by side to allow the relative condition of each site to be compared to all other sites.

Critical information that may affect the habitat score should be highlighted and discussed when interpreting the results.

### 5.4.2 Macroinvertebrates

Macroinvertebrate data is used to indicate ecosystem health in a number of indices. These indices are outlined below in Table 10. These indices will be used to compare upstream and downstream sites. Emphasis in reporting and analysis is to be placed on the difference between upstream and downstream sites and the factors contributing towards these differences rather than absolute values.

**Table 10 Indices of environmental health based on macroinvertebrate data**

| Name | Description |
|---|---|
| Taxonomic Richness | Total number of families within a sample. Most unambiguous diversity measurements. However this is a presence / absence metric and the abundance is not incorporated. Subsequently rare taxa have the same weighting as common taxa. Typically healthier communities have greater diversity. |
| PET (Plecoptera, Ephemeroptera, Trichoptera) Taxa Richness | The number of taxa collected from stoneflies (Plecoptera), mayflies (Ephemeroptera) and caddisflies (Trichoptera) which are sensitive to environmental change. There are typically more PET families in sites with good habitat and water quality than in heavily impacted sites. PET taxa are often the first to disappear when water quality or environmental degradation occurs. Lower scores of PET taxa indicate higher values of degradation. |
| SIGNAL 2 Index (Stream Invertebrate Grade Number – Average Level) | SIGNAL 2 scores are a measure of the sensitivity of freshwater macroinvertebrate families to pollutants and other physical and chemical stressors. SIGNAL 2 scores consider the relative abundance of tolerant or sensitive taxa, rather than just the presence/absence of these families.<br>Low SIGNAL 2 scores indicate poor habitat quality and/or impact, as a low value represents a high abundance of taxa tolerant to environmental change and a low abundance of taxa which are intolerant to environmental change. A high SIGNAL 2 score indicates a moderate to high abundance of taxa which are intolerant to environmental change, indicating good habitat quality.<br>The SIGNAL 2 score also considers background assessments for the region or specific stream boundaries. There have been no such studies undertaken for the Gilbert River catchment and the SIGNAL 2 scores should adopt interim boundaries based on the Central Queensland guidelines for indicative comparison (C&R Consulting, 2018). |

#### Multivariate Analysis

Quantitative macroinvertebrate analysis allows multivariate analysis to be undertaken and provide an indication of the relationship between upstream and downstream sample sites for a number of parameters. This multivariate analysis is widely undertaken in the ecology field. Table 11 provides a brief description of the multivariate analyses to perform for the assessment.

**Table 11 Multivariate analyses for macroinvertebrate data**

| Name | Description |
| --- | --- |
| SIMPER | Determines which variables (i.e. composition of macroinvertebrates) contribute to dissimilarity between sites and may help to define potential 'indicator' species. |
| nMDS (non metric multidimensional scaling) and associated Ordination Plots | A graph where the proximity of data from each site to other sites indicates the similarities in macroinvertebrate. The graph is calculated from the Bray-Curtis similarity matrix which is calculated as part of the analysis. |
| ANOSIM | Compares the observed differences between groups with the differences amongst replicates within the groups. A global analysis is calculated to determine if there are differences between any of the samples. If there are differences, then comparisons between each combination of sites are undertaken.<br>The results are indicated by an R statistic, whereby:<br>• R > 0.75 = groups well separated<br>• R > 0.50 = groups overlapping but clearly different<br>• R < 0.25 = groups barely separated<br>• Significance Level <5% = significant difference |
| RELATE (including BioEnv) | Used to correlate water, sediment and macroinvertebrate data to determine which water and sediment parameters are having the most impact. |

It is recommended that the above analyses are undertaken in the PRIMER software package. This package has been developed specifically to undertake the above analyses and will provide consistent graphical outputs from year to year to allow easy comparison of data.

**Comparison**

For macroinvertebrate data, analysis results from upstream sites are to be compared to downstream sites to determine if there is any discernible difference. If there are no differences that are not attributable to other environmental factors (such as the percentage of macrophyte cover between sites), then an impact can have been said to occur.

## 5.5 Groundwater

Groundwater data should be analysed to determine if there are any correlations between pit water data and the receiving environment. This will involve examination of correlations between certain parameters (i.e. zinc) as well as examination of cation/anion compositions. Groundwater quality data are to be compared to trigger levels outlined in Table 2, but exceedances of groundwater quality samples with the trigger values in Table 2 should not trigger investigation. The purpose of groundwater monitoring is to identify any linkages between the pit water and the Copperfield River. The WQOs outlined in Table 2 were developed for surface water systems and are not meant to be applied to groundwater systems. The WQOs outlined in Table 2 are appropriate for SW quality and will not be used as GW trigger values; however, the WQOs will be used for comparison with GW water sampled from bores BA06 and BA07 to evaluate long-term trends in GW quality, which will aid in assessment of potential linkages between the pit water and the Copperfield River.

# 6.0 Reporting and Review

All data collected as part of the REMP must be compiled into an annual REMP Assessment Report by October each year. The report must include:

- An overview of the releases for that period, including start date/time, end date/time and the volume released.
- A description of monitoring undertaken for all parameters outlined in this report.
- Examination of the suitability of data for derivation of local WQOs. If data is suitable, derive local WQOs using data collected as part of the REMP.
- Comparison of data collected in this report to licence conditions, standards, WQOs and include upstream to downstream comparison.
- A review of the suitability of monitoring locations, methods, timing, frequencies and parameters.
- Provide a summary table of monitoring required for the next REMP period.

The outcomes of the REMP should be used to evaluate whether adjustments to release rates are required to minimise the chance of environmental harm occurring.

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# Appendix A

## REMP Monitoring Locations and Frequencies

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# Appendix A REMP Monitoring Locations and Frequencies

| Group | Site | Easting | Northing | Description | Monitoring Frequency | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Water Quality | Sediment Quality | Biological | Flow |
| **Regional Monitoring – Background Sites** | WB | 201087 | 7907273 | Upstream of all influences on the Copperfield River | **Baseline Monitoring**<br>• Within 1 week of the commencement of flow<br>• Monthly thereafter for as long as water persists | **Initial Sediment Study**<br>• Dry Season 2019<br>• 5x replicates from each site<br>**Thereafter**<br>• 3x replicates from each site[2]<br>• At the end of the Wet Season after releases have ceased | • At least six weeks after flows recede to <1000 ML/d towards the end of the wet season (March – May)<br>• Early wet season sampling if possible (i.e. 6 weeks following flows receding to <1000ML/d) typically during November – February | N/A |
| | Pond 3 | 200868 | 7907862 | Pool situated 1.4km upstream | | | | |
| | E1 | 203774 | 7912124 | East Creek upstream of the confluence with the Copperfield River | | | | |
| **Regional Monitoring – Impact Sites** | W1 | 200799 | 7908133 | Downstream of the Tailings Storage Facility on the Copperfield River | **Baseline Monitoring**<br>• Within 1 week of the commencement of flow<br>• Monthly thereafter for as long as water persists<br>**During Releases**<br>• Within the first 24 hours of the commencement of release<br>• Every 3 days thereafter until seven days after the release ceases | **Initial Sediment Study**<br>• Dry Season 2019<br>• 5x replicates from each site<br>**Thereafter**<br>• 3x replicates from each site[2]<br>• At the end of the Wet Season after releases have ceased | • At least six weeks after flows recede to <1000 ML/d towards the end of the wet season (March – May)<br>• Early wet season sampling if possible (i.e. 6 weeks following flows receding to <1000ML/d) typically during November – February | N/A |
| | W2 | 201851 | 7910299 | Downstream of Manager's Creek Dam on the Copperfield River | | | | |
| | W3 | 202667 | 7915973 | At the causeway entrance to the Kidston Project on the Copperfield River. Most downstream monitoring point. | | | | |
| | E2 | 202887 | 7912971 | East Creek downstream of the confluence with the Copperfield River | | | N/A | |
| | Pond 5 | 202761 | 7915578 | Pool situated 7.0km downstream | | N/A | N/A | |
| | Copperfield River at the confluence with Sandy Creek (waterhole) | 197509 | 7929897 | Pool situated 20km downstream | | N/A | • At least six weeks after flows recede to <1000 ML/d towards the end of the wet season (March – May)<br>• Early wet season sampling if possible (i.e. 6 weeks following flows receding to <1000ML/d) typically during November – February | |
| | CG1 | TBA[1] | TBA[1] | Copperfield Gorge | | **Initial Sediment Study**<br>• Dry Season 2019<br>• 5x replicates from each site<br>**Thereafter**<br>• 3x replicates from each site[2]<br>At the end of the Wet Season after releases have ceased | N/A | |

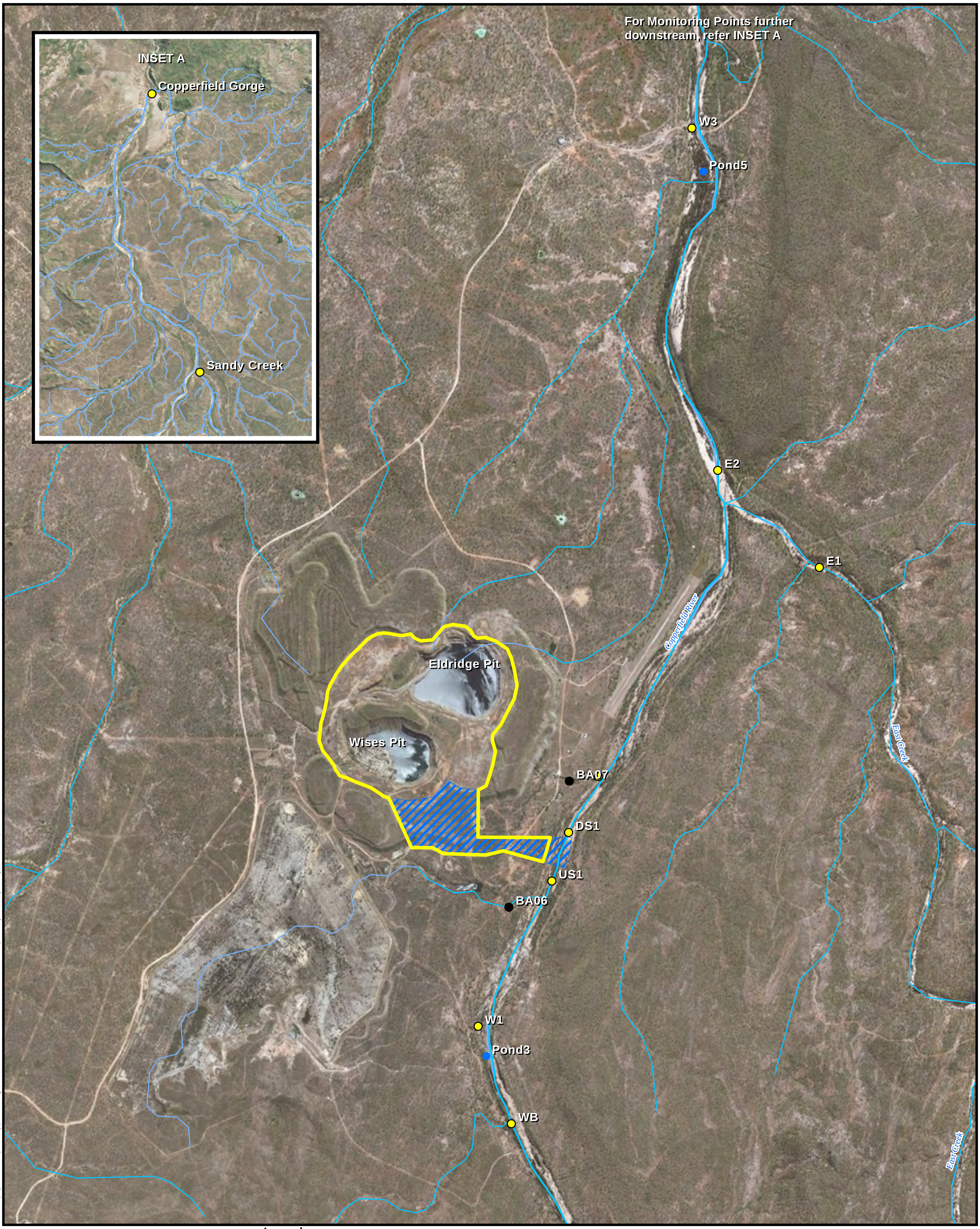
**DRAFT**

| Group | Site | Easting | Northing | Description | Monitoring Frequency | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Water Quality | Sediment Quality | Biological | Flow |
| **Near-field monitoring - Mixing Zone** | US1 | TBA[#] | TBA[#] | Immediately upstream of release location | **Baseline Monitoring**<br>• Within 1 week of the commencement of flow<br>• Monthly thereafter for as long as water persists<br>**During Releases**<br>• Within the first 24 hours of the commencement of release<br>• Every 3 days thereafter until seven days after the release ceases | **Initial Sediment Study**<br>• Dry Season 2019<br>• 5x replicates from each site<br>**Thereafter**<br>• 3x replicates from each site[2]<br>• At the end of the Wet Season after releases have ceased | N/A | Continuous |
| | DS1 | TBA[#] | TBA[#] | Immediately downstream of mixing zone for releases from the K2H Project | | | N/A | Continuous |
| **Release Water** | Eldridge Pit | TBA[#] | TBA[#] | Eldridge Pit at the Ramp | **Baseline Monitoring**<br>• Monthly for the first 24 months of Operation<br>• Quarterly thereafter | N/A | N/A | N/A |
| | Wises Pit | TBA[#] | TBA[#] | Wises Pit at the Ramp | | | | N/A |
| | Release Water | TBA[#] | TBA[#] | Sample of waters at the Release Point into the Copperfield River | • Within 24 hours of commencement of release<br>• Every day thereafter while releases are occurring. | | | N/A |
| **Groundwater Monitoring** | BA06 | 201067 | 7909160 | 6.0m deep well installed in river loam and sand. | **Construction Phase**<br>• Monthly<br>**Operational Phase**<br>• Quarterly | N/A | N/A | **WATER LEVEL:**<br>**Construction Phase**<br>• Monthly<br>**Operational Phase**<br>• Monthly |
| | BA07 | 201595 | 7910262 | 5.0m deep well installed in river loam and sand. | | | | |

[1] The most suitable location for monitoring at the Copperfield Gorge to be defined prior to the first release. Location is to be suitable for access in wet-weather events and suitable for water quality monitoring. NOTE: the sediment monitoring location may be different than the water quality sampling location as it would be ideal to capture sediment just upstream of the gorge in the dry river bed

[#] Location to be determined after installation of appropriate infrastructure.

[2] The initial sediment study is to determine whether replicates are required at each site for ongoing monitoring.



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DATUM GDA 1994, PROJECTION MGA ZONE 56

0 250 500 1,000
metres

1:30,000 (when printed at A3)

**Legend**
- Groundwater Bore
- Monitoring Point
- Pond
- Watercourse - Major
- Watercourse - Minor
- Key Project Infrastructure Footprint
- Spillway Options Corridor

KIDSTON PUMPED STORAGE HYDRO PROJECT
IMPACT ASSESSMENT REPORT

REMP Monitoring Points

| | |
|---|---|
| PROJECT ID | 60544566 |
| CREATED BY | RF |
| LAST MODIFIED | FraserR2I - 11 Jan 2019 |
| VERSION: | 2 |

**Figure**
75

A3 size

Filename: P:\605X\60544566\4. Tech Work Area\4.99 GIS\04_Outgoing\20190108_RF_K2H_MPs\20190108_RF_K2H_MPs.mxd

# Appendix J

## Eldridge Pit Water Quality Data – August 2018

ALS Environmental

# CERTIFICATE OF ANALYSIS

| | | | |
|---|---|---|---|
| **Work Order** | : **ET1802030** | Page | : 1 of 32 |
| Client | : **GENEX POWER LTD** | Laboratory | : Environmental Division Townsville |
| Contact | : A M | Contact | : Customer Services ET |
| Address | : Level 11, 2 Bligh Street, Sydney NSW 2000 PO Box R514, Royal Exchange, NSW 1225 Sydney NSW 2000 | Address | : 13 Carlton Street, Kirwan Townsville QLD Australia 4814 |
| Telephone | : +61 02 9993 4443 | Telephone | : +61 7 4773 0000 |
| Project | : Kidston | Date Samples Received | : 08-Aug-2018 13:20 |
| Order number | : | Date Analysis Commenced | : 09-Aug-2018 |
| C-O-C number | : ---- | Issue Date | : 20-Aug-2018 21:27 |
| Sampler | : JOHN LAWLER | | |
| Site | : ---- | | |
| Quote number | : EN/222/17 | | |
| No. of samples received | : 13 | | |
| No. of samples analysed | : 13 | | |

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

**Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.**

## *Signatories*

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

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Diana Mesa | 2IC Organic Chemist | Brisbane Organics, Stafford, QLD |
| Greg Vogel | Laboratory Manager | Brisbane Inorganics, Stafford, QLD |
| Hannah Beazley | | Brisbane Microbiological, Stafford, QLD |
| Kim McCabe | | Townsville Inorganics, Townsville, QLD |
| Kim McCabe | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Kim McCabe | Senior Inorganic Chemist | WB Water Lab Brisbane, Stafford, QLD |
| Mark Hallas | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Tom Maloney | | Townsville Inorganics, Townsville, QLD |
| Tom Maloney | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Tom Maloney | Senior Inorganic Chemist | WB Water Lab Brisbane, Stafford, QLD |

## *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.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

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
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- It is recognised that EK267PA-CM (Total Phosphorus) is less than EK271A-CM (Reactive Phosphorus) for sample Pit 2. However, the difference is within experimental variation of the methods.
- EG020-F (Dissolved Metals by ICP-MS) were found to be higher than EG020-T (Total Metals by ICP-MS) for sample ET1802030-002(Pit 2). This was confirmed by re-digestion and re-analysis.
- Results apply to sample(s) as submitted.
- EK067G (Total Phosphorous as P): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- EK058G, EA045, EA005-P, EA010-P, EA025H, ED037-P, ED041G, ED045G, EK040P, EK055G, EK057G, EK059G conducted by ALS Townsville, NATA accreditation no. 825, (Site no. 23313)
- KEY: PTP=Potential Toxin Producers
  ; ND=Not Detected; NS=Not Specified
  ; cf. = comparable from
- Samples were preserved with Lugols Iodine solution.
- It is recognised that EP005 (Total Organic Carbon) is less than EP002 (Dissolved Organic Carbon) for samples 'Pit 1' and 'Eldridge Ramp' . However, the difference is within experimental variation of the methods.
- EP002 (Dissolved Organic Carbon) was found to be higher than EP005 (Total Organic Carbon) for sample 'Eldridge 200m' . This has been confirmed by re-analysis.
- EK061G (Total Kjeldahl Nitrogen as N): Some samples were diluted due to matrix interference. LOR adjusted accordingly.
- It is recognised that EG094T (Total Metals in Fresh Water) is less than EG094F (Dissolved Metals in Fresh Water) for some samples. However, the difference is within experimental variation of the methods.
- It is recognised that EG020T (Total Metals) is less than EG020F (Dissolved Metals) for some samples. However, the difference is within experimental variation of the methods.
- Sodium Adsorption Ratio (where reported): Where results for Na, Ca or Mg are <LOR, a concentration at half the reported LOR is incorporated into the SAR calculation. This represents a conservative approach for Na relative to the assumption that <LOR = zero concentration and a conservative approach for Ca & Mg relative to the assumption that <LOR is equivalent to the LOR concentration.

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 7.74 | 7.60 | 7.67 | 8.16 | 7.68 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 3180 | 5120 | 3130 | 5160 | 3120 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | <5 | 7 | <5 | <5 | <5 |
| **EA045: Turbidity** | | | | | | | | |
| Turbidity | ---- | 0.1 | NTU | 0.5 | 13.5 | 0.6 | 0.6 | 0.4 |
| **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 | 44 | 98 | 45 | 93 | 45 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 44 | 98 | 45 | 93 | 45 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 1480 | 2400 | 1350 | 2410 | 1380 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 92 | 187 | 96 | 189 | 100 |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 324 | 472 | 323 | 492 | 305 |
| Magnesium | 7439-95-4 | 1 | mg/L | 96 | 137 | 95 | 147 | 91 |
| Sodium | 7440-23-5 | 1 | mg/L | 303 | 563 | 301 | 616 | 288 |
| Potassium | 7440-09-7 | 1 | mg/L | 47 | 110 | 47 | 126 | 45 |
| **ED093F: SAR and Hardness Calculations** | | | | | | | | |
| Total Hardness as CaCO3 | ---- | 1 | mg/L | 1200 | 1740 | 1200 | 1830 | 1140 |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | 0.02 | <0.01 | 0.03 | <0.01 | 0.02 |
| Arsenic | 7440-38-2 | 0.001 | mg/L | 0.028 | 0.517 | 0.028 | 0.234 | 0.026 |
| Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Barium | 7440-39-3 | 0.001 | mg/L | 0.040 | 0.036 | 0.039 | 0.040 | 0.038 |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0237 | 0.0004 | 0.0238 | 0.0006 | 0.0227 |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cobalt | 7440-48-4 | 0.001 | mg/L | 0.004 | 0.010 | 0.005 | 0.002 | 0.004 |
| Copper | 7440-50-8 | 0.001 | mg/L | 0.002 | 0.001 | 0.003 | 0.002 | 0.002 |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | 7439-96-5 | 0.001 | mg/L | 1.22 | 0.943 | 1.21 | 0.100 | 1.17 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **EG020F: Dissolved Metals by ICP-MS - Continued** | | | | | | | | |
| Molybdenum | 7439-98-7 | 0.001 | mg/L | **0.036** | **0.056** | **0.050** | **0.056** | **0.052** |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.023** | **0.006** | **0.024** | **0.003** | **0.022** |
| Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Uranium | 7440-61-1 | 0.001 | mg/L | **0.005** | **0.010** | **0.006** | **0.009** | **0.006** |
| 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 | **1.21** | **0.163** | **1.23** | **0.072** | **1.16** |
| Boron | 7440-42-8 | 0.05 | mg/L | **0.09** | **0.09** | **0.07** | **0.09** | **0.07** |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | **3.20** | <0.05 | <0.05 | <0.05 |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | **0.07** | **0.06** | **0.08** | <0.01 | **0.04** |
| Arsenic | 7440-38-2 | 0.001 | mg/L | **0.030** | **0.466** | **0.032** | **0.237** | **0.029** |
| Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Barium | 7440-39-3 | 0.001 | mg/L | **0.035** | **0.038** | **0.036** | **0.037** | **0.036** |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | **0.0243** | **0.0010** | **0.0246** | **0.0006** | **0.0250** |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cobalt | 7440-48-4 | 0.001 | mg/L | **0.004** | **0.005** | **0.004** | **0.002** | **0.004** |
| Copper | 7440-50-8 | 0.001 | mg/L | **0.006** | **0.005** | **0.005** | **0.001** | **0.004** |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | 7439-96-5 | 0.001 | mg/L | **1.22** | **0.577** | **1.23** | **0.098** | **1.22** |
| Molybdenum | 7439-98-7 | 0.001 | mg/L | **0.057** | **0.060** | **0.057** | **0.065** | **0.056** |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.022** | **0.004** | **0.022** | **0.002** | **0.022** |
| Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Uranium | 7440-61-1 | 0.001 | mg/L | **0.006** | **0.008** | **0.006** | **0.008** | **0.006** |
| 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 | **1.14** | **0.138** | **1.17** | **0.075** | **1.17** |
| Boron | 7440-42-8 | 0.05 | mg/L | **0.06** | **0.07** | **0.06** | **0.07** | **0.05** |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | **2.42** | **0.05** | <0.05 | <0.05 |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | <0.00004 | <0.00004 | <0.00004 |
| **EG035T: Total Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | <0.00004 | <0.00004 | <0.00004 |
| **EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS** | | | | | | | | |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS - Continued** | | | | | | | | |
| Uranium | 7440-61-1 | 0.05 | µg/L | **6.51** | **10.4** | ---- | ---- | ---- |
| Vanadium | 7440-62-2 | 0.2 | µg/L | **0.2** | **0.6** | ---- | ---- | ---- |
| Zinc | 7440-66-6 | 1 | µg/L | **1140** | **129** | ---- | ---- | ---- |
| **EG094T: Total metals in Fresh water by ORC-ICPMS** | | | | | | | | |
| Uranium | 7440-61-1 | 0.05 | µg/L | **6.65** | **9.70** | ---- | ---- | ---- |
| Vanadium | 7440-62-2 | 0.2 | µg/L | <0.2 | **0.6** | ---- | ---- | ---- |
| Zinc | 7440-66-6 | 1 | µg/L | **1220** | **111** | ---- | ---- | ---- |
| **EK025SF: Free CN by Segmented Flow Analyser** | | | | | | | | |
| Free Cyanide | ---- | 0.004 | mg/L | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 |
| **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 | **3.0** | **4.3** | **3.0** | **4.5** | **3.0** |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | ---- | ---- | **0.21** | **0.52** | **0.20** |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 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 | ---- | ---- | **5.14** | **0.41** | **5.08** |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | ---- | ---- | **5.15** | **0.41** | **5.09** |
| **EK060G:Organic Nitrogen as N (TKN-NH3) By Discrete Analyser** | | | | | | | | |
| Organic Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | <0.5 | **0.8** | <0.5 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | <0.5 | **1.3** | <0.5 |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | ---- | ---- | **5.2** | **1.7** | **5.1** |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | ---- | ---- | <0.05 | **0.09** | <0.05 |
| **EK255A: Ammonia** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.005 | mg/L | **0.146** | **0.646** | ---- | ---- | ---- |
| **EK257A: Nitrite** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 0.002 | mg/L | **0.012** | **0.005** | ---- | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **EK258A: Nitrate** | | | | | | | | |
| Nitrate as N | 14797-55-8 | 0.002 | mg/L | 3.51 | 0.451 | ---- | ---- | ---- |
| **EK259A: Nitrite and Nitrate (NOx)** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.002 | mg/L | 3.52 | 0.456 | ---- | ---- | ---- |
| **EK260A: Organic Nitrogen** | | | | | | | | |
| Organic Nitrogen as N | ---- | 0.01 | mg/L | 9.43 | 5.86 | ---- | ---- | ---- |
| **EK261A: Total Kjeldahl Nitrogen** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.01 | mg/L | 9.58 | 6.50 | ---- | ---- | ---- |
| **EK262A: Total Nitrogen** | | | | | | | | |
| Total Nitrogen as N | ---- | 0.01 | mg/L | 13.1 | 6.96 | ---- | ---- | ---- |
| **EK267A: Total Phosphorus (Persulfate Digestion)** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.005 | mg/L | 0.031 | 0.016 | ---- | ---- | ---- |
| **EK271A: Reactive Phosphorus** | | | | | | | | |
| Reactive Phosphorus as P | 14265-44-2 | 0.001 | mg/L | 0.008 | 0.020 | ---- | ---- | ---- |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | 34.3 | 57.2 | 31.7 | 57.4 | 32.4 |
| Total Cations | ---- | 0.01 | meq/L | 38.4 | 62.1 | 38.2 | 66.7 | 36.4 |
| Ionic Balance | ---- | 0.01 | % | 5.72 | 4.13 | 9.32 | 7.50 | 5.72 |
| **EP002: Dissolved Organic Carbon (DOC)** | | | | | | | | |
| Dissolved Organic Carbon | ---- | 1 | mg/L | 2 | 3 | 2 | 3 | <1 |
| **EP005: Total Organic Carbon (TOC)** | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | 1 | 3 | 1 | 3 | <1 |
| **EP008: Chlorophyll a & Pheophytin a** | | | | | | | | |
| Chlorophyll a | ---- | 1 | mg/m³ | ---- | ---- | <1 | <1 | <1 |
| **MW024: Bacillariophytes (Diatoms) - Centrales** | | | | | | | | |
| Acanthoceras spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Aulacoseira spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chaetoceros spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Coscinodiscus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyclotella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Melosira spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rhizosolenia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Skeletonema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Thalassioseira spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Bacillariophytes (Diatoms) - Centrales - Continued** | | | | | | | | |
| Urosolenia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other centrics | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Thalassiosira spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Bacillariophytes (Diatoms) - Pennales** | | | | | | | | |
| Achnanthidium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Amphora spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Asterionella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Bacillaria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Bacillariophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cocconeis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cylindrotheca closterium | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cymbella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Diatoma spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Entomoneis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Eunotia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Fragilaria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gomphonema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gyrosigma spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Hantzschia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Navicula spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Nitzschia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pinnularia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pseudonitzschia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rhoicosphenia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rhopalodia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Surirella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Synedra spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Tabellaria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Bacillariophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other pennates | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Bacillariophytes (Diatoms) - TOTAL BACILLARIOPHYTES** | | | | | | | | |
| Total Bacillariophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Chaetophorales** | | | | | | | | |
| Chaetophora spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Chlorophytes (Green Algae) - Chaetophorales - Continued** | | | | | | | | |
| Stigeoclonium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Chlorococcales** | | | | | | | | |
| Actinastrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Ankistrodesmus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Ankyra spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Botryococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chlorella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Closteridium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Closteriopsis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Coelastrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Crucigenia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cylindrocapsa spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dictyosphaerium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Didymocystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dimorphococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Elakatothrix spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Golenkenia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Hydrodictyon spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Kirchneriella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Lagerheimia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Micractinium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microspora spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Monoraphidium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Nephrocytium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Oocystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Palmella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pediastrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Quadrigula spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Scenedesmus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Schroederia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Selenastrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Selenodictyum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Sphaerocystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Tetradesmus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Tetraedron spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Chlorophytes (Green Algae) - Chlorococcales - Continued** | | | | | | | | |
| Tetrastrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Treubaria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Crucigeniella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dichotomochoccus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Westella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Cladophorales** | | | | | | | | |
| Cladophora spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rhizoclonium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Oedogoniales** | | | | | | | | |
| Bulbochaete spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Oedogonium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Tetrasporales** | | | | | | | | |
| Gloeocystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Tetraspora spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - TOTAL CHLOROPHYTES** | | | | | | | | |
| Total Chlorophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Ulotrichales** | | | | | | | | |
| Planktonema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Ulothrix spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Planctonema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Koliella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Volvocales** | | | | | | | | |
| Carteria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chlamydomonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chlorogonium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Eudorina spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gonium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Haematococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pandorina spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Phacotus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pleodorina spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pteromonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Spermatozoopsis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Sphaerellopsis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Chlorophytes (Green Algae) - Volvocales - Continued** | | | | | | | | |
| Tetraselmis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Volvox spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Green algae | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pyramimonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chlorophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other green cells | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other green filaments | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Stichococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chlorophytes (Green Algae) - Zygnematales** | | | | | | | | |
| Actinotaenium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Closterium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cosmarium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cosmocladium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Desmidium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Euastrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gonatozygon spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Hyalotheca spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Micrasterias spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Mougeotia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Netrium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Penium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pleurotaenium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Sirogonium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Sphaerozosma spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Spirogyra spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Spondylosium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Staurastrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Straurodesmus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Tellingia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Triploceras spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Xanthidium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Zygnema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Haplotaenium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chrysophytes (Golden Algae)** | | | | | | | | |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Chrysophytes (Golden Algae) - Continued** | | | | | | | | |
| Centritractus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chrysophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chrysochromulina spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Diceras spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dinobryon spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Epipyxis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Isthmochloron spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Mallomonas akrokomos | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Mallomonas splendidum | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Mallomonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Synura spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Tribonema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Uroglena spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Golden algae | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Chrysophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Chrysophytes (Golden Algae) - TOTAL CHRYSOPHYTES** | | | | | | | | |
| Total Chrysophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Cyanophytes (Blue Green Algae) - Chroococcales** | | | | | | | | |
| Aphanothece spp. <2 µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Aphanothece spp. >2 µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| cf. Synechococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| cf. Synechocystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Coelomoron spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Coelosphaerium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chroococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chroococcus minimus | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chroococcus minutus | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyanocatena imperfecta | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyanocatena planctonica | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyanocatena spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyanodictyon spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyanogranis libera | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyanonephron spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cyanothece spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Chroococcales - Continued** | | | | | | | | |
| Eucapsis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gloeocapsa spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gloeothece spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gomphosphaeria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Limnococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Merismopedia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Merismopedia danubiana | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Merismopedia marsonii | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Merismopedia punctata | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Merismopedia tenuissima | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microcystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microcystis aeruginosa (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microcystis cf. aeruginosa (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microcystis botrys | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microcystis flos-aquae | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microcystis wesenbergii | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Myxobaktron cf. spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Myxobaktron spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pannus punctiferus | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Picoplanktic Chroococcales (<2µm) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rhabdoderma spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rhabdogloea spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Radiocystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Snowella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Synechococcus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Synechocystis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Woronichinia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Large Chroococcales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Chroococcales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Chroococcales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Total Chroococcales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Aphanocapsa spp. < 2µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Aphanocapsa spp. > 2µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Cyanophytes (Blue Green Algae) - Nostocales** | | | | | | | | |
| Anabaena spp. (coiled) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Nostocales - Continued** | | | | | | | | |
| Anabaena spp. (straight) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dolichospermum crassum | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Anabaena torulosa | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Aphanizomenon spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Aphanizomenon gracile | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cuspidothrix issatschenkoi | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cylindrospermopsis raciborskii (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cylindrospermopsis cf. raciborskii (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cylindrospermum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gloeotrichia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Nodularia spumigena (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Nodularia cf. spumigena (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Nostoc linckia (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Nostoc cf. linckia (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Nostoc spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Raphidiopsis mediterranea (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Raphidiopsis cf. mediterranea (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rivularia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Sphaerospermopsis aphanizomenoides | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Nostocales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Total Nostocales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Anabaenopsis spp. (sphere) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Anabaenopsis spp. (cylinder) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dolichospermum circinale (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dolichospermum cf. circinale (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chrysosporum bergii | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chrysosporum ovalisporum (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Chrysosporum cf. ovalisporum (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dolichospermum smithii | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dolichospermum planctonicum | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dolichospermum spp. (straight) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Dolichospermum spp. (coiled) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Nostocales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Nostocales (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Cyanophytes (Blue Green Algae) - Oscillatoriales** | | | | | | | | |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Oscillatoriales - Continued** | | | | | | | | |
| Arthrospira spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Geitlerinema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Komvophoron spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Leptolyngbya spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Limnothrix spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Lyngbya spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Lyngbya wollei (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Lyngbya cf. wollei (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Oscillatoria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Planktolyngbya minor | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Planktolyngbya limnetica | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Planktolyngbya microspira | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pseudanabaena spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pseudanabaena galeata | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pseudanabaena limnetica | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Pseudanabaena mucicola | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Plectonema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Romeria spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Spirulina spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Trichodesmium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Tychonema spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Oscillatoriales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Total Oscillatoriales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Phormidium spp. <5 µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Phormidium spp. >5 µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Planktothrix spp. <5 µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Planktothrix spp. >5 µm | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Fischerella sp. (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Geitlerinema splendidum | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Glaucospira spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Limnothrix spp. (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Microseira wollei (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Phormidium aff. amoenum (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Phormidium aff. formosum (PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Phormidium spp. <5µm (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Oscillatoriales - Continued** | | | | | | | | |
| Phormidium spp. >5µm (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Planktolyngbya spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Oscillatoriales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Oscillatoriales (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Cyanophytes (Blue Green Algae) - Other Cyanophytes** | | | | | | | | |
| Other Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Cyanophytes (Blue Green Algae) - Stigonematales** | | | | | | | | |
| Nostochopsis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Total Stigonematales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Stigonmetales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Stigonematales | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Cyanophytes (Blue Green Algae) - TOTAL CYANOPHYTES** | | | | | | | | |
| Total Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Cyanophytes (Blue Green Algae) - TOTAL POTENTIALLY TOXIC CYANOPHYTES** | | | | | | | | |
| Total Potentially Toxic Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Flagellates - Cryptophytes** | | | | | | | | |
| Chroomonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Cryptomonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Rhodomonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Flagellates | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Cryptophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Flagellates | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Flagellates - Euglenophytes** | | | | | | | | |
| Encysted Euglenophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Euglena spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Eutreptia spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Lepocinclis spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Phacus spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Strombomonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Trachelomonas spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Flagellates - Pyrrophytes** | | | | | | | | |
| Ceratium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Encysted Dinium | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Pit 1 | Pit 2 | Eldridge Ramp | Wises Ramp | Eldridge 0m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-001 | ET1802030-002 | ET1802030-003 | ET1802030-004 | ET1802030-005 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Flagellates - Pyrrophytes - Continued** | | | | | | | | |
| Glenodinium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gonyaulax spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gymnodinium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Gyrodinium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Katodinium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Peridinium spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Prorocentrum minimum | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Prorocentrum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Dinoflagellates | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Unidentified Dinoflagellates | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Scrippsiella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Scerpsiella spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Flagellates - TOTAL FLAGELLATES** | | | | | | | | |
| Total Flagellates | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Raphidophyte** | | | | | | | | |
| Gonyostomum spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Heterosigma spp. | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Raphidophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| Other Raphidophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024: Raphidophyte - TOTAL RAPHIDOPHYTE** | | | | | | | | |
| Total Raphidophytes | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |
| **MW024T: TOTAL ALGAE** | | | | | | | | |
| Total Algae Count | ---- | 5 | cells/ml | ---- | ---- | ---- | ---- | <5 |

## Analytical Results

Sub-Matrix: WATER (Matrix: WATER)

| Compound | CAS Number | LOR | Unit | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| Client sampling date / time | | | | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| | | | | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 7.59 | 7.59 | 7.60 | 7.55 | 7.54 |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 3100 | 3130 | 3120 | 3120 | 3100 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | <5 | <5 | <5 | <5 | <5 |
| **EA045: Turbidity** | | | | | | | | |
| Turbidity | ---- | 0.1 | NTU | 0.3 | 0.4 | 0.3 | 0.3 | 0.3 |
| **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 | 44 | 44 | 43 | 43 | 45 |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 44 | 44 | 43 | 43 | 45 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 1580 | 1350 | 1440 | 1530 | 1350 |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 93 | 96 | 93 | 93 | 93 |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 316 | 321 | 313 | 314 | 321 |
| Magnesium | 7439-95-4 | 1 | mg/L | 93 | 94 | 93 | 92 | 93 |
| Sodium | 7440-23-5 | 1 | mg/L | 297 | 297 | 298 | 295 | 295 |
| Potassium | 7440-09-7 | 1 | mg/L | 46 | 47 | 46 | 46 | 46 |
| **ED093F: SAR and Hardness Calculations** | | | | | | | | |
| Total Hardness as CaCO3 | ---- | 1 | mg/L | 1170 | 1190 | 1160 | 1160 | 1180 |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | 0.02 | 0.03 | 0.02 | 0.02 | 0.03 |
| Arsenic | 7440-38-2 | 0.001 | mg/L | 0.026 | 0.027 | 0.027 | 0.027 | 0.028 |
| Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Barium | 7440-39-3 | 0.001 | mg/L | 0.038 | 0.038 | 0.038 | 0.038 | 0.039 |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0238 | 0.0234 | 0.0234 | 0.0238 | 0.0237 |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cobalt | 7440-48-4 | 0.001 | mg/L | 0.005 | 0.005 | 0.005 | 0.004 | 0.005 |
| Copper | 7440-50-8 | 0.001 | mg/L | 0.003 | 0.003 | 0.003 | 0.003 | 0.003 |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | 0.002 | <0.001 | <0.001 | <0.001 |
| Manganese | 7439-96-5 | 0.001 | mg/L | 1.22 | 1.23 | 1.22 | 1.22 | 1.23 |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| *Compound* | *CAS Number* | *LOR* | *Unit* | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **EG020F: Dissolved Metals by ICP-MS - Continued** | | | | | | | | |
| Molybdenum | 7439-98-7 | 0.001 | mg/L | **0.051** | **0.049** | **0.048** | **0.050** | **0.050** |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.024** | **0.025** | **0.024** | **0.024** | **0.025** |
| Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Uranium | 7440-61-1 | 0.001 | mg/L | **0.006** | **0.006** | **0.006** | **0.006** | **0.006** |
| 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 | **1.22** | **1.21** | **1.21** | **1.21** | **1.24** |
| Boron | 7440-42-8 | 0.05 | mg/L | **0.07** | **0.06** | **0.06** | **0.06** | **0.06** |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | **0.04** | **0.04** | **0.04** | **0.04** | **0.04** |
| Arsenic | 7440-38-2 | 0.001 | mg/L | **0.029** | **0.029** | **0.029** | **0.030** | **0.029** |
| Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Barium | 7440-39-3 | 0.001 | mg/L | **0.036** | **0.035** | **0.034** | **0.036** | **0.035** |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | **0.0254** | **0.0252** | **0.0254** | **0.0259** | **0.0258** |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Cobalt | 7440-48-4 | 0.001 | mg/L | **0.004** | **0.004** | **0.004** | **0.004** | **0.004** |
| Copper | 7440-50-8 | 0.001 | mg/L | **0.004** | **0.004** | **0.004** | **0.004** | **0.004** |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Manganese | 7439-96-5 | 0.001 | mg/L | **1.25** | **1.26** | **1.26** | **1.30** | **1.29** |
| Molybdenum | 7439-98-7 | 0.001 | mg/L | **0.057** | **0.056** | **0.057** | **0.058** | **0.058** |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.022** | **0.023** | **0.023** | **0.023** | **0.024** |
| Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | <0.01 | <0.01 |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | <0.001 | <0.001 |
| Uranium | 7440-61-1 | 0.001 | mg/L | **0.006** | **0.006** | **0.006** | **0.006** | **0.006** |
| 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 | **1.20** | **1.19** | **1.20** | **1.23** | **1.24** |
| Boron | 7440-42-8 | 0.05 | mg/L | **0.05** | **0.05** | **0.05** | **0.05** | **0.05** |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | <0.00004 | <0.00004 | <0.00004 |
| **EG035T: Total Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | <0.00004 | <0.00004 | <0.00004 |
| **EK025SF: Free CN by Segmented Flow Analyser** | | | | | | | | |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **EK025SF: Free CN by Segmented Flow Analyser - Continued** | | | | | | | | |
| Free Cyanide | ---- | 0.004 | mg/L | <0.004 | <0.004 | <0.004 | <0.004 | <0.004 |
| **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 | **3.0** | **2.9** | **2.9** | **3.0** | **3.0** |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | **0.22** | **0.21** | **0.19** | **0.18** | **0.21** |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 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 | **5.02** | **5.01** | **5.02** | **4.96** | **4.99** |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | **5.02** | **5.01** | **5.02** | **4.96** | **4.99** |
| **EK060G:Organic Nitrogen as N (TKN-NH3) By Discrete Analyser** | | | | | | | | |
| Organic Nitrogen as N | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | <0.5 | <0.5 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | **0.5** | <0.5 |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | **5.0** | **5.0** | **5.0** | **5.5** | **5.0** |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | <0.05 | <0.05 | <0.05 | <0.05 | <0.05 |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | **36.4** | **31.7** | **33.5** | **35.3** | **31.6** |
| Total Cations | ---- | 0.01 | meq/L | **37.5** | **37.9** | **37.4** | **37.2** | **37.7** |
| Ionic Balance | ---- | 0.01 | % | **1.51** | **8.88** | **5.57** | **2.63** | **8.73** |
| **EP002: Dissolved Organic Carbon (DOC)** | | | | | | | | |
| Dissolved Organic Carbon | ---- | 1 | mg/L | <1 | <1 | <1 | **1** | **1** |
| **EP005: Total Organic Carbon (TOC)** | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | <1 | <1 | <1 | **1** | **1** |
| **EP008: Chlorophyll a & Pheophytin a** | | | | | | | | |
| Chlorophyll a | ---- | 1 | mg/m³ | ---- | ---- | <1 | ---- | ---- |
| **MW024: Bacillariophytes (Diatoms) - Centrales** | | | | | | | | |
| Acanthoceras spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Bacillariophytes (Diatoms) - Centrales - Continued** | | | | | | | | |
| Aulacoseira spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chaetoceros spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Coscinodiscus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cyclotella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Melosira spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rhizosolenia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Skeletonema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Thalassioseira spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Urosolenia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other centrics | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Thalassiosira spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Bacillariophytes (Diatoms) - Pennales** | | | | | | | | |
| Achnanthidium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Amphora spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Asterionella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Bacillaria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Bacillariophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cocconeis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cylindrotheca closterium | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cymbella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Diatoma spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Entomoneis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Eunotia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Fragilaria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gomphonema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gyrosigma spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Hantzschia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Navicula spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Nitzschia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pinnularia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pseudonitzschia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rhoicosphenia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rhopalodia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Surirella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Synedra spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Bacillariophytes (Diatoms) - Pennales - Continued** | | | | | | | | |
| Tabellaria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Bacillariophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other pennates | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Bacillariophytes (Diatoms) - TOTAL BACILLARIOPHYTES** | | | | | | | | |
| Total Bacillariophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Chaetophorales** | | | | | | | | |
| Chaetophora spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Stigeoclonium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Chlorococcales** | | | | | | | | |
| Actinastrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Ankistrodesmus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Ankyra spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Botryococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chlorella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Closteridium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Closteriopsis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Coelastrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Crucigenia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cylindrocapsa spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dictyosphaerium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Didymocystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dimorphococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Elakatothrix spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Golenkenia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Hydrodictyon spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Kirchneriella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Lagerheimia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Micractinium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microspora spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Monoraphidium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Nephrocytium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Oocystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Palmella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pediastrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Chlorophytes (Green Algae) - Chlorococcales - Continued** | | | | | | | | |
| Quadrigula spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Scenedesmus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Schroederia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Selenastrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Selenodictyum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Sphaerocystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tetradesmus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tetraedron spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tetrastrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Treubaria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Crucigeniella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dichotomochoccus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Westella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Cladophorales** | | | | | | | | |
| Cladophora spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rhizoclonium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Oedogoniales** | | | | | | | | |
| Bulbochaete spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Oedogonium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Tetrasporales** | | | | | | | | |
| Gloeocystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tetraspora spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - TOTAL CHLOROPHYTES** | | | | | | | | |
| Total Chlorophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Ulotrichales** | | | | | | | | |
| Planktonema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Ulothrix spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Planctonema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Koliella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Volvocales** | | | | | | | | |
| Carteria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chlamydomonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chlorogonium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Eudorina spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Chlorophytes (Green Algae) - Volvocales - Continued** | | | | | | | | |
| Gonium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Haematococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pandorina spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phacotus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pleodorina spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pteromonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Spermatozoopsis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Sphaerellopsis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tetraselmis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Volvox spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Green algae | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pyramimonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chlorophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other green cells | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other green filaments | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Stichococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chlorophytes (Green Algae) - Zygnematales** | | | | | | | | |
| Actinotaenium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Closterium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cosmarium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cosmocladium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Desmidium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Euastrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gonatozygon spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Hyalotheca spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Micrasterias spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Mougeotia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Netrium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Penium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pleurotaenium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Sirogonium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Sphaerozosma spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Spirogyra spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Spondylosium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Staurastrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Chlorophytes (Green Algae) - Zygnematales - Continued** | | | | | | | | |
| Staurodesmus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tellingia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Triploceras spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Xanthidium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Zygnema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Haplotaenium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chrysophytes (Golden Algae)** | | | | | | | | |
| Centritractus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chrysophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chrysochromulina spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Diceras spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dinobryon spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Epipyxis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Isthmochloron spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Mallomonas akrokomos | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Mallomonas splendidum | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Mallomonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Synura spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tribonema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Uroglena spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Golden algae | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Chrysophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Chrysophytes (Golden Algae) - TOTAL CHRYSOPHYTES** | | | | | | | | |
| Total Chrysophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Cyanophytes (Blue Green Algae) - Chroococcales** | | | | | | | | |
| Aphanothece spp. <2 µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Aphanothece spp. >2 µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| cf. Synechococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| cf. Synechocystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Coelomoron spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Coelosphaerium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chroococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chroococcus minimus | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chroococcus minutus | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Chroococcales - Continued** | | | | | | | | |
| Cyanocatena imperfecta | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cyanocatena planctonica | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cyanocatena spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cyanodictyon spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cyanogranis libera | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cyanonephron spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cyanothece spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Eucapsis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gloeocapsa spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gloeothece spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gomphosphaeria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Limnococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Merismopedia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Merismopedia danubiana | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Merismopedia marsonii | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Merismopedia punctata | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Merismopedia tenuissima | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microcystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microcystis aeruginosa (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microcystis cf. aeruginosa (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microcystis botrys | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microcystis flos-aquae | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microcystis wesenbergii | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Myxobaktron cf. spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Myxobaktron spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pannus punctiferus | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Picoplanktic Chroococcales (<2µm) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rhabdoderma spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rhabdogloea spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Radiocystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Snowella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Synechococcus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Synechocystis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Woronichinia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Large Chroococcales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Chroococcales - Continued** | | | | | | | | |
| Other Chroococcales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Chroococcales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Total Chroococcales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Aphanocapsa spp. < 2µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Aphanocapsa spp. > 2µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Cyanophytes (Blue Green Algae) - Nostocales** | | | | | | | | |
| Anabaena spp. (coiled) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Anabaena spp. (straight) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dolichospermum crassum | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Anabaena torulosa | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Aphanizomenon spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Aphanizomenon gracile | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cuspidothrix issatschenkoi | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cylindrospermopsis raciborskii (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cylindrospermopsis cf. raciborskii (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cylindrospermum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gloeotrichia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Nodularia spumigena (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Nodularia cf. spumigena (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Nostoc linckia (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Nostoc cf. linckia (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Nostoc spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Raphidiopsis mediterranea (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Raphidiopsis cf. mediterranea (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rivularia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Sphaerospermopsis aphanizomenoides | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Nostocales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Total Nostocales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Anabaenopsis spp. (sphere) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Anabaenopsis spp. (cylinder) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dolichospermum circinale (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dolichospermum cf. circinale (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chrysosporum bergii | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chrysosporum ovalisporum (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Chrysosporum cf. ovalisporum (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Nostocales - Continued** | | | | | | | | |
| Dolichospermum smithii | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dolichospermum planctonicum | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dolichospermum spp. (straight) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Dolichospermum spp. (coiled) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Nostocales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Nostocales (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Cyanophytes (Blue Green Algae) - Oscillatoriales** | | | | | | | | |
| Arthrospira spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Geitlerinema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Komvophoron spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Leptolyngbya spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Limnothrix spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Lyngbya spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Lyngbya wollei (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Lyngbya cf. wollei (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Oscillatoria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Planktolyngbya minor | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Planktolyngbya limnetica | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Planktolyngbya microspira | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pseudanabaena spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pseudanabaena galeata | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pseudanabaena limnetica | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Pseudanabaena mucicola | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Plectonema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Romeria spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Spirulina spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Trichodesmium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Tychonema spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Oscillatoriales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Total Oscillatoriales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phormidium spp. <5 µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phormidium spp. >5 µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Planktothrix spp. <5 µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Planktothrix spp. >5 µm | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Fischerella sp. (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Cyanophytes (Blue Green Algae) - Oscillatoriales - Continued** | | | | | | | | |
| Geitlerinema splendidum | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Glaucospira spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Limnothrix spp. (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Microseira wollei (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phormidium aff. amoenum (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phormidium aff. formosum (PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phormidium spp. <5µm (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phormidium spp. >5µm (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Planktolyngbya spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Oscillatoriales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Oscillatoriales (possible PTP) | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Cyanophytes (Blue Green Algae) - Other Cyanophytes** | | | | | | | | |
| Other Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Cyanophytes (Blue Green Algae) - Stigonematales** | | | | | | | | |
| Nostochopsis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Total Stigonematales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Stigonmetales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Stigonematales | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Cyanophytes (Blue Green Algae) - TOTAL CYANOPHYTES** | | | | | | | | |
| Total Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Cyanophytes (Blue Green Algae) - TOTAL POTENTIALLY TOXIC CYANOPHYTES** | | | | | | | | |
| Total Potentially Toxic Cyanophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Flagellates - Cryptophytes** | | | | | | | | |
| Chroomonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Cryptomonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Rhodomonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Flagellates | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Cryptophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Flagellates | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Flagellates - Euglenophytes** | | | | | | | | |
| Encysted Euglenophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Euglena spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Eutreptia spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 10m | Eldridge 20m | Eldridge 30m | Eldridge 50m | Eldridge 100m |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 |
| Compound | CAS Number | LOR | Unit | ET1802030-006 | ET1802030-007 | ET1802030-008 | ET1802030-009 | ET1802030-010 |
| | | | | Result | Result | Result | Result | Result |
| **MW024: Flagellates - Euglenophytes - Continued** | | | | | | | | |
| Lepocinclis spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Phacus spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Strombomonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Trachelomonas spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Flagellates - Pyrrophytes** | | | | | | | | |
| Ceratium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Encysted Dinium | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Glenodinium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gonyaulax spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gymnodinium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Gyrodinium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Katodinium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Peridinium spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Prorocentrum minimum | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Prorocentrum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Dinoflagellates | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Unidentified Dinoflagellates | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Scrippsiella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Scerpsiella spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Flagellates - TOTAL FLAGELLATES** | | | | | | | | |
| Total Flagellates | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Raphidophyte** | | | | | | | | |
| Gonyostomum spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Heterosigma spp. | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Raphidophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| Other Raphidophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024: Raphidophyte - TOTAL RAPHIDOPHYTE** | | | | | | | | |
| Total Raphidophytes | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |
| **MW024T: TOTAL ALGAE** | | | | | | | | |
| Total Algae Count | ---- | 5 | cells/ml | ---- | ---- | <5 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 150m | Eldridge 200m | Eldridge Bottom | ---- | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | ---- | ---- |
| Compound | CAS Number | LOR | Unit | ET1802030-011 | ET1802030-012 | ET1802030-013 | -------- | -------- |
| | | | | Result | Result | Result | ---- | ---- |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| pH Value | ---- | 0.01 | pH Unit | 7.55 | 7.53 | 7.50 | ---- | ---- |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 3100 | 3120 | 3100 | ---- | ---- |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| Suspended Solids (SS) | ---- | 5 | mg/L | <5 | 16 | 6 | ---- | ---- |
| **EA045: Turbidity** | | | | | | | | |
| Turbidity | ---- | 0.1 | NTU | 0.4 | 6.1 | 0.4 | ---- | ---- |
| **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 | 43 | 44 | 44 | ---- | ---- |
| Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 43 | 44 | 44 | ---- | ---- |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | | |
| Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 1350 | 1460 | 1350 | ---- | ---- |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | | |
| Chloride | 16887-00-6 | 1 | mg/L | 94 | 93 | 94 | ---- | ---- |
| **ED093F: Dissolved Major Cations** | | | | | | | | |
| Calcium | 7440-70-2 | 1 | mg/L | 321 | 314 | 316 | ---- | ---- |
| Magnesium | 7439-95-4 | 1 | mg/L | 94 | 94 | 93 | ---- | ---- |
| Sodium | 7440-23-5 | 1 | mg/L | 300 | 299 | 300 | ---- | ---- |
| Potassium | 7440-09-7 | 1 | mg/L | 47 | 46 | 46 | ---- | ---- |
| **ED093F: SAR and Hardness Calculations** | | | | | | | | |
| Total Hardness as CaCO3 | ---- | 1 | mg/L | 1190 | 1170 | 1170 | ---- | ---- |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | 0.03 | 0.03 | 0.03 | ---- | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | 0.027 | 0.027 | 0.027 | ---- | ---- |
| Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Barium | 7440-39-3 | 0.001 | mg/L | 0.038 | 0.038 | 0.038 | ---- | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0233 | 0.0236 | 0.0241 | ---- | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Cobalt | 7440-48-4 | 0.001 | mg/L | 0.005 | 0.005 | 0.005 | ---- | ---- |
| Copper | 7440-50-8 | 0.001 | mg/L | 0.003 | 0.004 | 0.003 | ---- | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Manganese | 7439-96-5 | 0.001 | mg/L | 1.24 | 1.23 | 1.24 | ---- | ---- |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 150m | Eldridge 200m | Eldridge Bottom | ---- | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | ---- | ---- |
| Compound | CAS Number | LOR | Unit | ET1802030-011 | ET1802030-012 | ET1802030-013 | -------- | -------- |
| | | | | Result | Result | Result | ---- | ---- |
| **EG020F: Dissolved Metals by ICP-MS - Continued** | | | | | | | | |
| Molybdenum | 7439-98-7 | 0.001 | mg/L | **0.050** | **0.049** | **0.051** | ---- | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.024** | **0.024** | **0.024** | ---- | ---- |
| Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | ---- | ---- |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Uranium | 7440-61-1 | 0.001 | mg/L | **0.006** | **0.006** | **0.006** | ---- | ---- |
| Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | ---- | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | **1.23** | **1.23** | **1.23** | ---- | ---- |
| Boron | 7440-42-8 | 0.05 | mg/L | **0.06** | **0.06** | **0.06** | ---- | ---- |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | <0.05 | ---- | ---- |
| **EG020T: Total Metals by ICP-MS** | | | | | | | | |
| Aluminium | 7429-90-5 | 0.01 | mg/L | **0.04** | **0.25** | **0.04** | ---- | ---- |
| Arsenic | 7440-38-2 | 0.001 | mg/L | **0.029** | **0.032** | **0.029** | ---- | ---- |
| Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Barium | 7440-39-3 | 0.001 | mg/L | **0.035** | **0.038** | **0.036** | ---- | ---- |
| Cadmium | 7440-43-9 | 0.0001 | mg/L | **0.0251** | **0.0260** | **0.0256** | ---- | ---- |
| Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Cobalt | 7440-48-4 | 0.001 | mg/L | **0.004** | **0.005** | **0.004** | ---- | ---- |
| Copper | 7440-50-8 | 0.001 | mg/L | **0.004** | **0.008** | **0.004** | ---- | ---- |
| Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Manganese | 7439-96-5 | 0.001 | mg/L | **1.26** | **1.30** | **1.27** | ---- | ---- |
| Molybdenum | 7439-98-7 | 0.001 | mg/L | **0.058** | **0.058** | **0.058** | ---- | ---- |
| Nickel | 7440-02-0 | 0.001 | mg/L | **0.023** | **0.024** | **0.022** | ---- | ---- |
| Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | ---- | ---- |
| Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | <0.001 | ---- | ---- |
| Uranium | 7440-61-1 | 0.001 | mg/L | **0.006** | **0.006** | **0.006** | ---- | ---- |
| Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | <0.01 | <0.01 | ---- | ---- |
| Zinc | 7440-66-6 | 0.005 | mg/L | **1.21** | **1.26** | **1.20** | ---- | ---- |
| Boron | 7440-42-8 | 0.05 | mg/L | **0.05** | **0.05** | **0.05** | ---- | ---- |
| Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | **0.23** | <0.05 | ---- | ---- |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | <0.00004 | ---- | ---- |
| **EG035T: Total Mercury by FIMS** | | | | | | | | |
| Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | <0.00004 | ---- | ---- |
| **EK025SF: Free CN by Segmented Flow Analyser** | | | | | | | | |

## Analytical Results

| Sub-Matrix: WATER (Matrix: WATER) | | | Client sample ID | Eldridge 150m | Eldridge 200m | Eldridge Bottom | ---- | ---- |
|---|---|---|---|---|---|---|---|---|
| | | | Client sampling date / time | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | 07-Aug-2018 00:00 | ---- | ---- |
| Compound | CAS Number | LOR | Unit | ET1802030-011 | ET1802030-012 | ET1802030-013 | -------- | -------- |
| | | | | Result | Result | Result | ---- | ---- |
| **EK025SF: Free CN by Segmented Flow Analyser - Continued** | | | | | | | | |
| Free Cyanide | ---- | 0.004 | mg/L | <0.004 | <0.004 | <0.004 | ---- | ---- |
| **EK026SF: Total CN by Segmented Flow Analyser** | | | | | | | | |
| Total Cyanide | 57-12-5 | 0.004 | mg/L | <0.004 | <0.004 | <0.004 | ---- | ---- |
| **EK040P: Fluoride by PC Titrator** | | | | | | | | |
| Fluoride | 16984-48-8 | 0.1 | mg/L | **2.9** | **2.9** | **2.9** | ---- | ---- |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | | |
| Ammonia as N | 7664-41-7 | 0.01 | mg/L | **0.20** | **0.21** | **0.18** | ---- | ---- |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | | |
| Nitrite as N | 14797-65-0 | 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 | **5.01** | **5.00** | **4.98** | ---- | ---- |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | | |
| Nitrite + Nitrate as N | ---- | 0.01 | mg/L | **5.01** | **5.00** | **4.98** | ---- | ---- |
| **EK060G:Organic Nitrogen as N (TKN-NH3) By Discrete Analyser** | | | | | | | | |
| Organic Nitrogen as N | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | ---- | ---- |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | <0.5 | <0.5 | <0.5 | ---- | ---- |
| **EK062G: Total Nitrogen as N (TKN + NOx) by Discrete Analyser** | | | | | | | | |
| ^ Total Nitrogen as N | ---- | 0.1 | mg/L | **5.0** | **5.0** | **5.0** | ---- | ---- |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| Total Phosphorus as P | ---- | 0.01 | mg/L | <0.05 | <0.05 | <0.05 | ---- | ---- |
| **EN055: Ionic Balance** | | | | | | | | |
| Total Anions | ---- | 0.01 | meq/L | **31.6** | **33.9** | **31.6** | ---- | ---- |
| Total Cations | ---- | 0.01 | meq/L | **38.0** | **37.6** | **37.6** | ---- | ---- |
| Ionic Balance | ---- | 0.01 | % | **9.17** | **5.16** | **8.67** | ---- | ---- |
| **EP002: Dissolved Organic Carbon (DOC)** | | | | | | | | |
| Dissolved Organic Carbon | ---- | 1 | mg/L | **1** | **1** | **1** | ---- | ---- |
| **EP005: Total Organic Carbon (TOC)** | | | | | | | | |
| Total Organic Carbon | ---- | 1 | mg/L | **1** | <1 | **1** | ---- | ---- |

# QUALITY CONTROL REPORT

| | | | | | |
|---|---|---|---|---|---|
| **Work Order** | : **ET1802030** | | Page | : 1 of 16 | |
| Client | : **GENEX POWER LTD** | | Laboratory | : Environmental Division Townsville | |
| Contact | : A M | | Contact | : Customer Services ET | |
| Address | : Level 11, 2 Bligh Street, Sydney NSW 2000 PO Box R514, Royal Exchange, NSW 1225<br>Sydney NSW 2000 | | Address | : 13 Carlton Street, Kirwan Townsville QLD Australia 4814 | |
| Telephone | : +61 02 9993 4443 | | Telephone | : +61 7 4773 0000 | |
| Project | : Kidston | | Date Samples Received | : 08-Aug-2018 | |
| Order number | : | | Date Analysis Commenced | : 09-Aug-2018 | |
| C-O-C number | : ---- | | Issue Date | : 20-Aug-2018 | |
| Sampler | : JOHN LAWLER | | | | |
| Site | : ---- | | | | |
| Quote number | : EN/222/17 | | | | |
| No. of samples received | : 13 | | | | |
| No. of samples analysed | : 13 | | | | |

Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

## *Signatories*

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

| *Signatories* | *Position* | *Accreditation Category* |
|---|---|---|
| Diana Mesa | 2IC Organic Chemist | Brisbane Organics, Stafford, QLD |
| Greg Vogel | Laboratory Manager | Brisbane Inorganics, Stafford, QLD |
| Hannah Beazley | | Brisbane Microbiological, Stafford, QLD |
| Kim McCabe | | Townsville Inorganics, Townsville, QLD |
| Kim McCabe | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Kim McCabe | Senior Inorganic Chemist | WB Water Lab Brisbane, Stafford, QLD |
| Mark Hallas | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Tom Maloney | | Townsville Inorganics, Townsville, QLD |
| Tom Maloney | Senior Inorganic Chemist | Brisbane Inorganics, Stafford, QLD |
| Tom Maloney | Senior Inorganic Chemist | WB Water Lab Brisbane, Stafford, QLD |

## 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

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
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
RPD = Relative Percentage Difference
# = Indicates failed QC

## Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QWI-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: **WATER**

| | | | | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *Laboratory sample ID* | *Client sample ID* | *Method: Compound* | *CAS Number* | *LOR* | *Unit* | *Original Result* | *Duplicate Result* | *RPD (%)* | *Recovery Limits (%)* |
| **EA005P: pH by PC Titrator (QC Lot: 1861927)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EA005-P: pH Value | ---- | 0.01 | pH Unit | 7.74 | 7.72 | 0.259 | 0% - 20% |
| ET1802030-011 | Eldridge 150m | EA005-P: pH Value | ---- | 0.01 | pH Unit | 7.55 | 7.52 | 0.398 | 0% - 20% |
| **EA010P: Conductivity by PC Titrator (QC Lot: 1861928)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EA010-P: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 3180 | 3140 | 1.26 | 0% - 20% |
| ET1802030-011 | Eldridge 150m | EA010-P: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | 3100 | 3110 | 0.322 | 0% - 20% |
| **EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1861949)** | | | | | | | | | |
| ET1802012-001 | Anonymous | EA025H: Suspended Solids (SS) | ---- | 5 | mg/L | <5 | <5 | 0.00 | No Limit |
| ET1802030-001 | Pit 1 | EA025H: Suspended Solids (SS) | ---- | 5 | mg/L | <5 | <5 | 0.00 | No Limit |
| **EA025: Total Suspended Solids dried at 104 ± 2°C (QC Lot: 1861950)** | | | | | | | | | |
| ET1802030-011 | Eldridge 150m | EA025H: Suspended Solids (SS) | ---- | 5 | mg/L | <5 | <5 | 0.00 | No Limit |
| **EA045: Turbidity (QC Lot: 1861964)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EA045: Turbidity | ---- | 0.1 | NTU | 0.5 | 0.5 | 0.00 | No Limit |
| ET1802030-011 | Eldridge 150m | EA045: Turbidity | ---- | 0.1 | NTU | 0.4 | 0.4 | 0.00 | No Limit |
| **ED037P: Alkalinity by PC Titrator (QC Lot: 1861926)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | ED037-P: Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | 0.00 | No Limit |
| | | ED037-P: Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | 0.00 | No Limit |
| | | ED037-P: Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 44 | 46 | 4.54 | 0% - 20% |
| | | ED037-P: Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 44 | 46 | 4.54 | 0% - 20% |
| ET1802030-011 | Eldridge 150m | ED037-P: Hydroxide Alkalinity as CaCO3 | DMO-210-001 | 1 | mg/L | <1 | <1 | 0.00 | No Limit |
| | | ED037-P: Carbonate Alkalinity as CaCO3 | 3812-32-6 | 1 | mg/L | <1 | <1 | 0.00 | No Limit |
| | | ED037-P: Bicarbonate Alkalinity as CaCO3 | 71-52-3 | 1 | mg/L | 43 | 45 | 3.99 | 0% - 20% |
| | | ED037-P: Total Alkalinity as CaCO3 | ---- | 1 | mg/L | 43 | 45 | 3.99 | 0% - 20% |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1861937)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | ED041G: Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 1480 | 1370 | 7.45 | 0% - 20% |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Recovery Limits (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Laboratory Duplicate (DUP) Report | | | | | |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QC Lot: 1861937) - continued** | | | | | | | | | |
| ET1802030-011 | Eldridge 150m | ED041G: Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | 1350 | 1330 | 1.29 | 0% - 20% |
| **ED045G: Chloride by Discrete Analyser (QC Lot: 1861938)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | ED045G: Chloride | 16887-00-6 | 1 | mg/L | 92 | 95 | 2.63 | 0% - 20% |
| ET1802030-011 | Eldridge 150m | ED045G: Chloride | 16887-00-6 | 1 | mg/L | 94 | 93 | 0.00 | 0% - 20% |
| **ED093F: Dissolved Major Cations (QC Lot: 1867612)** | | | | | | | | | |
| EB1819443-019 | Anonymous | ED093F: Calcium | 7440-70-2 | 1 | mg/L | 23 | 23 | 0.00 | 0% - 20% |
| | | ED093F: Magnesium | 7439-95-4 | 1 | mg/L | 24 | 24 | 0.00 | 0% - 20% |
| | | ED093F: Sodium | 7440-23-5 | 1 | mg/L | 68 | 68 | 0.00 | 0% - 20% |
| | | ED093F: Potassium | 7440-09-7 | 1 | mg/L | 6 | 6 | 0.00 | No Limit |
| ET1802030-005 | Eldridge 0m | ED093F: Calcium | 7440-70-2 | 1 | mg/L | 305 | 320 | 5.01 | 0% - 20% |
| | | ED093F: Magnesium | 7439-95-4 | 1 | mg/L | 91 | 94 | 3.64 | 0% - 20% |
| | | ED093F: Sodium | 7440-23-5 | 1 | mg/L | 288 | 300 | 4.29 | 0% - 20% |
| | | ED093F: Potassium | 7440-09-7 | 1 | mg/L | 45 | 47 | 4.58 | 0% - 20% |
| **ED093F: Dissolved Major Cations (QC Lot: 1867613)** | | | | | | | | | |
| ET1802030-007 | Eldridge 20m | ED093F: Calcium | 7440-70-2 | 1 | mg/L | 321 | 316 | 1.52 | 0% - 20% |
| | | ED093F: Magnesium | 7439-95-4 | 1 | mg/L | 94 | 93 | 0.00 | 0% - 20% |
| | | ED093F: Sodium | 7440-23-5 | 1 | mg/L | 297 | 297 | 0.00 | 0% - 20% |
| | | ED093F: Potassium | 7440-09-7 | 1 | mg/L | 47 | 46 | 0.00 | 0% - 20% |
| **EG020F: Dissolved Metals by ICP-MS (QC Lot: 1867608)** | | | | | | | | | |
| ET1802030-005 | Eldridge 0m | EG020B-F: Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020B-F: Uranium | 7440-61-1 | 0.001 | mg/L | 0.006 | 0.006 | 0.00 | No Limit |
| EB1819443-006 | Anonymous | EG020B-F: Silver | 7440-22-4 | 0.001 | mg/L | <1 µg/L | <0.001 | 0.00 | No Limit |
| | | EG020B-F: Uranium | 7440-61-1 | 0.001 | mg/L | <1 µg/L | <0.001 | 0.00 | No Limit |
| **EG020F: Dissolved Metals by ICP-MS (QC Lot: 1867611)** | | | | | | | | | |
| ET1802030-005 | Eldridge 0m | EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0227 | 0.0243 | 6.85 | 0% - 20% |
| | | EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | 0.026 | 0.028 | 8.10 | 0% - 20% |
| | | EG020A-F: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Barium | 7440-39-3 | 0.001 | mg/L | 0.038 | 0.039 | 0.00 | 0% - 20% |
| | | EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Cobalt | 7440-48-4 | 0.001 | mg/L | 0.004 | 0.005 | 0.00 | No Limit |
| | | EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | 0.002 | 0.002 | 0.00 | No Limit |
| | | EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Manganese | 7439-96-5 | 0.001 | mg/L | 1.17 | 1.22 | 4.19 | 0% - 20% |
| | | EG020A-F: Molybdenum | 7439-98-7 | 0.001 | mg/L | 0.052 | 0.050 | 3.47 | 0% - 20% |
| | | EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | 0.022 | 0.024 | 5.41 | 0% - 20% |
| | | EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | 1.16 | 1.20 | 2.82 | 0% - 20% |
| | | EG020A-F: Aluminium | 7429-90-5 | 0.01 | mg/L | 0.02 | 0.02 | 0.00 | No Limit |
| | | EG020A-F: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-F: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Recovery Limits (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Laboratory Duplicate (DUP) Report | | | | | |
| **EG020F: Dissolved Metals by ICP-MS (QC Lot: 1867611) - continued** | | | | | | | | | |
| ET1802030-005 | Eldridge 0m | EG020A-F: Boron | 7440-42-8 | 0.05 | mg/L | 0.07 | 0.06 | 0.00 | No Limit |
| | | EG020A-F: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | 0.00 | No Limit |
| EB1819443-006 | Anonymous | EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.1 µg/L | <0.0001 | 0.00 | No Limit |
| | | EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | 3 µg/L | 0.003 | 0.00 | No Limit |
| | | EG020A-F: Beryllium | 7440-41-7 | 0.001 | mg/L | <1 µg/L | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Barium | 7440-39-3 | 0.001 | mg/L | 142 µg/L | 0.141 | 1.04 | 0% - 20% |
| | | EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <1 µg/L | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Cobalt | 7440-48-4 | 0.001 | mg/L | <1 µg/L | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | 2 µg/L | 0.002 | 0.00 | No Limit |
| | | EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | <1 µg/L | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Manganese | 7439-96-5 | 0.001 | mg/L | 141 µg/L | 0.140 | 0.00 | 0% - 20% |
| | | EG020A-F: Molybdenum | 7439-98-7 | 0.001 | mg/L | 2 µg/L | 0.002 | 0.00 | No Limit |
| | | EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | 4 µg/L | 0.004 | 0.00 | No Limit |
| | | EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | <5 µg/L | <0.005 | 0.00 | No Limit |
| | | EG020A-F: Aluminium | 7429-90-5 | 0.01 | mg/L | <10 µg/L | <0.01 | 0.00 | No Limit |
| | | EG020A-F: Selenium | 7782-49-2 | 0.01 | mg/L | <10 µg/L | <0.01 | 0.00 | No Limit |
| | | EG020A-F: Vanadium | 7440-62-2 | 0.01 | mg/L | <10 µg/L | <0.01 | 0.00 | No Limit |
| | | EG020A-F: Boron | 7440-42-8 | 0.05 | mg/L | 130 µg/L | 0.13 | 0.00 | No Limit |
| | | EG020A-F: Iron | 7439-89-6 | 0.05 | mg/L | <50 µg/L | <0.05 | 0.00 | No Limit |
| **EG020F: Dissolved Metals by ICP-MS (QC Lot: 1867614)** | | | | | | | | | |
| ET1802030-012 | Eldridge 200m | EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0236 | 0.0242 | 2.42 | 0% - 20% |
| | | EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | 0.027 | 0.028 | 4.09 | 0% - 20% |
| | | EG020A-F: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Barium | 7440-39-3 | 0.001 | mg/L | 0.038 | 0.038 | 0.00 | 0% - 20% |
| | | EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Cobalt | 7440-48-4 | 0.001 | mg/L | 0.005 | 0.004 | 0.00 | No Limit |
| | | EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | 0.004 | 0.004 | 0.00 | No Limit |
| | | EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-F: Manganese | 7439-96-5 | 0.001 | mg/L | 1.23 | 1.25 | 1.52 | 0% - 20% |
| | | EG020A-F: Molybdenum | 7439-98-7 | 0.001 | mg/L | 0.049 | 0.051 | 2.99 | 0% - 20% |
| | | EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | 0.024 | 0.025 | 4.21 | 0% - 20% |
| | | EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | 1.23 | 1.23 | 0.180 | 0% - 20% |
| | | EG020A-F: Aluminium | 7429-90-5 | 0.01 | mg/L | 0.03 | 0.03 | 0.00 | No Limit |
| | | EG020A-F: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-F: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-F: Boron | 7440-42-8 | 0.05 | mg/L | 0.06 | 0.06 | 0.00 | No Limit |
| | | EG020A-F: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | 0.00 | No Limit |
| **EG020T: Total Metals by ICP-MS (QC Lot: 1867926)** | | | | | | | | | |
| ET1802030-008 | Eldridge 30m | EG020B-T: Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020B-T: Uranium | 7440-61-1 | 0.001 | mg/L | 0.006 | 0.006 | 0.00 | No Limit |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Recovery Limits (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Laboratory Duplicate (DUP) Report | | | | | |
| **EG020T: Total Metals by ICP-MS (QC Lot: 1867926) - continued** | | | | | | | | | |
| EB1819267-001 | Anonymous | EG020B-T: Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020B-T: Uranium | 7440-61-1 | 0.001 | mg/L | 0.020 | 0.021 | 0.00 | 0% - 50% |
| **EG020T: Total Metals by ICP-MS (QC Lot: 1867928)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EG020A-T: Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0243 | 0.0250 | 2.74 | 0% - 20% |
| | | EG020A-T: Arsenic | 7440-38-2 | 0.001 | mg/L | 0.030 | 0.031 | 0.00 | 0% - 20% |
| | | EG020A-T: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Barium | 7440-39-3 | 0.001 | mg/L | 0.035 | 0.036 | 0.00 | 0% - 20% |
| | | EG020A-T: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Cobalt | 7440-48-4 | 0.001 | mg/L | 0.004 | 0.004 | 0.00 | No Limit |
| | | EG020A-T: Copper | 7440-50-8 | 0.001 | mg/L | 0.006 | 0.005 | 0.00 | No Limit |
| | | EG020A-T: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Manganese | 7439-96-5 | 0.001 | mg/L | 1.22 | 1.25 | 1.83 | 0% - 20% |
| | | EG020A-T: Molybdenum | 7439-98-7 | 0.001 | mg/L | 0.057 | 0.057 | 0.00 | 0% - 20% |
| | | EG020A-T: Nickel | 7440-02-0 | 0.001 | mg/L | 0.022 | 0.022 | 0.00 | 0% - 20% |
| | | EG020A-T: Zinc | 7440-66-6 | 0.005 | mg/L | 1.14 | 1.17 | 1.90 | 0% - 20% |
| | | EG020A-T: Aluminium | 7429-90-5 | 0.01 | mg/L | 0.07 | 0.06 | 0.00 | No Limit |
| | | EG020A-T: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-T: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-T: Boron | 7440-42-8 | 0.05 | mg/L | 0.06 | 0.06 | 0.00 | No Limit |
| | | EG020A-T: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | 0.00 | No Limit |
| EB1819267-001 | Anonymous | EG020A-T: Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0001 | <0.0001 | 0.00 | No Limit |
| | | EG020A-T: Arsenic | 7440-38-2 | 0.001 | mg/L | 0.004 | 0.004 | 0.00 | No Limit |
| | | EG020A-T: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Barium | 7440-39-3 | 0.001 | mg/L | 0.192 | 0.174 | 10.2 | 0% - 20% |
| | | EG020A-T: Chromium | 7440-47-3 | 0.001 | mg/L | 0.010 | 0.010 | 0.00 | 0% - 50% |
| | | EG020A-T: Cobalt | 7440-48-4 | 0.001 | mg/L | 0.006 | 0.006 | 0.00 | No Limit |
| | | EG020A-T: Copper | 7440-50-8 | 0.001 | mg/L | 0.014 | 0.012 | 10.1 | 0% - 50% |
| | | EG020A-T: Lead | 7439-92-1 | 0.001 | mg/L | 0.010 | 0.010 | 0.00 | No Limit |
| | | EG020A-T: Manganese | 7439-96-5 | 0.001 | mg/L | 1.09 | 1.07 | 2.10 | 0% - 20% |
| | | EG020A-T: Molybdenum | 7439-98-7 | 0.001 | mg/L | 0.025 | 0.025 | 0.00 | 0% - 20% |
| | | EG020A-T: Nickel | 7440-02-0 | 0.001 | mg/L | 0.013 | 0.013 | 0.00 | 0% - 50% |
| | | EG020A-T: Zinc | 7440-66-6 | 0.005 | mg/L | 0.076 | 0.074 | 1.61 | 0% - 50% |
| | | EG020A-T: Aluminium | 7429-90-5 | 0.01 | mg/L | 13.5 | 11.2 | 18.5 | 0% - 20% |
| | | EG020A-T: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-T: Vanadium | 7440-62-2 | 0.01 | mg/L | 0.02 | 0.02 | 0.00 | No Limit |
| | | EG020A-T: Boron | 7440-42-8 | 0.05 | mg/L | 0.98 | 0.97 | 1.03 | 0% - 50% |
| | | EG020A-T: Iron | 7439-89-6 | 0.05 | mg/L | 26.6 | 24.5 | 8.06 | 0% - 20% |
| **EG020T: Total Metals by ICP-MS (QC Lot: 1867930)** | | | | | | | | | |
| ET1802030-008 | Eldridge 30m | EG020A-T: Cadmium | 7440-43-9 | 0.0001 | mg/L | 0.0254 | 0.0247 | 2.70 | 0% - 20% |
| | | EG020A-T: Arsenic | 7440-38-2 | 0.001 | mg/L | 0.029 | 0.028 | 0.00 | 0% - 20% |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Recovery Limits (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Laboratory Duplicate (DUP) Report | | | | | |
| **EG020T: Total Metals by ICP-MS (QC Lot: 1867930) - continued** | | | | | | | | | |
| ET1802030-008 | Eldridge 30m | EG020A-T: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Barium | 7440-39-3 | 0.001 | mg/L | 0.034 | 0.035 | 0.00 | 0% - 20% |
| | | EG020A-T: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Cobalt | 7440-48-4 | 0.001 | mg/L | 0.004 | 0.004 | 0.00 | No Limit |
| | | EG020A-T: Copper | 7440-50-8 | 0.001 | mg/L | 0.004 | 0.004 | 0.00 | No Limit |
| | | EG020A-T: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Manganese | 7439-96-5 | 0.001 | mg/L | 1.26 | 1.26 | 0.215 | 0% - 20% |
| | | EG020A-T: Molybdenum | 7439-98-7 | 0.001 | mg/L | 0.057 | 0.057 | 0.00 | 0% - 20% |
| | | EG020A-T: Nickel | 7440-02-0 | 0.001 | mg/L | 0.023 | 0.023 | 0.00 | 0% - 20% |
| | | EG020A-T: Zinc | 7440-66-6 | 0.005 | mg/L | 1.20 | 1.18 | 1.80 | 0% - 20% |
| | | EG020A-T: Aluminium | 7429-90-5 | 0.01 | mg/L | 0.04 | 0.04 | 0.00 | No Limit |
| | | EG020A-T: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-T: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-T: Boron | 7440-42-8 | 0.05 | mg/L | 0.05 | 0.05 | 0.00 | No Limit |
| | | EG020A-T: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | <0.05 | 0.00 | No Limit |
| ET1802039-002 | Anonymous | EG020A-T: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | <0.0001 | 0.00 | No Limit |
| | | EG020A-T: Arsenic | 7440-38-2 | 0.001 | mg/L | 0.103 | 0.106 | 3.16 | 0% - 20% |
| | | EG020A-T: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Barium | 7440-39-3 | 0.001 | mg/L | 0.143 | 0.145 | 1.21 | 0% - 20% |
| | | EG020A-T: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Cobalt | 7440-48-4 | 0.001 | mg/L | 0.002 | 0.002 | 0.00 | No Limit |
| | | EG020A-T: Copper | 7440-50-8 | 0.001 | mg/L | 0.002 | 0.003 | 0.00 | No Limit |
| | | EG020A-T: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Manganese | 7439-96-5 | 0.001 | mg/L | 3.58 | 4.20 | 15.9 | 0% - 20% |
| | | EG020A-T: Molybdenum | 7439-98-7 | 0.001 | mg/L | 0.003 | 0.004 | 0.00 | No Limit |
| | | EG020A-T: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | <0.001 | 0.00 | No Limit |
| | | EG020A-T: Zinc | 7440-66-6 | 0.005 | mg/L | 0.006 | 0.008 | 18.8 | No Limit |
| | | EG020A-T: Aluminium | 7429-90-5 | 0.01 | mg/L | 0.34 | 0.30 | 11.6 | 0% - 20% |
| | | EG020A-T: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-T: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| | | EG020A-T: Boron | 7440-42-8 | 0.05 | mg/L | 0.07 | 0.07 | 0.00 | No Limit |
| | | EG020A-T: Iron | 7439-89-6 | 0.05 | mg/L | 0.56 | 0.80 | 35.5 | 0% - 50% |
| **EG035F: Dissolved Mercury by FIMS (QC Lot: 1867972)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EG035F-LL: Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | 0.00 | No Limit |
| ET1802030-011 | Eldridge 150m | EG035F-LL: Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | 0.00 | No Limit |
| **EG035T: Total Mercury by FIMS (QC Lot: 1867932)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EG035T-LL: Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | 0.00 | No Limit |
| ET1802030-011 | Eldridge 150m | EG035T-LL: Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | <0.00004 | 0.00 | No Limit |
| **EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 1867922)** | | | | | | | | | |
| EB1819443-007 | Anonymous | EG094A-F: Uranium | 7440-61-1 | 0.05 | µg/L | 0.97 | 0.95 | 1.46 | 0% - 50% |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Recovery Limits (%) |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Laboratory Duplicate (DUP) Report | | | | | |
| **EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QC Lot: 1867922) - continued** | | | | | | | | | |
| EB1819443-007 | Anonymous | EG094A-F: Vanadium | 7440-62-2 | 0.2 | µg/L | 1.5 | 1.5 | 0.00 | No Limit |
| | | EG094A-F: Zinc | 7440-66-6 | 1 | µg/L | <1 | <1 | 0.00 | No Limit |
| **EG094T: Total metals in Fresh water by ORC-ICPMS (QC Lot: 1867872)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EG094A-T: Uranium | 7440-61-1 | 0.05 | µg/L | 6.65 | 6.58 | 1.000 | 0% - 20% |
| | | EG094A-T: Vanadium | 7440-62-2 | 0.2 | µg/L | <0.2 | <0.2 | 0.00 | No Limit |
| | | EG094A-T: Zinc | 7440-66-6 | 1 | µg/L | 1220 | 1170 | 3.88 | 0% - 20% |
| EB1819301-001 | Anonymous | EG094A-T: Uranium | 7440-61-1 | 0.05 | µg/L | <0.05 | <0.05 | 0.00 | No Limit |
| | | EG094A-T: Vanadium | 7440-62-2 | 0.2 | µg/L | 0.8 | 0.8 | 0.00 | No Limit |
| | | EG094A-T: Zinc | 7440-66-6 | 1 | µg/L | 2 | 1 | 0.00 | No Limit |
| **EK025SF: Free CN by Segmented Flow Analyser (QC Lot: 1867079)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK025SF: Free Cyanide | ---- | 0.004 | mg/L | <0.004 | <0.004 | 0.00 | No Limit |
| ET1802030-011 | Eldridge 150m | EK025SF: Free Cyanide | ---- | 0.004 | mg/L | <0.004 | <0.004 | 0.00 | No Limit |
| **EK026SF: Total CN by Segmented Flow Analyser (QC Lot: 1867080)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK026SF: Total Cyanide | 57-12-5 | 0.004 | mg/L | <0.004 | <0.004 | 0.00 | No Limit |
| ET1802030-011 | Eldridge 150m | EK026SF: Total Cyanide | 57-12-5 | 0.004 | mg/L | <0.004 | <0.004 | 0.00 | No Limit |
| **EK040P: Fluoride by PC Titrator (QC Lot: 1861925)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK040P: Fluoride | 16984-48-8 | 0.1 | mg/L | 3.0 | 3.0 | 0.00 | 0% - 20% |
| ET1802030-011 | Eldridge 150m | EK040P: Fluoride | 16984-48-8 | 0.1 | mg/L | 2.9 | 3.0 | 0.00 | 0% - 20% |
| **EK055G: Ammonia as N by Discrete Analyser (QC Lot: 1861954)** | | | | | | | | | |
| ET1802024-001 | Anonymous | EK055G: Ammonia as N | 7664-41-7 | 0.01 | mg/L | 0.07 | <0.01 | 151 | No Limit |
| ET1802030-010 | Eldridge 100m | EK055G: Ammonia as N | 7664-41-7 | 0.01 | mg/L | 0.21 | 0.20 | 0.00 | 0% - 20% |
| **EK057G: Nitrite as N by Discrete Analyser (QC Lot: 1861939)** | | | | | | | | | |
| ET1802030-003 | Eldridge Ramp | EK057G: Nitrite as N | 14797-65-0 | 0.01 | mg/L | 0.01 | 0.01 | 0.00 | No Limit |
| ET1802030-013 | Eldridge Bottom | EK057G: Nitrite as N | 14797-65-0 | 0.01 | mg/L | <0.01 | <0.01 | 0.00 | No Limit |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QC Lot: 1861955)** | | | | | | | | | |
| ET1802024-001 | Anonymous | EK059G: Nitrite + Nitrate as N | ---- | 0.01 | mg/L | 1.49 | 1.48 | 0.00 | 0% - 20% |
| ET1802030-010 | Eldridge 100m | EK059G: Nitrite + Nitrate as N | ---- | 0.01 | mg/L | 4.99 | 4.97 | 0.484 | 0% - 20% |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QC Lot: 1867737)** | | | | | | | | | |
| EB1819424-001 | Anonymous | EK061G: Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | 0.3 | 0.3 | 0.00 | No Limit |
| ET1802030-008 | Eldridge 30m | EK061G: Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | <0.5 | <0.5 | 0.00 | No Limit |
| **EK067G: Total Phosphorus as P by Discrete Analyser (QC Lot: 1867736)** | | | | | | | | | |
| EB1819418-001 | Anonymous | EK067G: Total Phosphorus as P | ---- | 0.01 | mg/L | 0.16 | 0.14 | 16.5 | No Limit |
| ET1802030-008 | Eldridge 30m | EK067G: Total Phosphorus as P | ---- | 0.01 | mg/L | <0.05 | <0.05 | 0.00 | No Limit |
| **EK255A: Ammonia (QC Lot: 1862336)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK255A-CM: Ammonia as N | 7664-41-7 | 0.005 | mg/L | 0.146 | 0.167 | 13.5 | No Limit |
| **EK257A: Nitrite (QC Lot: 1862337)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK257A-CM: Nitrite as N | 14797-65-0 | 0.002 | mg/L | 0.012 | 0.012 | 0.00 | No Limit |
| **EK259A: Nitrite and Nitrate (NOx) (QC Lot: 1862335)** | | | | | | | | | |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | Laboratory Duplicate (DUP) Report | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | LOR | Unit | Original Result | Duplicate Result | RPD (%) | Recovery Limits (%) |
| **EK259A: Nitrite and Nitrate (NOx) (QC Lot: 1862335) - continued** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK259A-CM: Nitrite + Nitrate as N | ---- | 0.002 | mg/L | 3.52 | 3.47 | 1.63 | 0% - 20% |
| **EK262A: Total Nitrogen (QC Lot: 1864421)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK262PA-CM: Total Nitrogen as N | ---- | 0.01 | mg/L | 13.1 | 13.0 | 0.922 | 0% - 20% |
| **EK267A: Total Phosphorus (Persulfate Digestion) (QC Lot: 1864422)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK267PA-CM: Total Phosphorus as P | ---- | 0.005 | mg/L | 0.031 | 0.018 | 51.4 | No Limit |
| **EK271A: Reactive Phosphorus (QC Lot: 1862338)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EK271A-CM: Reactive Phosphorus as P | 14265-44-2 | 0.001 | mg/L | 0.008 | 0.011 | 33.4 | No Limit |
| **EP002: Dissolved Organic Carbon (DOC) (QC Lot: 1867840)** | | | | | | | | | |
| ET1802030-003 | Eldridge Ramp | EP002: Dissolved Organic Carbon | ---- | 1 | mg/L | 2 | 1 | 0.00 | No Limit |
| ET1802030-010 | Eldridge 100m | EP002: Dissolved Organic Carbon | ---- | 1 | mg/L | 1 | 1 | 0.00 | No Limit |
| **EP005: Total Organic Carbon (TOC) (QC Lot: 1867837)** | | | | | | | | | |
| ET1802030-001 | Pit 1 | EP005: Total Organic Carbon | ---- | 1 | mg/L | 1 | <1 | 0.00 | No Limit |
| ET1802030-010 | Eldridge 100m | EP005: Total Organic Carbon | ---- | 1 | mg/L | 1 | <1 | 0.00 | No Limit |

## Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: **WATER**

| | | | | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Recovery Limits (%) | |
| Method: Compound | CAS Number | LOR | Unit | Result | Concentration | LCS | Low | High |
| **EA005P: pH by PC Titrator (QCLot: 1861927)** | | | | | | | | |
| EA005-P: pH Value | ---- | ---- | pH Unit | ---- | 4 pH Unit | 101 | 98 | 102 |
| | | | | ---- | 7 pH Unit | 99.6 | 98 | 102 |
| **EA010P: Conductivity by PC Titrator (QCLot: 1861928)** | | | | | | | | |
| EA010-P: Electrical Conductivity @ 25°C | ---- | 1 | µS/cm | <1 | 147 µS/cm | 100 | 91 | 107 |
| | | | | <1 | 12890 µS/cm | 98.9 | 91 | 107 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1861949)** | | | | | | | | |
| EA025H: Suspended Solids (SS) | ---- | 5 | mg/L | <5 | 150 mg/L | 97.3 | 83 | 120 |
| | | | | <5 | 1000 mg/L | 94.8 | 83 | 120 |
| **EA025: Total Suspended Solids dried at 104 ± 2°C (QCLot: 1861950)** | | | | | | | | |
| EA025H: Suspended Solids (SS) | ---- | 5 | mg/L | <5 | 150 mg/L | 100 | 83 | 120 |
| | | | | <5 | 1000 mg/L | 97.4 | 83 | 120 |
| **EA045: Turbidity (QCLot: 1861964)** | | | | | | | | |
| EA045: Turbidity | ---- | 0.1 | NTU | <0.1 | 4 NTU | 100 | 87 | 113 |
| | | | | <0.1 | 40 NTU | 101 | 95 | 105 |
| | | | | <0.1 | 400 NTU | 100 | 97 | 103 |
| **ED037P: Alkalinity by PC Titrator (QCLot: 1861926)** | | | | | | | | |
| ED037-P: Total Alkalinity as CaCO3 | ---- | ---- | mg/L | ---- | 200 mg/L | 89.2 | 87 | 112 |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1861937)** | | | | | | | | |
| ED041G: Sulfate as SO4 - Turbidimetric | 14808-79-8 | 1 | mg/L | <1 | 100 mg/L | 87.7 | 80 | 120 |
| | | | | <1 | 25 mg/L | 114 | 80 | 120 |
| **ED045G: Chloride by Discrete Analyser (QCLot: 1861938)** | | | | | | | | |
| ED045G: Chloride | 16887-00-6 | 1 | mg/L | <1 | 1000 mg/L | 97.0 | 80 | 120 |
| | | | | <1 | 10 mg/L | 89.2 | 80 | 120 |
| **ED093F: Dissolved Major Cations (QCLot: 1867612)** | | | | | | | | |
| ED093F: Calcium | 7440-70-2 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |
| ED093F: Magnesium | 7439-95-4 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |
| ED093F: Sodium | 7440-23-5 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |
| ED093F: Potassium | 7440-09-7 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |
| **ED093F: Dissolved Major Cations (QCLot: 1867613)** | | | | | | | | |
| ED093F: Calcium | 7440-70-2 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |
| ED093F: Magnesium | 7439-95-4 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |
| ED093F: Sodium | 7440-23-5 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |
| ED093F: Potassium | 7440-09-7 | 1 | mg/L | <1 | ---- | ---- | ---- | ---- |

Sub-Matrix: **WATER**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | Result | Concentration | LCS | Low | High |
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 1867608)** | | | | | | | | |
| EG020B-F: Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.0 | 85 | 114 |
| EG020B-F: Uranium | 7440-61-1 | 0.001 | mg/L | <0.001 | ---- | ---- | ---- | ---- |
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 1867611)** | | | | | | | | |
| EG020A-F: Aluminium | 7429-90-5 | 0.01 | mg/L | <0.01 | 0.5 mg/L | 97.1 | 79 | 118 |
| EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 101 | 88 | 116 |
| EG020A-F: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 96.5 | 81 | 117 |
| EG020A-F: Barium | 7440-39-3 | 0.001 | mg/L | <0.001 | 0.5 mg/L | 94.8 | 70 | 130 |
| EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | 0.1 mg/L | 93.8 | 88 | 108 |
| EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.8 | 87 | 113 |
| EG020A-F: Cobalt | 7440-48-4 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 100.0 | 86 | 112 |
| EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | <0.001 | 0.2 mg/L | 106 | 88 | 114 |
| EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.4 | 89 | 110 |
| EG020A-F: Manganese | 7439-96-5 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.7 | 89 | 120 |
| EG020A-F: Molybdenum | 7439-98-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.9 | 89 | 112 |
| EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.7 | 89 | 113 |
| EG020A-F: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 99.0 | 83 | 112 |
| EG020A-F: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 111 | 88 | 114 |
| EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | 0.2 mg/L | 97.5 | 87 | 113 |
| EG020A-F: Boron | 7440-42-8 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 101 | 81 | 125 |
| EG020A-F: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 99.8 | 82 | 114 |
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 1867614)** | | | | | | | | |
| EG020A-F: Aluminium | 7429-90-5 | 0.01 | mg/L | <0.01 | 0.5 mg/L | 96.0 | 79 | 118 |
| EG020A-F: Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 103 | 88 | 116 |
| EG020A-F: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 94.0 | 81 | 117 |
| EG020A-F: Barium | 7440-39-3 | 0.001 | mg/L | <0.001 | 0.5 mg/L | 97.9 | 70 | 130 |
| EG020A-F: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | 0.1 mg/L | 94.2 | 88 | 108 |
| EG020A-F: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 99.7 | 87 | 113 |
| EG020A-F: Cobalt | 7440-48-4 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 99.9 | 86 | 112 |
| EG020A-F: Copper | 7440-50-8 | 0.001 | mg/L | <0.001 | 0.2 mg/L | 108 | 88 | 114 |
| EG020A-F: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 97.3 | 89 | 110 |
| EG020A-F: Manganese | 7439-96-5 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 97.9 | 89 | 120 |
| EG020A-F: Molybdenum | 7439-98-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 96.9 | 89 | 112 |
| EG020A-F: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 102 | 89 | 113 |
| EG020A-F: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 93.9 | 83 | 112 |
| EG020A-F: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 107 | 88 | 114 |
| EG020A-F: Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | 0.2 mg/L | 97.4 | 87 | 113 |
| EG020A-F: Boron | 7440-42-8 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 106 | 81 | 125 |
| EG020A-F: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 100 | 82 | 114 |

Sub-Matrix: **WATER**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | Result | Concentration | LCS | Low | High |
| **EG020T: Total Metals by ICP-MS (QCLot: 1867926)** | | | | | | | | |
| EG020B-T: Silver | 7440-22-4 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 102 | 84 | 117 |
| EG020B-T: Uranium | 7440-61-1 | 0.001 | mg/L | <0.001 | ---- | ---- | ---- | ---- |
| **EG020T: Total Metals by ICP-MS (QCLot: 1867928)** | | | | | | | | |
| EG020A-T: Aluminium | 7429-90-5 | 0.01 | mg/L | <0.01 | 0.5 mg/L | 110 | 80 | 114 |
| EG020A-T: Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 108 | 88 | 112 |
| EG020A-T: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 99.7 | 81 | 119 |
| EG020A-T: Barium | 7440-39-3 | 0.001 | mg/L | <0.001 | 0.5 mg/L | 103 | 70 | 130 |
| EG020A-T: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | 0.1 mg/L | 101 | 88 | 111 |
| EG020A-T: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.3 | 89 | 115 |
| EG020A-T: Cobalt | 7440-48-4 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 99.5 | 89 | 115 |
| EG020A-T: Copper | 7440-50-8 | 0.001 | mg/L | <0.001 | 0.2 mg/L | 98.5 | 88 | 116 |
| EG020A-T: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 103 | 89 | 112 |
| EG020A-T: Manganese | 7439-96-5 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 100 | 88 | 114 |
| EG020A-T: Molybdenum | 7439-98-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 106 | 90 | 114 |
| EG020A-T: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 105 | 88 | 116 |
| EG020A-T: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 101 | 79 | 111 |
| EG020A-T: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 98.2 | 87 | 114 |
| EG020A-T: Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | 0.2 mg/L | 104 | 84 | 114 |
| EG020A-T: Boron | 7440-42-8 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 97.9 | 82 | 128 |
| EG020A-T: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 106 | 82 | 118 |
| **EG020T: Total Metals by ICP-MS (QCLot: 1867930)** | | | | | | | | |
| EG020A-T: Aluminium | 7429-90-5 | 0.01 | mg/L | <0.01 | 0.5 mg/L | 98.5 | 80 | 114 |
| EG020A-T: Arsenic | 7440-38-2 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 99.9 | 88 | 112 |
| EG020A-T: Beryllium | 7440-41-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 92.7 | 81 | 119 |
| EG020A-T: Barium | 7440-39-3 | 0.001 | mg/L | <0.001 | 0.5 mg/L | 104 | 70 | 130 |
| EG020A-T: Cadmium | 7440-43-9 | 0.0001 | mg/L | <0.0001 | 0.1 mg/L | 99.8 | 88 | 111 |
| EG020A-T: Chromium | 7440-47-3 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 89.9 | 89 | 115 |
| EG020A-T: Cobalt | 7440-48-4 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 91.6 | 89 | 115 |
| EG020A-T: Copper | 7440-50-8 | 0.001 | mg/L | <0.001 | 0.2 mg/L | 90.9 | 88 | 116 |
| EG020A-T: Lead | 7439-92-1 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 104 | 89 | 112 |
| EG020A-T: Manganese | 7439-96-5 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 91.9 | 88 | 114 |
| EG020A-T: Molybdenum | 7439-98-7 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 105 | 90 | 114 |
| EG020A-T: Nickel | 7440-02-0 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 110 | 88 | 116 |
| EG020A-T: Selenium | 7782-49-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 90.2 | 79 | 111 |
| EG020A-T: Vanadium | 7440-62-2 | 0.01 | mg/L | <0.01 | 0.1 mg/L | 90.3 | 87 | 114 |
| EG020A-T: Zinc | 7440-66-6 | 0.005 | mg/L | <0.005 | 0.2 mg/L | 94.8 | 84 | 114 |
| EG020A-T: Boron | 7440-42-8 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 87.2 | 82 | 128 |
| EG020A-T: Iron | 7439-89-6 | 0.05 | mg/L | <0.05 | 0.5 mg/L | 97.0 | 82 | 118 |

Sub-Matrix: **WATER**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | Result | Concentration | LCS | Low | High |
| **EG035F: Dissolved Mercury by FIMS (QCLot: 1867972)** | | | | | | | | |
| EG035F-LL: Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | 0.002 mg/L | 112 | 85 | 118 |
| **EG035T: Total Mercury by FIMS (QCLot: 1867932)** | | | | | | | | |
| EG035T-LL: Mercury | 7439-97-6 | 0.00004 | mg/L | <0.00004 | 0.002 mg/L | 95.0 | 84 | 114 |
| **EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 1867922)** | | | | | | | | |
| EG094A-F: Uranium | 7440-61-1 | 0.05 | µg/L | <0.05 | ---- | ---- | ---- | ---- |
| EG094A-F: Vanadium | 7440-62-2 | 0.2 | µg/L | <0.2 | 10 µg/L | 120 | 80 | 120 |
| EG094A-F: Zinc | 7440-66-6 | 1 | µg/L | <1 | 20 µg/L | 99.6 | 80 | 120 |
| **EG094T: Total metals in Fresh water by ORC-ICPMS (QCLot: 1867872)** | | | | | | | | |
| EG094A-T: Uranium | 7440-61-1 | 0.05 | µg/L | <0.05 | ---- | ---- | ---- | ---- |
| EG094A-T: Vanadium | 7440-62-2 | 0.2 | µg/L | <0.2 | 10 µg/L | 102 | 80 | 120 |
| EG094A-T: Zinc | 7440-66-6 | 1 | µg/L | <1 | 20 µg/L | 82.0 | 80 | 120 |
| **EK025SF: Free CN by Segmented Flow Analyser (QCLot: 1867079)** | | | | | | | | |
| EK025SF: Free Cyanide | ---- | 0.004 | mg/L | <0.004 | 0.2 mg/L | 99.1 | 80 | 120 |
| **EK026SF: Total CN by Segmented Flow Analyser (QCLot: 1867080)** | | | | | | | | |
| EK026SF: Total Cyanide | 57-12-5 | 0.004 | mg/L | <0.004 | 0.2 mg/L | 108 | 85 | 119 |
| **EK040P: Fluoride by PC Titrator (QCLot: 1861925)** | | | | | | | | |
| EK040P: Fluoride | 16984-48-8 | 0.1 | mg/L | <0.1 | 5 mg/L | 98.6 | 80 | 120 |
| **EK055G: Ammonia as N by Discrete Analyser (QCLot: 1861954)** | | | | | | | | |
| EK055G: Ammonia as N | 7664-41-7 | 0.01 | mg/L | <0.01 | 0.5 mg/L | 90.5 | 80 | 120 |
| **EK057G: Nitrite as N by Discrete Analyser (QCLot: 1861939)** | | | | | | | | |
| EK057G: Nitrite as N | 14797-65-0 | 0.01 | mg/L | <0.01 | 0.5 mg/L | 108 | 80 | 120 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1861955)** | | | | | | | | |
| EK059G: Nitrite + Nitrate as N | ---- | 0.01 | mg/L | <0.01 | 0.5 mg/L | 92.2 | 89 | 115 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1867737)** | | | | | | | | |
| EK061G: Total Kjeldahl Nitrogen as N | ---- | 0.1 | mg/L | <0.1 | 10 mg/L | 73.7 | 70 | 111 |
| **EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1867736)** | | | | | | | | |
| EK067G: Total Phosphorus as P | ---- | 0.01 | mg/L | <0.01 | 0.442 mg/L | 85.2 | 77 | 109 |
| **EK255A: Ammonia (QCLot: 1862336)** | | | | | | | | |
| EK255A-CM: Ammonia as N | 7664-41-7 | 0.005 | mg/L | <0.005 | 0.1 mg/L | 116 | 80 | 120 |
| **EK257A: Nitrite (QCLot: 1862337)** | | | | | | | | |
| EK257A-CM: Nitrite as N | 14797-65-0 | 0.002 | mg/L | <0.002 | 0.1 mg/L | 104 | 84 | 119 |
| **EK259A: Nitrite and Nitrate (NOx) (QCLot: 1862335)** | | | | | | | | |
| EK259A-CM: Nitrite + Nitrate as N | ---- | 0.002 | mg/L | <0.002 | 0.1 mg/L | 110 | 80 | 120 |
| **EK262A: Total Nitrogen (QCLot: 1864421)** | | | | | | | | |
| EK262PA-CM: Total Nitrogen as N | ---- | 0.01 | mg/L | <0.01 | 1 mg/L | 95.8 | 80 | 120 |
| **EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 1864422)** | | | | | | | | |

Sub-Matrix: **WATER**

| Method: Compound | CAS Number | LOR | Unit | Method Blank (MB) Report | Laboratory Control Spike (LCS) Report | | | |
|---|---|---|---|---|---|---|---|---|
| | | | | | Spike | Spike Recovery (%) | Recovery Limits (%) | |
| | | | | Result | Concentration | LCS | Low | High |
| **EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 1864422) - continued** | | | | | | | | |
| EK267PA-CM: Total Phosphorus as P | ---- | 0.005 | mg/L | <0.005 | 0.42 mg/L | 100 | 80 | 120 |
| **EK271A: Reactive Phosphorus (QCLot: 1862338)** | | | | | | | | |
| EK271A-CM: Reactive Phosphorus as P | 14265-44-2 | 0.001 | mg/L | <0.001 | 0.1 mg/L | 98.2 | 81 | 120 |
| **EP002: Dissolved Organic Carbon (DOC) (QCLot: 1867840)** | | | | | | | | |
| EP002: Dissolved Organic Carbon | ---- | 1 | mg/L | <1 | 10 mg/L | 91.5 | 80 | 112 |
| | | | | <1 | 100 mg/L | 98.1 | 80 | 112 |
| **EP005: Total Organic Carbon (TOC) (QCLot: 1867837)** | | | | | | | | |
| EP005: Total Organic Carbon | ---- | 1 | mg/L | <1 | 10 mg/L | 93.7 | 79 | 113 |
| | | | | <1 | 100 mg/L | 98.9 | 79 | 113 |
| **EP008: Chlorophyll (QCLot: 1862979)** | | | | | | | | |
| EP008: Chlorophyll a | ---- | 1 | $mg/m^3$ | <1 | 12 $mg/m^3$ | 100 | 85 | 123 |

## *Matrix Spike (MS) Report*

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | Matrix Spike (MS) Report | | | |
|---|---|---|---|---|---|---|---|
| | | | | Spike | SpikeRecovery(%) | Recovery Limits (%) | |
| | | | | Concentration | MS | Low | High |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA (QCLot: 1861937)** | | | | | | | |
| ET1802030-002 | Pit 2 | ED041G: Sulfate as SO4 - Turbidimetric | 14808-79-8 | 20 mg/L | # Not Determined | 70 | 130 |
| **ED045G: Chloride by Discrete Analyser (QCLot: 1861938)** | | | | | | | |
| ET1802030-002 | Pit 2 | ED045G: Chloride | 16887-00-6 | 400 mg/L | 93.6 | 70 | 130 |
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 1867611)** | | | | | | | |
| EB1819443-008 | Anonymous | EG020A-F: Aluminium | 7429-90-5 | 0.5 mg/L | 94.8 | 70 | 130 |
| | | EG020A-F: Arsenic | 7440-38-2 | 0.1 mg/L | 98.3 | 70 | 130 |
| | | EG020A-F: Beryllium | 7440-41-7 | 0.1 mg/L | 92.7 | 70 | 130 |
| | | EG020A-F: Barium | 7440-39-3 | 0.5 mg/L | 98.8 | 70 | 130 |
| | | EG020A-F: Cadmium | 7440-43-9 | 0.1 mg/L | 95.8 | 70 | 130 |
| | | EG020A-F: Chromium | 7440-47-3 | 0.1 mg/L | 98.5 | 70 | 130 |
| | | EG020A-F: Cobalt | 7440-48-4 | 0.1 mg/L | 95.1 | 70 | 130 |
| | | EG020A-F: Copper | 7440-50-8 | 0.2 mg/L | 102 | 70 | 130 |
| | | EG020A-F: Lead | 7439-92-1 | 0.1 mg/L | 93.0 | 70 | 130 |
| | | EG020A-F: Manganese | 7439-96-5 | 0.1 mg/L | 93.8 | 70 | 130 |
| | | EG020A-F: Molybdenum | 7439-98-7 | 0.1 mg/L | 93.6 | 70 | 130 |
| | | EG020A-F: Nickel | 7440-02-0 | 0.1 mg/L | 94.1 | 70 | 130 |
| | | EG020A-F: Selenium | 7782-49-2 | 0.1 mg/L | 93.5 | 70 | 130 |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | Matrix Spike (MS) Report: Spike Concentration | SpikeRecovery(%) MS | Recovery Limits (%) Low | Recovery Limits (%) High |
|---|---|---|---|---|---|---|---|
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 1867611) - continued** | | | | | | | |
| EB1819443-008 | Anonymous | EG020A-F: Vanadium | 7440-62-2 | 0.1 mg/L | 88.9 | 70 | 130 |
| | | EG020A-F: Zinc | 7440-66-6 | 0.2 mg/L | 96.4 | 70 | 130 |
| | | EG020A-F: Boron | 7440-42-8 | 0.5 mg/L | 96.8 | 70 | 130 |
| **EG020F: Dissolved Metals by ICP-MS (QCLot: 1867614)** | | | | | | | |
| ET1802030-013 | Eldridge Bottom | EG020A-F: Aluminium | 7429-90-5 | 0.5 mg/L | 90.4 | 70 | 130 |
| | | EG020A-F: Arsenic | 7440-38-2 | 0.1 mg/L | 99.3 | 70 | 130 |
| | | EG020A-F: Beryllium | 7440-41-7 | 0.1 mg/L | 89.0 | 70 | 130 |
| | | EG020A-F: Barium | 7440-39-3 | 0.5 mg/L | 98.2 | 70 | 130 |
| | | EG020A-F: Cadmium | 7440-43-9 | 0.1 mg/L | 94.7 | 70 | 130 |
| | | EG020A-F: Chromium | 7440-47-3 | 0.1 mg/L | 94.3 | 70 | 130 |
| | | EG020A-F: Cobalt | 7440-48-4 | 0.1 mg/L | 94.1 | 70 | 130 |
| | | EG020A-F: Copper | 7440-50-8 | 0.2 mg/L | 99.5 | 70 | 130 |
| | | EG020A-F: Lead | 7439-92-1 | 0.1 mg/L | 95.3 | 70 | 130 |
| | | EG020A-F: Manganese | 7439-96-5 | 0.1 mg/L | # Not Determined | 70 | 130 |
| | | EG020A-F: Molybdenum | 7439-98-7 | 0.1 mg/L | 90.2 | 70 | 130 |
| | | EG020A-F: Nickel | 7440-02-0 | 0.1 mg/L | 91.3 | 70 | 130 |
| | | EG020A-F: Selenium | 7782-49-2 | 0.1 mg/L | 92.6 | 70 | 130 |
| | | EG020A-F: Vanadium | 7440-62-2 | 0.1 mg/L | 88.3 | 70 | 130 |
| | | EG020A-F: Zinc | 7440-66-6 | 0.2 mg/L | # Not Determined | 70 | 130 |
| | | EG020A-F: Boron | 7440-42-8 | 0.5 mg/L | 97.2 | 70 | 130 |
| **EG020T: Total Metals by ICP-MS (QCLot: 1867928)** | | | | | | | |
| EB1819418-001 | Anonymous | EG020A-T: Arsenic | 7440-38-2 | 1 mg/L | 99.1 | 70 | 130 |
| | | EG020A-T: Beryllium | 7440-41-7 | 0.1 mg/L | 101 | 70 | 130 |
| | | EG020A-T: Barium | 7440-39-3 | 1 mg/L | 108 | 70 | 130 |
| | | EG020A-T: Cadmium | 7440-43-9 | 0.5 mg/L | 100 | 70 | 130 |
| | | EG020A-T: Chromium | 7440-47-3 | 1 mg/L | 95.9 | 70 | 130 |
| | | EG020A-T: Cobalt | 7440-48-4 | 1 mg/L | 96.4 | 70 | 130 |
| | | EG020A-T: Copper | 7440-50-8 | 1 mg/L | 93.1 | 70 | 130 |
| | | EG020A-T: Lead | 7439-92-1 | 1 mg/L | 112 | 70 | 130 |
| | | EG020A-T: Manganese | 7439-96-5 | 1 mg/L | 97.0 | 70 | 130 |
| | | EG020A-T: Nickel | 7440-02-0 | 1 mg/L | 88.0 | 70 | 130 |
| | | EG020A-T: Vanadium | 7440-62-2 | 1 mg/L | 96.4 | 70 | 130 |
| | | EG020A-T: Zinc | 7440-66-6 | 1 mg/L | 90.0 | 70 | 130 |
| **EG020T: Total Metals by ICP-MS (QCLot: 1867930)** | | | | | | | |
| ET1802030-009 | Eldridge 50m | EG020A-T: Arsenic | 7440-38-2 | 1 mg/L | 100 | 70 | 130 |
| | | EG020A-T: Beryllium | 7440-41-7 | 0.1 mg/L | 94.6 | 70 | 130 |

Sub-Matrix: **WATER**

| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | Matrix Spike (MS) Report<br>Spike<br>Concentration | SpikeRecovery(%)<br>MS | Recovery Limits (%)<br>Low | High |
|---|---|---|---|---|---|---|---|
| **EG020T: Total Metals by ICP-MS (QCLot: 1867930) - continued** | | | | | | | |
| ET1802030-009 | Eldridge 50m | EG020A-T: Barium | 7440-39-3 | 1 mg/L | 106 | 70 | 130 |
| | | EG020A-T: Cadmium | 7440-43-9 | 0.5 mg/L | 102 | 70 | 130 |
| | | EG020A-T: Chromium | 7440-47-3 | 1 mg/L | 96.4 | 70 | 130 |
| | | EG020A-T: Cobalt | 7440-48-4 | 1 mg/L | 99.6 | 70 | 130 |
| | | EG020A-T: Copper | 7440-50-8 | 1 mg/L | 97.9 | 70 | 130 |
| | | EG020A-T: Lead | 7439-92-1 | 1 mg/L | 116 | 70 | 130 |
| | | EG020A-T: Manganese | 7439-96-5 | 1 mg/L | 96.2 | 70 | 130 |
| | | EG020A-T: Nickel | 7440-02-0 | 1 mg/L | 91.8 | 70 | 130 |
| | | EG020A-T: Vanadium | 7440-62-2 | 1 mg/L | 97.6 | 70 | 130 |
| | | EG020A-T: Zinc | 7440-66-6 | 1 mg/L | 92.4 | 70 | 130 |
| **EG035F: Dissolved Mercury by FIMS (QCLot: 1867972)** | | | | | | | |
| ET1802030-002 | Pit 2 | EG035F-LL: Mercury | 7439-97-6 | 0.002 mg/L | 125 | 70 | 130 |
| **EG035T: Total Mercury by FIMS (QCLot: 1867932)** | | | | | | | |
| ET1802030-002 | Pit 2 | EG035T-LL: Mercury | 7439-97-6 | 0.002 mg/L | 115 | 70 | 130 |
| **EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS (QCLot: 1867922)** | | | | | | | |
| EB1819443-009 | Anonymous | EG094A-F: Vanadium | 7440-62-2 | 50 µg/L | 101 | 70 | 130 |
| | | EG094A-F: Zinc | 7440-66-6 | 100 µg/L | 96.6 | 70 | 130 |
| **EG094T: Total metals in Fresh water by ORC-ICPMS (QCLot: 1867872)** | | | | | | | |
| EB1819301-002 | Anonymous | EG094A-T: Vanadium | 7440-62-2 | 50 µg/L | 90.6 | 70 | 130 |
| | | EG094A-T: Zinc | 7440-66-6 | 100 µg/L | 94.3 | 70 | 130 |
| **EK025SF: Free CN by Segmented Flow Analyser (QCLot: 1867079)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK025SF: Free Cyanide | ---- | 0.4 mg/L | 102 | 70 | 130 |
| **EK026SF: Total CN by Segmented Flow Analyser (QCLot: 1867080)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK026SF: Total Cyanide | 57-12-5 | 0.4 mg/L | 104 | 70 | 130 |
| **EK040P: Fluoride by PC Titrator (QCLot: 1861925)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK040P: Fluoride | 16984-48-8 | 1.92 mg/L | 100 | 80 | 120 |
| **EK055G: Ammonia as N by Discrete Analyser (QCLot: 1861954)** | | | | | | | |
| ET1802024-002 | Anonymous | EK055G: Ammonia as N | 7664-41-7 | 0.4 mg/L | 73.1 | 70 | 130 |
| **EK057G: Nitrite as N by Discrete Analyser (QCLot: 1861939)** | | | | | | | |
| ET1802030-004 | Wises Ramp | EK057G: Nitrite as N | 14797-65-0 | 0.4 mg/L | 120 | 70 | 130 |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser (QCLot: 1861955)** | | | | | | | |
| ET1802024-002 | Anonymous | EK059G: Nitrite + Nitrate as N | ---- | 0.4 mg/L | 70.1 | 70 | 130 |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser (QCLot: 1867737)** | | | | | | | |
| EB1819424-002 | Anonymous | EK061G: Total Kjeldahl Nitrogen as N | ---- | 5 mg/L | 88.5 | 70 | 130 |
| **EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1867736)** | | | | | | | |

Sub-Matrix: **WATER**

| | | | | Matrix Spike (MS) Report | | | |
|---|---|---|---|---|---|---|---|
| | | | | Spike | SpikeRecovery(%) | Recovery Limits (%) | |
| Laboratory sample ID | Client sample ID | Method: Compound | CAS Number | Concentration | MS | Low | High |
| **EK067G: Total Phosphorus as P by Discrete Analyser (QCLot: 1867736) - continued** | | | | | | | |
| EB1819420-003 | Anonymous | EK067G: Total Phosphorus as P | ---- | 1 mg/L | 95.0 | 70 | 130 |
| **EK255A: Ammonia (QCLot: 1862336)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK255A-CM: Ammonia as N | 7664-41-7 | 0.566 mg/L | 130 | 70 | 130 |
| **EK257A: Nitrite (QCLot: 1862337)** | | | | | | | |
| EB1819229-002 | Anonymous | EK257A-CM: Nitrite as N | 14797-65-0 | 0.1 mg/L | 92.1 | 70 | 130 |
| **EK259A: Nitrite and Nitrate (NOx) (QCLot: 1862335)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK259A-CM: Nitrite + Nitrate as N | ---- | 0.566 mg/L | 121 | 70 | 130 |
| **EK262A: Total Nitrogen (QCLot: 1864421)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK262PA-CM: Total Nitrogen as N | ---- | 30 mg/L | 101 | 70 | 130 |
| **EK267A: Total Phosphorus (Persulfate Digestion) (QCLot: 1864422)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK267PA-CM: Total Phosphorus as P | ---- | 1 mg/L | 96.2 | 70 | 130 |
| **EK271A: Reactive Phosphorus (QCLot: 1862338)** | | | | | | | |
| ET1802030-002 | Pit 2 | EK271A-CM: Reactive Phosphorus as P | 14265-44-2 | 0.4 mg/L | 122 | 70 | 130 |
| **EP002: Dissolved Organic Carbon (DOC) (QCLot: 1867840)** | | | | | | | |
| ET1802030-004 | Wises Ramp | EP002: Dissolved Organic Carbon | ---- | 100 mg/L | 98.3 | 70 | 130 |
| **EP005: Total Organic Carbon (TOC) (QCLot: 1867837)** | | | | | | | |
| ET1802030-002 | Pit 2 | EP005: Total Organic Carbon | ---- | 100 mg/L | 98.4 | 70 | 130 |

Environmental

# QA/QC Compliance Assessment to assist with Quality Review

| | | | |
|---|---|---|---|
| **Work Order** | : **ET1802030** | Page | : 1 of 20 |
| Client | : **GENEX POWER LTD** | Laboratory | : Environmental Division Townsville |
| Contact | : A M | Telephone | : +61 7 4773 0000 |
| Project | : Kidston | Date Samples Received | : 08-Aug-2018 |
| Site | : ---- | Issue Date | : 20-Aug-2018 |
| Sampler | : JOHN LAWLER | No. of samples received | : 13 |
| Order number | : | No. of samples analysed | : 13 |

**This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.**

Brief method summaries and references are also provided to assist in traceability.

## *Summary of Outliers*

### *Outliers : Quality Control Samples*

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **Matrix Spike outliers exist - please see following pages for full details.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

### *Outliers : Analysis Holding Time Compliance*

- **Analysis Holding Time Outliers exist - please see following pages for full details.**

### *Outliers : Frequency of Quality Control Samples*

- **NO Quality Control Sample Frequency Outliers exist.**

## Outliers : Quality Control Samples

*Duplicates, Method Blanks, Laboratory Control Samples and Matrix Spikes*

Matrix: **WATER**

| Compound Group Name | Laboratory Sample ID | Client Sample ID | Analyte | CAS Number | Data | Limits | Comment |
|---|---|---|---|---|---|---|---|
| **Matrix Spike (MS) Recoveries** | | | | | | | |
| ED041G: Sulfate (Turbidimetric) as SO4 2- by DA | ET1802030--002 | Pit 2 | **Sulfate as SO4 - Turbidimetric** | 14808-79-8 | Not Determined | ---- | **MS recovery not determined, background level greater than or equal to 4x spike level.** |
| EG020F: Dissolved Metals by ICP-MS | ET1802030--013 | Eldridge Bottom | **Manganese** | 7439-96-5 | Not Determined | ---- | **MS recovery not determined, background level greater than or equal to 4x spike level.** |
| EG020F: Dissolved Metals by ICP-MS | ET1802030--013 | Eldridge Bottom | **Zinc** | 7440-66-6 | Not Determined | ---- | **MS recovery not determined, background level greater than or equal to 4x spike level.** |

## Outliers : Analysis Holding Time Compliance

Matrix: **WATER**

| *Method* | | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| **Container** / Client Sample ID(s) | | Date extracted | Due for extraction | Days overdue | Date analysed | Due for analysis | Days overdue |
| **EA005P: pH by PC Titrator** | | | | | | | |
| **Clear Plastic Bottle - Natural** | | | | | | | |
| Pit 1, | Pit 2, | ---- | ---- | ---- | 09-Aug-2018 | 07-Aug-2018 | **2** |
| Eldridge Ramp, | Wises Ramp, | | | | | | |
| Eldridge 0m, | Eldridge 10m, | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | |
| Eldridge Bottom | | | | | | | |
| **EK255A: Ammonia** | | | | | | | |
| **Clear Plastic - Filtered (AS/ISO) - for UT Nut.** | | | | | | | |
| Pit 1, | Pit 2 | ---- | ---- | ---- | 09-Aug-2018 | 08-Aug-2018 | **1** |
| **EK262A: Total Nitrogen** | | | | | | | |
| **Clear Plastic Bottle - Natural** | | | | | | | |
| Pit 1, | Pit 2 | 10-Aug-2018 | 08-Aug-2018 | **2** | 10-Aug-2018 | 08-Aug-2018 | **2** |
| **EK267A: Total Phosphorus (Persulfate Digestion)** | | | | | | | |
| **Clear Plastic Bottle - Natural** | | | | | | | |
| Pit 1, | Pit 2 | 10-Aug-2018 | 08-Aug-2018 | **2** | 10-Aug-2018 | 08-Aug-2018 | **2** |
| **EK271A: Reactive Phosphorus** | | | | | | | |
| **Clear Plastic - Filtered (AS/ISO) - for UT Nut.** | | | | | | | |
| Pit 1, | Pit 2 | ---- | ---- | ---- | 09-Aug-2018 | 08-Aug-2018 | **1** |

## Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for ***VOC in soils*** vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

| *Method* | | *Sample Date* | *Extraction / Preparation* | | | *Analysis* | | |
|---|---|---|---|---|---|---|---|---|
| *Container / Client Sample ID(s)* | | | *Date extracted* | *Due for extraction* | *Evaluation* | *Date analysed* | *Due for analysis* | *Evaluation* |
| **EA005P: pH by PC Titrator** | | | | | | | | |
| **Clear Plastic Bottle - Natural (EA005-P)** | | | | | | | | |
| Pit 1, | Pit 2, | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 07-Aug-2018 | ✘ |
| Eldridge Ramp, | Wises Ramp, | | | | | | | |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |
| **EA010P: Conductivity by PC Titrator** | | | | | | | | |
| **Clear Plastic Bottle - Natural (EA010-P)** | | | | | | | | |
| Pit 1, | Pit 2, | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 04-Sep-2018 | ✓ |
| Eldridge Ramp, | Wises Ramp, | | | | | | | |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |
| **EA025: Total Suspended Solids dried at 104 ± 2°C** | | | | | | | | |
| **Clear Plastic Bottle - Natural (EA025H)** | | | | | | | | |
| Pit 1, | Pit 2, | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 14-Aug-2018 | ✓ |
| Eldridge Ramp, | Wises Ramp, | | | | | | | |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation: Date extracted | Due for extraction | Evaluation | Analysis: Date analysed | Due for analysis | Evaluation |
|---|---|---|---|---|---|---|---|
| **EA045: Turbidity** | | | | | | | |
| **Clear Plastic Bottle - Natural (EA045)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 09-Aug-2018 | ✓ |
| **ED037P: Alkalinity by PC Titrator** | | | | | | | |
| **Clear Plastic Bottle - Natural (ED037-P)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 21-Aug-2018 | ✓ |
| **ED041G: Sulfate (Turbidimetric) as SO4 2- by DA** | | | | | | | |
| **Clear Plastic Bottle - Natural (ED041G)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 04-Sep-2018 | ✓ |
| **ED045G: Chloride by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Natural (ED045G)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 04-Sep-2018 | ✓ |

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation: Date extracted | Due for extraction | Evaluation | Analysis: Date analysed | Due for analysis | Evaluation |
|---|---|---|---|---|---|---|---|
| **ED093F: Dissolved Major Cations** | | | | | | | |
| **Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **----** | ---- | ---- | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| **ED093F: SAR and Hardness Calculations** | | | | | | | |
| **Clear Plastic Bottle - Filtered; Lab-acidified (ED093F)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **----** | ---- | ---- | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| **EG020F: Dissolved Metals by ICP-MS** | | | | | | | |
| **Clear Plastic Bottle - Filtered; Lab-acidified (EG020B-F)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **----** | ---- | ---- | **13-Aug-2018** | 03-Feb-2019 | ✓ |
| **EG020T: Total Metals by ICP-MS** | | | | | | | |
| **Clear Plastic Bottle - Unfiltered; Lab-acidified (EG020B-T)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | **14-Aug-2018** | 03-Feb-2019 | ✓ | **14-Aug-2018** | 03-Feb-2019 | ✓ |

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| *Method* / *Container / Client Sample ID(s)* | | *Sample Date* | *Extraction / Preparation* | | | *Analysis* | | |
|---|---|---|---|---|---|---|---|---|
| | | | *Date extracted* | *Due for extraction* | *Evaluation* | *Date analysed* | *Due for analysis* | *Evaluation* |
| **EG035F: Dissolved Mercury by FIMS** | | | | | | | | |
| **Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG035F-LL)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **----** | ---- | ---- | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| **Clear Plastic Bottle - Filtered; Lab-acidified (EG035F-LL)** | | | | | | | | |
| Eldridge Ramp, | Wises Ramp, | **07-Aug-2018** | **----** | ---- | ---- | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |
| **EG035T: Total Mercury by FIMS** | | | | | | | | |
| **Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG035T-LL)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 04-Sep-2018 | ✓ |
| **Clear Plastic Bottle - Unfiltered; Lab-acidified (EG035T-LL)** | | | | | | | | |
| Eldridge Ramp, | Wises Ramp, | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 04-Sep-2018 | ✓ |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |
| **EG094F: Dissolved Metals in Fresh Water by ORC-ICPMS** | | | | | | | | |
| **Clear HDPE (U-T ORC) - Filtered; Lab-acidified (EG094A-F)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **EG094T: Total metals in Fresh water by ORC-ICPMS** | | | | | | | | |
| **Clear HDPE (U-T ORC) - Unfiltered; Lab-acidified (EG094A-T)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **14-Aug-2018** | 03-Feb-2019 | ✓ | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **EK025SF: Free CN by Segmented Flow Analyser** | | | | | | | | |
| **White Plastic Bottle-NaOH - Pb Acetate (EK025SF)** | | | | | | | | |
| Pit 1, | Pit 2, | **07-Aug-2018** | **----** | ---- | ---- | **11-Aug-2018** | 21-Aug-2018 | ✓ |
| Eldridge Ramp, | Wises Ramp, | | | | | | | |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation: Date extracted | Due for extraction | Evaluation | Analysis: Date analysed | Due for analysis | Evaluation |
|---|---|---|---|---|---|---|---|
| **EK026SF: Total CN by Segmented Flow Analyser** | | | | | | | |
| **White Plastic Bottle-NaOH - Pb Acetate (EK026SF)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | 07-Aug-2018 | ---- | ---- | ---- | 11-Aug-2018 | 21-Aug-2018 | ✓ |
| **EK040P: Fluoride by PC Titrator** | | | | | | | |
| **Clear Plastic Bottle - Natural (EK040P)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | 07-Aug-2018 | ---- | ---- | ---- | 09-Aug-2018 | 04-Sep-2018 | ✓ |
| **EK055G: Ammonia as N by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK055G)** | | | | | | | |
| Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | 07-Aug-2018 | ---- | ---- | ---- | 09-Aug-2018 | 04-Sep-2018 | ✓ |
| **EK057G: Nitrite as N by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Natural (EK057G)** | | | | | | | |
| Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | 07-Aug-2018 | ---- | ---- | ---- | 09-Aug-2018 | 09-Aug-2018 | ✓ |
| **EK059G: Nitrite plus Nitrate as N (NOx) by Discrete Analyser** | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK059G)** | | | | | | | |
| Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | 07-Aug-2018 | ---- | ---- | ---- | 09-Aug-2018 | 04-Sep-2018 | ✓ |

Matrix: **WATER**

Evaluation: ✘ = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **EK061G: Total Kjeldahl Nitrogen By Discrete Analyser** | | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK061G)** | | | | | | | | |
| Eldridge Ramp, | Wises Ramp, | **07-Aug-2018** | **13-Aug-2018** | 04-Sep-2018 | ✓ | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |
| **EK067G: Total Phosphorus as P by Discrete Analyser** | | | | | | | | |
| **Clear Plastic Bottle - Sulfuric Acid (EK067G)** | | | | | | | | |
| Eldridge Ramp, | Wises Ramp, | **07-Aug-2018** | **13-Aug-2018** | 04-Sep-2018 | ✓ | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| Eldridge 0m, | Eldridge 10m, | | | | | | | |
| Eldridge 20m, | Eldridge 30m, | | | | | | | |
| Eldridge 50m, | Eldridge 100m, | | | | | | | |
| Eldridge 150m, | Eldridge 200m, | | | | | | | |
| Eldridge Bottom | | | | | | | | |
| **EK255A: Ammonia** | | | | | | | | |
| **Clear Plastic - Filtered (AS/ISO) - for UT Nut. (EK255A-CM)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 08-Aug-2018 | ✘ |
| **EK257A: Nitrite** | | | | | | | | |
| **Clear Plastic - Filtered (AS/ISO) - for UT Nut. (EK257A-CM)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 11-Aug-2018 | ✓ |
| **EK259A: Nitrite and Nitrate (NOx)** | | | | | | | | |
| **Clear Plastic - Filtered (AS/ISO) - for UT Nut. (EK259A-CM)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 11-Aug-2018 | ✓ |
| **EK262A: Total Nitrogen** | | | | | | | | |
| **Clear Plastic Bottle - Natural (EK262PA-CM)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **10-Aug-2018** | 08-Aug-2018 | ✘ | **10-Aug-2018** | 08-Aug-2018 | ✘ |
| **EK267A: Total Phosphorus (Persulfate Digestion)** | | | | | | | | |
| **Clear Plastic Bottle - Natural (EK267PA-CM)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **10-Aug-2018** | 08-Aug-2018 | ✘ | **10-Aug-2018** | 08-Aug-2018 | ✘ |
| **EK271A: Reactive Phosphorus** | | | | | | | | |
| **Clear Plastic - Filtered (AS/ISO) - for UT Nut. (EK271A-CM)** | | | | | | | | |
| Pit 1, | Pit 2 | **07-Aug-2018** | **----** | ---- | ---- | **09-Aug-2018** | 08-Aug-2018 | ✘ |

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method / Container / Client Sample ID(s) | Sample Date | Extraction / Preparation: Date extracted | Due for extraction | Evaluation | Analysis: Date analysed | Due for analysis | Evaluation |
|---|---|---|---|---|---|---|---|
| **EP002: Dissolved Organic Carbon (DOC)** | | | | | | | |
| **Amber DOC Filtered- Sulfuric Preserved (EP002)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | ---- | ---- | ---- | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| **EP005: Total Organic Carbon (TOC)** | | | | | | | |
| **Amber TOC Vial - Sulfuric Acid (EP005)** | | | | | | | |
| Pit 1, Pit 2, Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 10m, Eldridge 20m, Eldridge 30m, Eldridge 50m, Eldridge 100m, Eldridge 150m, Eldridge 200m, Eldridge Bottom | **07-Aug-2018** | ---- | ---- | ---- | **13-Aug-2018** | 04-Sep-2018 | ✓ |
| **EP008: Chlorophyll a & Pheophytin a** | | | | | | | |
| **White Plastic Bottle - Unpreserved (EP008)** | | | | | | | |
| Eldridge Ramp, Wises Ramp, Eldridge 0m, Eldridge 30m | **07-Aug-2018** | ---- | ---- | ---- | **09-Aug-2018** | 09-Aug-2018 | ✓ |
| **MW024: Bacillariophytes (Diatoms) - Centrales** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | **07-Aug-2018** | ---- | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Bacillariophytes (Diatoms) - Pennales** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | **07-Aug-2018** | ---- | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Bacillariophytes (Diatoms) - TOTAL BACILLARIOPHYTES** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | **07-Aug-2018** | ---- | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - Chaetophorales** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | **07-Aug-2018** | ---- | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - Chlorococcales** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | **07-Aug-2018** | ---- | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - Cladophorales** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | **07-Aug-2018** | ---- | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method<br>Container / Client Sample ID(s) | | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|---|
| | | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **MW024: Chlorophytes (Green Algae) - Oedogoniales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - Tetrasporales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - TOTAL CHLOROPHYTES** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - Ulotrichales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - Volvocales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chlorophytes (Green Algae) - Zygnematales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chrysophytes (Golden Algae)** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Chrysophytes (Golden Algae) - TOTAL CHRYSOPHYTES** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Cyanophytes (Blue Green Algae) - Chroococcales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Cyanophytes (Blue Green Algae) - Nostocales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Cyanophytes (Blue Green Algae) - Oscillatoriales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Cyanophytes (Blue Green Algae) - Other Cyanophytes** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |
| **MW024: Cyanophytes (Blue Green Algae) - Stigonematales** | | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | | |
| Eldridge 0m, | Eldridge 30m | **07-Aug-2018** | **----** | ---- | ---- | **14-Aug-2018** | 03-Feb-2019 | ✓ |

Matrix: **WATER**

Evaluation: × = Holding time breach ; ✓ = Within holding time.

| Method | Sample Date | Extraction / Preparation | | | Analysis | | |
|---|---|---|---|---|---|---|---|
| Container / Client Sample ID(s) | | Date extracted | Due for extraction | Evaluation | Date analysed | Due for analysis | Evaluation |
| **MW024: Cyanophytes (Blue Green Algae) - TOTAL CYANOPHYTES** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024: Cyanophytes (Blue Green Algae) - TOTAL POTENTIALLY TOXIC CYANOPHYTES** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024: Flagellates - Cryptophytes** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024: Flagellates - Euglenophytes** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024: Flagellates - Pyrrophytes** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024: Flagellates - TOTAL FLAGELLATES** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024: Raphidophyte** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024: Raphidophyte - TOTAL RAPHIDOPHYTE** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |
| **MW024T: TOTAL ALGAE** | | | | | | | |
| **White Plastic Bottle-Lugols Iodine (MW024_TOT)** | | | | | | | |
| Eldridge 0m, Eldridge 30m | 07-Aug-2018 | ---- | ---- | ---- | 14-Aug-2018 | 03-Feb-2019 | ✓ |

## Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| Quality Control Sample Type | | Count | | Rate (%) | | | Quality Control Specification |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| Laboratory Duplicates (DUP) | | | | | | | |
| Alkalinity by PC Titrator | ED037-P | 2 | 16 | **12.50** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Ammonia as N - Ultra-Trace for Catchment Monitoring | EK255A-CM | 1 | 3 | **33.33** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Ammonia as N by Discrete analyser | EK055G | 2 | 17 | **11.76** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 2 | 17 | **11.76** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Conductivity by PC Titrator | EA010-P | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Mercury by FIMS - Low Level | EG035F-LL | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 3 | 24 | **12.50** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite B | EG020B-F | 2 | 18 | **11.11** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-F | 1 | 2 | **50.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Organic Carbon | EP002 | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Fluoride by PC Titrator | EK040P | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Free CN by Segmented Flow Analyser | EK025SF | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Cations - Dissolved | ED093F | 3 | 29 | **10.34** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M | EK259A-CM | 1 | 3 | **33.33** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 2 | 17 | **11.76** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N - Ultra-Trace for Catchment Monitoring | EK257A-CM | 1 | 3 | **33.33** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 2 | 14 | **14.29** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| pH by PC Titrator | EA005-P | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Reactive Phosphorus as P - Ultra-Trace for Catchment M | EK271A-CM | 1 | 2 | **50.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Suspended Solids (High Level) | EA025H | 3 | 23 | **13.04** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Cyanide by Segmented Flow Analyser | EK026SF | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Mercury by FIMS - Low Level | EG035T-LL | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals by ICP-MS - Suite A | EG020A-T | 4 | 35 | **11.43** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals by ICP-MS - Suite B | EG020B-T | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-T | 2 | 2 | **100.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM | EK262PA-CM | 1 | 5 | **20.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Organic Carbon | EP005 | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM | EK267PA-CM | 1 | 2 | **50.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Turbidity | EA045 | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Laboratory Control Samples (LCS) | | | | | | | |
| Alkalinity by PC Titrator | ED037-P | 1 | 16 | **6.25** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| *Quality Control Sample Type* | | *Count* | | *Rate (%)* | | | *Quality Control Specification* |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| **Laboratory Control Samples (LCS) - Continued** | | | | | | | |
| Ammonia as N - Ultra-Trace for Catchment Monitoring | EK255A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Ammonia as N by Discrete analyser | EK055G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 2 | 17 | **11.76** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chlorophyll a and Pheophytin a | EP008 | 1 | 8 | **12.50** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Conductivity by PC Titrator | EA010-P | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Mercury by FIMS - Low Level | EG035F-LL | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 2 | 24 | **8.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite B | EG020B-F | 1 | 18 | **5.56** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-F | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Organic Carbon | EP002 | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Fluoride by PC Titrator | EK040P | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Free CN by Segmented Flow Analyser | EK025SF | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M | EK259A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N - Ultra-Trace for Catchment Monitoring | EK257A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 1 | 14 | **7.14** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| pH by PC Titrator | EA005-P | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Reactive Phosphorus as P - Ultra-Trace for Catchment M | EK271A-CM | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 2 | 20 | **10.00** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Suspended Solids (High Level) | EA025H | 4 | 23 | **17.39** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Cyanide by Segmented Flow Analyser | EK026SF | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Mercury by FIMS - Low Level | EG035T-LL | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals by ICP-MS - Suite A | EG020A-T | 2 | 35 | **5.71** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals by ICP-MS - Suite B | EG020B-T | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-T | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM | EK262PA-CM | 1 | 5 | **20.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Organic Carbon | EP005 | 2 | 13 | **15.38** | **10.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM | EK267PA-CM | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Turbidity | EA045 | 3 | 13 | **23.08** | **15.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| **Method Blanks (MB)** | | | | | | | |
| Ammonia as N - Ultra-Trace for Catchment Monitoring | EK255A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Ammonia as N by Discrete analyser | EK055G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chlorophyll a and Pheophytin a | EP008 | 1 | 8 | **12.50** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Conductivity by PC Titrator | EA010-P | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Mercury by FIMS - Low Level | EG035F-LL | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

Matrix: **WATER**

Evaluation: ✗ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| Quality Control Sample Type | | Count | | Rate (%) | | | Quality Control Specification |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| **Method Blanks (MB) - Continued** | | | | | | | |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 2 | 24 | **8.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite B | EG020B-F | 1 | 18 | **5.56** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-F | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Organic Carbon | EP002 | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Fluoride by PC Titrator | EK040P | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Free CN by Segmented Flow Analyser | EK025SF | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Major Cations - Dissolved | ED093F | 2 | 29 | **6.90** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M | EK259A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N - Ultra-Trace for Catchment Monitoring | EK257A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 1 | 14 | **7.14** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Reactive Phosphorus as P - Ultra-Trace for Catchment M | EK271A-CM | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Suspended Solids (High Level) | EA025H | 2 | 23 | **8.70** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Cyanide by Segmented Flow Analyser | EK026SF | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Mercury by FIMS - Low Level | EG035T-LL | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals by ICP-MS - Suite A | EG020A-T | 2 | 35 | **5.71** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals by ICP-MS - Suite B | EG020B-T | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-T | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM | EK262PA-CM | 1 | 5 | **20.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Organic Carbon | EP005 | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM | EK267PA-CM | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Turbidity | EA045 | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| **Matrix Spikes (MS)** | | | | | | | |
| Ammonia as N - Ultra-Trace for Catchment Monitoring | EK255A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Ammonia as N by Discrete analyser | EK055G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Chloride by Discrete Analyser | ED045G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Mercury by FIMS - Low Level | EG035F-LL | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | 2 | 24 | **8.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-F | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Dissolved Organic Carbon | EP002 | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Fluoride by PC Titrator | EK040P | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Free CN by Segmented Flow Analyser | EK025SF | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M | EK259A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | 1 | 17 | **5.88** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

Matrix: **WATER**

Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

| Quality Control Sample Type | | Count | | Rate (%) | | | Quality Control Specification |
|---|---|---|---|---|---|---|---|
| *Analytical Methods* | *Method* | *QC* | *Regular* | ***Actual*** | ***Expected*** | *Evaluation* | |
| **Matrix Spikes (MS) - Continued** | | | | | | | |
| Nitrite as N - Ultra-Trace for Catchment Monitoring | EK257A-CM | 1 | 3 | **33.33** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Nitrite as N by Discrete Analyser | EK057G | 1 | 14 | **7.14** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Reactive Phosphorus as P - Ultra-Trace for Catchment M | EK271A-CM | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Cyanide by Segmented Flow Analyser | EK026SF | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Mercury by FIMS - Low Level | EG035T-LL | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals by ICP-MS - Suite A | EG020A-T | 2 | 35 | **5.71** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-T | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM | EK262PA-CM | 1 | 5 | **20.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Organic Carbon | EP005 | 1 | 13 | **7.69** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus as P By Discrete Analyser | EK067G | 1 | 20 | **5.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |
| Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM | EK267PA-CM | 1 | 2 | **50.00** | **5.00** | ✓ | NEPM 2013 B3 & ALS QC Standard |

## *Brief Method Summaries*

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

| *Analytical Methods* | *Method* | *Matrix* | *Method Descriptions* |
|---|---|---|---|
| pH by PC Titrator | EA005-P | WATER | In house: Referenced to APHA 4500 H+ B. This procedure determines pH of water samples by automated ISE. This method is compliant with NEPM (2013) Schedule B(3) |
| Conductivity by PC Titrator | EA010-P | WATER | In house: Referenced to APHA 2510 B. This procedure determines conductivity by automated ISE. This method is compliant with NEPM (2013) Schedule B(3) |
| Suspended Solids (High Level) | EA025H | WATER | In house: Referenced to APHA 2540D. A gravimetric procedure employed to determine the amount of `non-filterable` residue in a aqueous sample. The prescribed GFC (1.2um) filter is rinsed with deionised water, oven dried and weighed prior to analysis. A well-mixed sample is filtered through a glass fibre filter (1.2um). The residue on the filter paper is dried at 104+/-2C . This method is compliant with NEPM (2013) Schedule B(3) |
| Turbidity | EA045 | WATER | In house: Referenced to APHA 2130 B. This method is compliant with NEPM (2013) Schedule B(3) |
| Alkalinity by PC Titrator | ED037-P | WATER | In house: Referenced to APHA 2320 B This procedure determines alkalinity by automated measurement (e.g. PC Titrate) using pH 4.5 for indicating the total alkalinity end-point. This method is compliant with NEPM (2013) Schedule B(3) |
| Sulfate (Turbidimetric) as SO4 2- by Discrete Analyser | ED041G | WATER | In house: Referenced to APHA 4500-SO4. Dissolved sulfate is determined in a 0.45um filtered sample. Sulfate ions are converted to a barium sulfate suspension in an acetic acid medium with barium chloride. Light absorbance of the BaSO4 suspension is measured by a photometer and the SO4-2 concentration is determined by comparison of the reading with a standard curve. This method is compliant with NEPM (2013) Schedule B(3) |
| Chloride by Discrete Analyser | ED045G | WATER | In house: Referenced to APHA 4500 Cl - G.The thiocyanate ion is liberated from mercuric thiocyanate through sequestration of mercury by the chloride ion to form non-ionised mercuric chloride.in the presence of ferric ions the librated thiocynate forms highly-coloured ferric thiocynate which is measured at 480 nm APHA 21st edition seal method 2 017-1-L april 2003 |
| Major Cations - Dissolved | ED093F | WATER | In house: Referenced to APHA 3120 and 3125; USEPA SW 846 - 6010 and 6020; Cations are determined by either ICP-AES or ICP-MS techniques. This method is compliant with NEPM (2013) Schedule B(3)<br><br>Sodium Adsorption Ratio is calculated from Ca, Mg and Na which determined by ALS in house method QWI-EN/ED093F. This method is compliant with NEPM (2013) Schedule B(3)<br><br>Hardness parameters are calculated based on APHA 2340 B. This method is compliant with NEPM (2013) Schedule B(3) |
| Dissolved Metals by ICP-MS - Suite A | EG020A-F | WATER | In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. |
| Total Metals by ICP-MS - Suite A | EG020A-T | WATER | In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. |

| Analytical Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| Dissolved Metals by ICP-MS - Suite B | EG020B-F | WATER | In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. |
| Total Metals by ICP-MS - Suite B | EG020B-T | WATER | In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector. |
| Dissolved Mercury by FIMS - Low Level | EG035F-LL | WATER | In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3) |
| Total Mercury by FIMS - Low Level | EG035T-LL | WATER | In house: Referenced to AS 3550, APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the unfiltered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM (2013) Schedule B(3) |
| Dissolved Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-F | WATER | In house: Referenced to APHA 3125; USEPA SW846 - 6020 Samples are 0.45µm filtered prior to analysis. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3) |
| Total Metals in Fresh Water -Suite A by ORC-ICPMS | EG094A-T | WATER | In house: Referenced to APHA 3125; USEPA SW846 - 6020. The ORC-ICPMS technique removes interfering species through a series of chemical reactions prior to ion detection. Ions are passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to measurement by a discrete dynode ion detector. This method is compliant with NEPM (2013) Schedule B(3) |
| Free CN by Segmented Flow Analyser | EK025SF | WATER | In house: Referenced to ASTM D7237: Using an automated segmented flow analyser, a sample at high pH (sodium hydroxide preserved) is buffered to pH 6.0. The hydrogen cyanide present passes across a gas dialysis membrane into an acceptor stream consisting of 0.01 M sodium hydroxide. The acceptor stream mixes with a buffer at pH 5.2 and reacts with chloramine-T to form cyanogen chloride. Cyanogen chloride reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour, measured at 600nm. This method is compliant with NEPM (2013) Schedule B(3) |

| Analytical Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| Total Cyanide by Segmented Flow Analyser | EK026SF | WATER | In house: Referenced to APHA 4500-CN C / ASTM D7511. Sodium hydroxide preserved samples are introduced into an automated segmented flow analyser. Complex bound cyanide is decomposed in a continuously flowing stream, at a pH of 3.8, by the effect of UV light. A UV-B lamp (312 nm) and a decomposition spiral of borosilicate glass are used to filter out UV light with a wavelength of less than 290 nm thus preventing the conversion of thiocyanate into cyanide. The hydrogen cyanide present at a pH of 3.8 is separated by gas dialysis. The hydrogen cyanide is then determined photometrically, based on the reaction of cyanide with chloramine-T to form cyanogen chloride. This then reacts with 4-pyridine carboxylic acid and 1,3-dimethylbarbituric acid to give a red colour which is measured at 600 nm. This method is compliant with NEPM (2013) Schedule B(3) |
| Fluoride by PC Titrator | EK040P | WATER | In house: Referenced to APHA 4500-F C: CDTA is added to the sample to provide a uniform ionic strength background, adjust pH, and break up complexes. Fluoride concentration is determined by either manual or automatic ISE measurement. This method is compliant with NEPM (2013) Schedule B(3) |
| Ammonia as N by Discrete analyser | EK055G | WATER | In house: Referenced to APHA 4500-NH3 G Ammonia is determined by direct colorimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3) |
| Nitrite as N by Discrete Analyser | EK057G | WATER | In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3) |
| Nitrate as N by Discrete Analyser | EK058G | WATER | In house: Referenced to APHA 4500-NO3- F. Nitrate is reduced to nitrite by way of a chemical reduction followed by quantification by Discrete Analyser. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. This method is compliant with NEPM (2013) Schedule B(3) |
| Nitrite and Nitrate as N (NOx) by Discrete Analyser | EK059G | WATER | In house: Referenced to APHA 4500-NO3- F. Combined oxidised Nitrogen (NO2+NO3) is determined by Chemical Reduction and direct colourimetry by Discrete Analyser. This method is compliant with NEPM (2013) Schedule B(3) |
| Organic Nitrogen as N (TKN - NH3) (discrete analyser) | EK060G | WATER | In house: Referenced to APHA 4500-Norg/4500-NH3. This method is compliant with NEPM (2013) Schedule B(3) |
| Total Kjeldahl Nitrogen as N By Discrete Analyser | EK061G | WATER | In house: Referenced to APHA 4500-Norg D (In house). An aliquot of sample is digested using a high temperature Kjeldahl digestion to convert nitrogenous compounds to ammonia. Ammonia is determined colorimetrically by discrete analyser. This method is compliant with NEPM (2013) Schedule B(3) |
| Total Nitrogen as N (TKN + Nox) By Discrete Analyser | EK062G | WATER | In house: Referenced to APHA 4500-Norg / 4500-NO3-. This method is compliant with NEPM (2013) Schedule B(3) |
| Total Phosphorus as P By Discrete Analyser | EK067G | WATER | In house: Referenced to APHA 4500-P H, Jirka et al (1976), Zhang et al (2006). This procedure involves sulphuric acid digestion of a sample aliquot to break phosphorus down to orthophosphate. The orthophosphate reacts with ammonium molybdate and antimony potassium tartrate to form a complex which is then reduced and its concentration measured at 880nm using discrete analyser. This method is compliant with NEPM (2013) Schedule B(3) |
| Ammonia as N - Ultra-Trace for Catchment Monitoring | EK255A-CM | WATER | In house: Referenced to APHA 4500-NH3 H. Ammonia is determined by direct colorimetry by FIA. This method is compliant with NEPM (2013) Schedule B(3) |
| Nitrite as N - Ultra-Trace for Catchment Monitoring | EK257A-CM | WATER | In house: Referenced to APHA 4500-NO2- B. Nitrite is determined by direct colourimetry by FIA. |
| Nitrate as N - Ultra-Trace for Catchment Monitoring | EK258A-CM | WATER | In house: Referenced to APHA 4500-NO3- I Nitrate is reduced to nitrite by way of a cadmium reduction column followed by quantification by FIA. Nitrite is determined seperately by direct colourimetry and result for Nitrate calculated as the difference between the two results. |

| *Analytical Methods* | *Method* | *Matrix* | *Method Descriptions* |
|---|---|---|---|
| Nitrite and Nitrate as N (NOx) - Ultra-Trace for Catchment M | EK259A-CM | WATER | In house: Referenced to APHA 4500-NO3- I. Combined oxidised Nitrogen (NO2+NO3) is determined by Cadmium Reduction and direct colourimetry by FIA. |
| Organic Nitrogen as N ( diss. TN - NH3-N - NOx-N ) (FIA-UT) | EK260PA-CM | WATER | Calculated by difference from total Nitrogen and inorganic Nitrogen (Ammonia, Nitrate and Nitrite). Contributing method parameters are determined by FIA. APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen, 4500 NO3- I. NOx and 4500 NH3+-H Ammonia. This method is compliant with NEPM (2013) Schedule B(3) |
| TKN (Total N - NOx-N). (FIA - UT) for Catchment Monitoring | EK261PA-CM | WATER | In house: Referenced to APHA 4500-P J. & 4500-NO3- I . Calculated by difference from total Nitrogen and NOx. Contributing method parameters are determined by FIA. This method is compliant with NEPM (2013) Schedule B(3) |
| Total Nitrogen as N (Persulfate digestion)-Ultra-Trace - CM | EK262PA-CM | WATER | In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (2013) Schedule B(3) |
| Total Phosphorus(Persulfate Digestion) - Ultra-Trace for CM | EK267PA-CM | WATER | In house: Referenced to APHA 4500-P J. Persulfate Method for Simultaneous Determination of Total Nitrogen and Total Phosphorus. As sample is digested with persulfate under alkaline conditions yielding orthophosphate and nitrate. Following digestion, analytes are determined by flow injection analysis. This method is compliant with NEPM (2013) Schedule B(3) |
| Reactive Phosphorus as P - Ultra-Trace for Catchment M | EK271A-CM | WATER | In house: Referenced to APHA 4500-P E Ammonium molybdate and potassium antimonyl tartrate reacts in acid medium with othophosphate to form a heteropoly acid -phosphomolybdic acid - which is reduced to intensely coloured molybdenum blue by ascorbic acid. Quantification is by FIA. This method is compliant with NEPM (2013) Schedule B(3) |
| Ionic Balance by PCT DA and Turbi SO4 DA | EN055 - PG | WATER | In house: Referenced to APHA 1030F. This method is compliant with NEPM (2013) Schedule B(3) |
| Dissolved Organic Carbon | EP002 | WATER | In house: Referenced to APHA 5310 B. This method is compliant with NEPM (2013) Schedule B(3) . Samples are combusted at high termperature in the presence of an oxidative catalyst. The evolved carbon dioxide is quantified using an IR detector. |
| Total Organic Carbon | EP005 | WATER | In house: Referenced to APHA 5310 B, The automated TOC analyzer determines Total and Inorganic Carbon by IR cell. TOC is calculated as the difference. This method is compliant with NEPM (2013) Schedule B(3) |
| Chlorophyll a and Pheophytin a | EP008 | WATER | In house: Referenced to APHA 10200 H. The pigments are extracted into aqueous acetone. The optical density of the extract before and after acidification at both 664 nm and 665 nm is determined spectrometrically. |
| Total Algae Count | MW024 TOT | WATER | In house: Referenced to Hotzel and Groome, 1999 and APHA 10200 |

| *Preparation Methods* | *Method* | *Matrix* | *Method Descriptions* |
|---|---|---|---|
| TKN/TP Digestion | EK061/EK067 | WATER | In house: Referenced to APHA 4500 Norg - D; APHA 4500 P - H. This method is compliant with NEPM (2013) Schedule B(3) |
| Persulfate Digestion for UT TN and TP for FIA finish. | EK262/267-PA Prep | WATER | In house: Referenced to APHA 4500 P - J. This method is compliant with NEPM (2013) Schedule B(3) |
| Digestion for Total Recoverable Metals | EN25 | WATER | In house: Referenced to USEPA SW846-3005. Method 3005 is a Nitric/Hydrochloric acid digestion procedure used to prepare surface and ground water samples for analysis by ICPAES or ICPMS. This method is compliant with NEPM (2013) Schedule B(3) |

| Preparation Methods | Method | Matrix | Method Descriptions |
|---|---|---|---|
| Digestion for Total Recoverable Metals - ORC | EN25-ORC | WATER | In house: Referenced to USEPA SW846-3005. This is an Ultrapure Nitric acid digestion procedure used to prepare surface and ground water samples for analysis by ORC- ICPMS. This method is compliant with NEPM (2013) Schedule B(3) |

ALS Environmental

# CHAIN OF CUSTODY

ALS Laboratory: please tick →

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**CLIENT:** Genex

**OFFICE:**

**PROJECT:** KIDSTON

**ORDER NUMBER:**

**PROJECT MANAGER:** Reece Fraser **CONTACT PH:**

**SAMPLER:** Genex - John Lawlor - **SAMPLER MOBILE:**

**COC emailed to ALS?** NO **EDD FORMAT (or default):**

**Email Reports to** (will default to PM if no other addresses are listed): reece.fraser@aecom.com; cm@genexpower.com.au

**Email Invoice to** (will default to PM if no other addresses are listed): rouven.lau@aecom.com; reece.fraser@aecom.com

**TURNAROUND REQUIREMENTS :** (Standard TAT may be longer for some tests e.g.. Ultra Trace Organics) Standard TAT (List due date): ASAP - please provide prelim results when available.

**ALS QUOTE NO.:** As per Genex Quote

**Task Number:**

**COC SEQUENCE NUMBER (Circle)** COC: 1 OF: 1

FOR LABORATORY USE ONLY (Circle)
Custody Seal Intact?
Free ice / frozen ice bricks present upon receipt?
Random Sample Temperature on Receipt
Other comment

| RELINQUISHED BY: | RECEIVED BY: | RELINQUISHED BY: | RECEIVED BY: |
|---|---|---|---|
| Reece Fraser | CM | | |
| DATE/TIME: 08/08/2018 | DATE/TIME: 8/8/18 13:20 | DATE/TIME: | DATE/TIME: |

**COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:**

| ALS USE | SAMPLE DETAILS MATRIX: SOLID (S) WATER (W) | | | CONTAINER INFORMATION | | ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required). | | | | | | | | | Additional Information |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| LAB ID | SAMPLE ID | DATE / TIME | MATRIX | TYPE & PRESERVATIVE (refer to codes below) | TOTAL CONTAINERS | As per quote from Joy Morgan to Reece Fraser 3/8/18 - no Chlorophyll a | As per quote from Joy Morgan to Reece Fraser 3/8/18 - Including Chlorophyll a | Total and dissolved Silver | | | | | | | Comments on likely contaminant levels, dilutions, or samples requiring specific QC analysis etc. |
| 1 | Pit 1 | 7/8/2018 | W | | 11 | X | | X | | | | | | | |
| 2 | Pit 2 | 7/8/2018 | W | | 11 | X | | X | | | | | | | |
| 3 | Eldridge Ramp | 7/8/2018 | W | | 9 | | X | X | | | | | | | |
| 4 | Wises Ramp | 7/8/2018 | W | | 9 | | X | X | | | | | | | |
| 5 | Eldridge 0m | 7/8/2018 | W | | 9 | | X | X | | | | | | | |
| 6 | Eldridge 10m | 7/8/2018 | W | | 8 | X | | X | | | | | | | |
| 7 | Eldridge 20m | 7/8/2018 | W | | 8 | X | | X | | | | | | | |
| 8 | Eldridge 30m | 7/8/2018 | W | | 9 | | X | X | | | | | | | |
| 9 | Eldridge 50m | 7/8/2018 | W | | 8 | X | | X | | | | | | | |
| 10 | Eldridge 100m | 7/8/2018 | W | | 8 | X | | X | | | | | | | |
| 11 | Eldridge 150m | 7/8/2018 | W | | 8 | X | | X | | | | | | | |
| 12 | Eldridge 200m | 7/8/2018 | W | | 8 | X | | X | | | | | | | |
| 13 | Eldridge Bottom | 7/8/2018 | W | | 8 | X | | X | | | | | | | |
| | | | | TOTAL | 114 | 9 | 4 | 13 | | | | | | | |

Environmental Division
Townsville
Work Order Reference
ET1802030

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*Water Container Codes:* P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

# Appendix K

## Preliminary Construction Assessment

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# Memorandum

| | | | |
|---|---|---|---|
| To | | Page | 1 |
| CC | | | |
| Subject | Preliminary Construction Assessment [Revision 1] | | |
| From | | | |
| File/Ref No. | | Date | 08/01/2019 |

## 1.0 Introduction

### 1.1 Relationship to Previous Assessment

This appendix presents the results of a number of modelling scenarios and sensitivities completed in order to assess the Kidston Pumped Storage Project (the Project) during the construction phase. Fundamentally, this revised assessment differs from the previous assessment (refer to Appendix 1) in that:

- The objective of the previous assessment (Appendix 1) was to determine a suitable release rate for the construction phase. It was found that a significantly lower dilution ratio and higher discharge capacity was required during the construction phase when compared to the operational phase.
- The current revised assessment focusses on identification of a number of additional strategies required for the design and temporary construction phase operation of the Project assuming adoption of the same proposed release regime as that nominated for the operational phase, namely:
  - A release trigger of 400 ML/d in the Copperfield River at the proposed release point (releases may be made at any time during the construction phase as long as the receiving flow is in excess of the trigger).
  - A maximum discharge capacity of 1 $m^3/s$ (86.4 ML/d);
  - A minimum dilution ratio of 200 to 1 (0.5033% release ratio) which is based on the contaminant of most concern (dissolved zinc) and assumes the following:
    - End of pipe concentration of 1.5874 mg/L for dissolved zinc;
    - Receiving concentration of 0.0025 mg/L for dissolved zone; and
    - Water quality objective (WQO) of 0.014 mg/L (hardness modified) for dissolved zinc.
- Additional objectives for the assessment included:
  - Elimination of the reliance of releases of water from the Copperfield dam to augment discharge potential;
  - Potentially limiting releases to only the 2020/21 wet season; and
  - A reduction in the assumed water consumption (1 ML/d) of additional disposal options, including (but not limited to) construction activities such as bulk earthworks, dust suppression, etc.

In addition, the construction phase schedule has been subjected to a number changes including a later start data and reduced duration.

## 1.2 Construction Phase Activities

The dewatering of Eldridge Pit must be completed in order to facilitate access for the completion of the tailrace tunnel outlet and pit wall stabilisation works. At the approximate time of writing, current water levels in both Wises and Eldridge Pits indicate that the volume of water required to be pumped from Eldridge Pit exceeds both the current (undeveloped) and preliminary constructed capacity of Wises Pit ('excess construction water'). In order for the tailrace outlet works to commence in accordance with planned construction scheduling the Project water balance must achieve an overall net loss equivalent to the estimated excess construction water. However, the net loss is the balance of a number of inflows (rainfall, runoff, seepage interception system (SIS) and groundwater inflows) and outflows (controlled releases, evaporation).

## 1.3 Preliminary Construction Phase Assessment

The proposed operational phase controlled release assumptions (refer to Section 1.1above) provide sufficient release potential for the operational phase of the Project. However, when applied to the construction phase, do not allow for the release of the volume of water required to meet proposed construction scheduling. In order to determine additional strategies required for the design and temporary construction phase operation of the Project the following were completed:

- Detailed review of the revised construction and pit dewatering staging schedule in order to confirm and define:
  - Dewatering volumes and rates;
  - Critical dates;
  - Key schedule-based objectives; and
  - Model objective functions – i.e. key metrics with which to compare the relative efficacy of each model scenario.
- Review and develop model assumptions for the transition of Wises Pit from its existing condition as an open cut mine pit with an external (runoff) catchment to its constructed condition with an extensive water surface area and no external catchment.
- Assess the efficacy of proposed design and temporary construction phase operational strategies:
  - Creation of additional storage within the proposed Wises upper reservoir though the removal of additional waste rock material currently located within the proposed footprint;
  - Temporary storage of water in the construction Wises upper reservoir above both the operational phase full supply level (FSL) of RL 551 m AHD and the operational phase spillway elevation of 551.5 m AHD.

Additional sensitivity assessment of key assumptions (catchment area and runoff coefficient for Wises Pit) against adopted model objective functions was previously assessed as part of the previous assessment. Results indicated a relatively low sensitivity to both assumptions. Results are presented in Appendix A.

### 1.4 Modelled Construction and Dewatering Schedule

Modelling of the construction phase has considered three key stages associated with the dewatering of Eldridge Pit and construction of the power hall access tunnel, tailrace outlet works and the Wises upper reservoir embankment. Table 1 summarises the key construction stages, dates and durations.

**Table 1 Key Construction Phase Stages**

| Stage | Description | Stage Schedule Details | | |
|---|---|---|---|---|
| | | Scheduled Stage Start | Scheduled Stage End | Scheduled Stage Duration (days) |
| 1 | Dewatering of Eldridge Pit for safe access to allow main access tunnel construction. Dewatering to continue up to the maximum allowable fill (RL 525m AHD) in the existing Wises Pit without impacting ongoing embankment works. | 11/12/2019 | 16/04/2020 | 127 |
| 2 | Final dewatering of Eldridge Pit to the completed Wises upper reservoir. Eldridge lowered to RL suitable for the safe construction of tailrace outlet works (305 m AHD). | 18/11/2020 | 13/08/2021 | 268 |
| 3 | Refill of Eldridge Pit to MOL RL (328.4 m AHD) | 28/01/2022 | 11/02/2022 | 779 (total from start of stage 1 to end of stage 3) |

It should be noted that this programme is indicative, is based on dewatering commencing in December 2019 and may be subject to change.

The key model objective function adopted was the scheduled duration of stage 2 dewatering as:

- On-time achievement of stage 2 completion is critical to the commencement of key construction activities associated with the tailrace tunnel outlet works.
- On-time completion of stage 2 is notably dependant on the availability of the constructed Wises upper reservoir to receive the remaining volume from Eldridge Pit.
- Current water levels in both Wises and Eldridge Pits imply insufficient capacity in the fully constructed Wises upper reservoir to receive all of the estimated stage 2 dewatering volume.

  On-time completion of stage 1 dewatering is not anticipated to be limited by the ability of the current Wises Pit to receive the estimated stage 1 dewatering volume (required to complete access tunnel works) and the total volume is effectively the balance of the current undeveloped Wises Pit less its current volume.

#### 1.4.1 Adopted Model Performance Targets (Objective Function)

Reliability up to the 80$^{th}$ percentile (P80) was adopted as the target for achieving the modelled stage 2 dewatering duration of 268 days. This was required to be achieved while adopting the operational phase release conditions (200 to 1 dilution ratio for dissolved zinc – refer to Section 1.1)

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### 1.5 Estimated Dewatering Volumes, Excess Water and Adopted Pump Rates

Table 2 details the dewatering volumes associated with stages 1 and 2. Note that Stage 3 is simply the refilling of Eldridge Pit to MOL and is not considered to be of material interest to the assessment. From the table it can be seen that the end water RL for the constructed Wises upper reservoir upon completion of stage 2 is estimated to be 552.6 m AHD. This should be contrasted with the proposed spillway elevation of RL 551.5 m AHD and the proposed FSL of 551 m AHD. This effectively results in an excess construction volume of:

- Approximately 1.9 GL if Wises upper reservoir is filled to the spillway elevation (551.5 m AHD) at the end of stage 2; or
- Approximately 2.5 GL if Wises upper reservoir is filled to the FSL elevation (551 m AHD) at the end of stage 2.

These high excess water volumes were the primary driver in the previous assessment for the requirement to have a significantly lower dilution ration when compared to the operational phase.

**Table 2 Construction Dewatering Volumes**

| Stage | Eldridge Pit | | | | Pump Volume | Existing Wises Pit/Upper Reservoir | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Start RL | Start Vol. | End RL | End Vol. | GL | Start RL | Start Vol. | End RL | End Vol. |
| | m | GL | m | GL | | m | GL | m | GL |
| 1 | 484.49 | 29.092 | 457.7 | 21.454 | 7.637 | 493.96 | 0.80 | 525 | 8.44 |
| 2 | 457.7 | 21.454 | 305 | 1.062 | 20.392 | 525 | 8.44 | 552.60[1] | 28.83[2] |
| 3 | Refill Eldridge to MOL RL (328.4 m AHD) | | | | | | | | |

Based on the key construction stages in Table 1 and the estimated dewatering volumes in Table 2 the following preliminary pump rates have been adopted for the construction phase modelling:

- Stage 1 – 1,200 L/s (104 ML/d); and
- Stage 2 – 1,200 L/s (104 ML/d).
- Pumps were initially assumed to operate 20 hours per day however sensitivity analysis indicated that as the excess water volume was progressively reduced, the effective pump capacity (after consideration of duty) become a key driver and results were relatively insensitive to dilution ratio. The final scenarios (refer to Section 4.0) therefore increased the assumed duty to 22 hours.

### 1.6 Construction of Wises Upper Reservoir Embankment

The transition of the existing Wises open cut pit into the Wises upper reservoir will result in significant changes to its water balance throughout the duration of the construction phase. While detailed construction scheduling has not yet been completed, a number of high level assumptions have been adopted to reflect the proposed construction of the upper reservoir and its impact on the water balance. Referring to Figure 1:

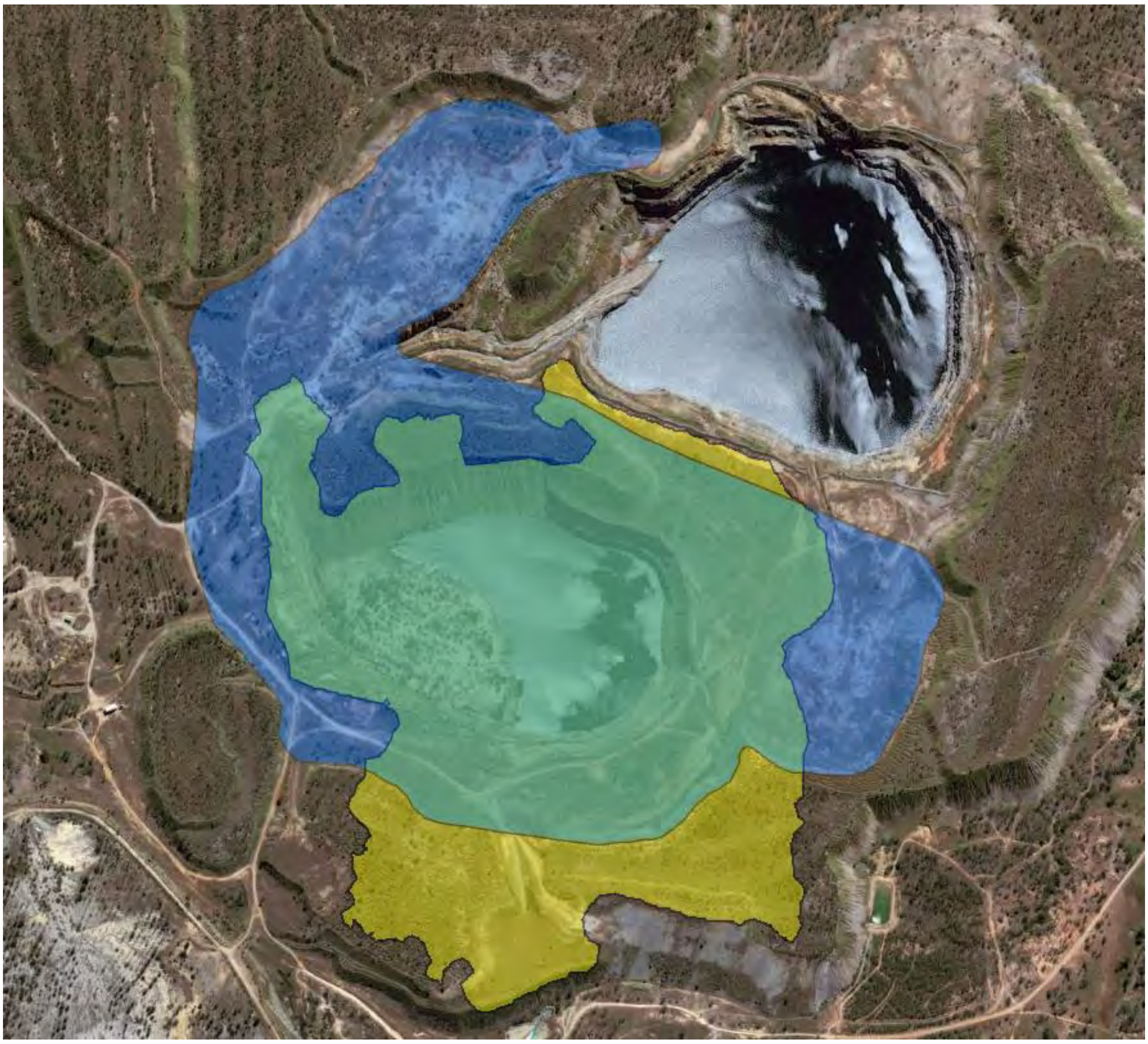
- The existing Wises Pit has an external catchment of approximately 105 Ha;
- The Wises upper reservoir will have an internally-draining catchment of approximately 125 Ha and no external catchment; and
- Approximately 75 ha of the existing Wises Pit external catchment lies within the proposed Wises upper reservoir, an internally-draining catchment.

[1] Indicates resultant water level is in excess of the FSL (551 m AHD) and spillway (551.5 m AHD) elevations.
[2] Indicates that the resultant water volume is in excess of the Wises upper reservoir storage capacity of 26.74 GL (at FSL) and 27.36 GL (at spillway elevation.)

Adopted catchment area assumptions for Wises Pit during the construction phase model simulation are summarised in Table 3. A runoff coefficient of 0.33 was adopted for the Wises Pit external catchment. This is consistent with that used for Eldridge Pit (McConnell Dowel - John Holland JV, 2018) and (Entura, 2016) but does not represent a calibrated value. Sensitivity to the runoff coefficient as well as assumed catchment areas are discussed in Appendix A.

**Table 3 Adopted Wises Pit Catchment Area Assumptions for Construction Simulation**

| Date | Description | Wises Catchment | | Comment |
|---|---|---|---|---|
| | | Runoff | Internal (Direct Rainfall) | |
| 1/21/2019 | Start of model construction simulation and stage 1 dewatering (11/12/19) | 75 Ha less the water surface area (calculated daily during model simulation) | Based on water surface area (calculated daily during model simulation) | Assumes existing external areas outside embankment diverted as early works. This assumption has been sensitivity tested (refer to 1.0) |
| 1/05/2020 | Existing drainage paths away from pit blocked by embankment earthworks | 125 ha less the water surface area (calculated daily during model simulation) | Based on water surface area (calculated daily during model simulation) | 7 months into critical construction period. |
| 18/11/2020 | Start of stage 2 dewatering | 0 Ha | 125 Ha | Conservative assumption that assumes immediate inundation of runoff catchment upon commencement of stage 3 dewatering. |
| 28/01/2022 | Commence refill of Eldridge | 0 Ha | 125 Ha | End of critical construction period/model simulation |



| Catchment | Area (Ha) | Ref. | Comment |
|---|---|---|---|
| Existing Wises Pit catchment (yellow and green areas) | 105 (total – yellow and green areas)<br>30 (outside Wises upper reservoir footprint – yellow area) | | Early works are assumed to divert any of the existing Wises Pit catchment that falls outside of the proposed Wises upper reservoir footprint (yellow area only) in order to reduce the volume of external runoff entering Wises Pit during construction. The resultant area of 75 ha (green area) assumed to be the un-divertible remaining external catchment at start of construction phase. This assumption has been sensitivity tested (refer to Section 1.0). |
| Wises upper reservoir footprint | 125 | | Internally draining catchment for constructed Wises upper reservoir. |
| Area of overlap | 75 | | Assumed remaining external catchment reporting to Wises Pit during initial construction period i.e. prior to stage 3 dewatering. |

**Figure 1 Assumed Wises Pit Catchments during Construction Phase**

## 2.0 Revised Construction Phase Sensitivity Assessment Modelling

### 2.1 Construction Sensitivity Assessment Scenarios Assessed

A number of sensitivity scenarios were assessed for the construction phase simulation as summarised in Table 4 below:

- Scenario 1 utilises the previous construction phase dilution ratio (20 to 1) which was adopted as the base case with which to compare. Maximum allowed volume in Wises (FSL) is RL 551 m AHD and no additional excavation of waste rock material.
- Scenarios 1.1 to 1.5 assessed the impact of progressively reducing the potential freeboard in Wises upper reservoir (by increasing the FSL) during the construction phase. This was completed by progressively increasing the level at which water transferred from Eldridge Pit during stage 2 dewatering is halted (the FSL). Five scenarios considered incremental 100mm reductions in freeboard (difference between maximum allowable water level and spillway elevation).
- Scenarios 2.1 to 2.9 assessed the impact of progressive temporary increases to the spillway elevation. Nine scenarios considered incremental 100mm increases to the spillway elevation with a constant 100mm of freeboard maintained for all scenarios (i.e. FSL is maintained at 100mm below the spillway RL).
- Scenarios 3.1 to 3.5 assessed the potential impact of increasing the storage capacity of the completed Wises upper reservoir through the additional removal of waste rock material currently placed in the existing open cut pit. A total of five scenarios considered progressive 0.25 $Mm^3$ excavations from 0.5 $Mm^3$ to the maximum possible excavation volume of 1.5 $Mm^3$. For these scenarios the proposed operational spillway RL (551.5 m AHD) was maintained with 100mm of freeboard (i.e. FSL is maintained at 100mm below the spillway RL).

### 2.1.1 Simulation Parameters and Key Objectives Summary

Each scenario was run as a boot-strapped Monte Carlo simulation consisting of 127 realisations. The simulation duration used was as follows:

- Start – 1/12/2019; and
- End – 21/01/2022 (start of stage 3 and refill of Eldridge Pit).

The key objectives were to:

- Target the scheduled stage 2 dewatering duration of 268 days up to the 80$^{th}$ percentile (P80); and
- Adopt operational phase release conditions (refer to Section 1.1) i.e. 400 ML/d day release trigger in the Copperfield River at the proposed release location, 200 to 1 dilution ratio for dissolved zinc (0.5033% release ratio) and a maximum release capacity of 1.0 $m^3$/s (86.4 ML/d).
- A number of additional secondary objectives included:
  - Elimination of the reliance of releases of water from the Copperfield dam to augment discharge potential;
  - Potentially limiting releases to only the 2020/21 wet season; and
  - A reduction in the assumed water consumption of additional disposal options, including (but not limited to) construction activities such as bulk earthworks, dust suppression, etc.

Table 4 **Revised Construction Phase Sensitivity Assessment Scenarios Assessed**

| Scenario | Description | Wises Freeboard RL (m AHD) | Wises Freeboard Volume (ML)[3] | Wises Spillway RL (m AHD) | Wises Initial RL (m AHD) | Wises Initial Volume (GL) | Eldridge Initial RL (m AHD) | Eldridge Initial Volume (GL) | Excess Water (ML) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | Base case | 551 | 612.5 | 551.5 | 493.96 | 0.8077 | 484.49 | 29.203 | 2,458 | Target Stage 2 dewatering duration achieved with a 25 to 1 dilution ratio |
| 1.1 | Freeboard capacity scenarios (no increase to spillway RL) | 551.1 | 490.0 | 551.5 | 493.96 | 0.8077 | 484.49 | 29.2 | 2,336 | -100mm reduction in freeboard[4] |
| 1.2 | | 551.2 | 367.5 | 551.5 | 493.96 | 0.8077 | 484.49 | 29.2 | 2,213 | -200mm reduction in freeboard |
| 1.3 | | 551.3 | 245.0 | 551.5 | 493.96 | 0.8077 | 484.49 | 29.2 | 2,091 | -300mm reduction in freeboard |
| 1.4 | | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,968 | -400mm reduction in freeboard |
| 1.5 | | 551.5 | 0 | 551.5 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,846 | -500mm reduction in freeboard (no freeboard) |
| 2.1 | Increased spillway RL scenarios (freeboard maintained at 100mm) | 551.5 | 123.5 | 551.6 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,846 | +100mm increase to spillway RL |
| 2.2 | | 551.6 | 123.5 | 551.7 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,722 | +200mm increase to spillway RL |
| 2.3 | | 551.7 | 123.5 | 551.8 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,599 | +300mm increase to spillway RL |
| 2.4 | | 551.8 | 123.5 | 551.9 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,475 | +400mm increase to spillway RL |
| 2.5 | | 551.9 | 123.5 | 552.0 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,352 | +500mm increase to spillway RL |
| 2.6 | | 552 | 124.4 | 552.1 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,228 | +600mm increase to spillway RL |
| 2.7 | | 552.1 | 124.4 | 552.2 | 493.96 | 0.8077 | 484.49 | 29.2 | 1,104 | +700mm increase to spillway RL |
| 2.8 | | 552.2 | 124.4 | 552.3 | 493.96 | 0.8077 | 484.49 | 29.2 | 980 | +800mm increase to spillway RL |
| 2.9 | | 552.3 | 124.4 | 552.4 | 493.96 | 0.8077 | 484.49 | 29.2 | 855 | +900mm increase to spillway RL |
| 3.1 | Additional Wises storage only (no increase to spillway RL, freeboard maintained at 100mm)[5] | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 482.89 | 28.704 | 1,469 | ~0.5 $Mm^3$ excavation |
| 3.2 | | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 482.27 | 28.454 | 1,220 | ~0.75 $Mm^3$ excavation |
| 3.3 | | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 481.43 | 28.205 | 971 | ~1.0 $Mm^3$ excavation |
| 3.4 | | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 480.68 | 27.953 | 717 | ~1.25 $Mm^3$ excavation |
| 3.5 | | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | ~1.5 $Mm^3$ excavation |
| 4.1 | Reduced release capacity | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | 1$m^3$/s release capacity |
| 4.2 | Delay releases | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | No releases until start of '20/21 wet season |
| 4.3 | No dam releases | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | Turn off Copperfield Dam releases. |
| 4.4 | No additional disposal | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | No additional disposal options |
| 4.5 | Reduced additional disposal | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | 0.5 ML/d additional disposal |

[3] Freeboard volumes presented here are prior to development of a revised storage curve for the constructed wises upper reservoir incorporating the full 1.5$Mm^3$ of waste rock excavation from the existing Wises open cut pit
[4] Differemnce between FSL and spillway RL
[5] The assessment of these scenarios was completed prior to development of a revised storage curve for the constructed wises upper reservoir. The additional storage volume provided by the waste rock excavation was simulated by removal of an equivalent volume of water from the Eldridge Pit starting volume.

| Scenario | Description | Wises Freeboard RL (m AHD) | Wises Freeboard Volume (ML)[3] | Wises Spillway RL (m AHD) | Wises Initial RL (m AHD) | Wises Initial Volume (GL) | Eldridge Initial RL (m AHD) | Eldridge Initial Volume (GL) | Excess Water (ML) | Comments |
|---|---|---|---|---|---|---|---|---|---|---|
| 4.6 | Reduced release capacity + no dam releases | 551.4 | 122.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | • $1m^3/s$ release capacity<br>• Turn off Copperfield Dam releases. |
| 4.7 | Reduced release capacity + no dam releases + reduced additional disposal | 551.4 | 22.5 | 551.5 | 493.96 | 0.8077 | 479.87 | 27.706 | 472 | • $1m^3/s$ release capacity<br>• Turn off Copperfield Dam releases<br>• 0.5 ML/d additional disposal |

## 3.0 Revised Construction Phase Sensitivity Assessment Modelling Results

### 3.1 Freeboard Capacity Scenarios (Scenarios 1.1 to 1.5)

The requirement to maximise water storage in the Wises upper reservoir occurs towards to end of the stage 2 dewatering and must be maintained until the start of stage 3 when Eldridge lower reservoir is returned to its MOL (refer to Table 1). Table 5 below shows the results for scenarios 1.1 to 1.5 which considered potential reductions in the freeboard (achieved by increasing the FSL whilst maintaining the spillway RL) for Wises upper reservoir during the construction phase:

- While each progressive reduction in freeboard allows for some increases in dilution ratio, even when the freeboard is reduced to zero, the dilution ratio required to meet the stage 2 dewatering duration target is 34 to 1 which is still significantly lower than the target of 200 to 1.
- The results indicate that the minimum freeboard that could be temporarily applied during the construction phase to reduce the likelihood of an uncontrolled overflow is 100mm (scenario 1.4). This criterion was subsequently adopted for all further scenarios – i.e. FSL is 100m below the spillway RL.

**Table 5 Required Dilution Ratios for Freeboard Capacity Scenarios**

| Scenario | Description | Required Dilution Ratio (Zinc (F)) | P80 Stage 2 Duration (Target 268 Days) | Comments |
|---|---|---|---|---|
| 0 | Basecase (500mm freeboard) | 25:1 | 271 | Target Stage 2 dewatering duration achieved with a 25 to 1 dilution ratio |
| 1.1 | -100mm reduction in freeboard | 27.5:1 | 272 | |
| 1.2 | -200mm reduction in freeboard | 29:1 | 273 | |
| 1.3 | -300mm reduction in freeboard | 31:1 | 274 | |
| 1.4 | -400mm reduction in freeboard | 32.5:1 | 273 | Adopted for further assessment. |
| 1.5 | -500mm reduction in freeboard (no freeboard) | 34:1 | 274 | Uncontrolled (overflow) discharges noted at P5 result |

### 3.2 Increased Spillway RL Scenarios (Scenarios 2.1 to 2.9)

Adopting scenario 1.4 as the basis for comparison (100mm of freeboard), results for the increased spillway RL scenarios (2.1 to 2.9) are shown below in Table 6:

- Initial increases to the spillway RL have only a limited impact on the required dilution ratio. For example, a 300mm increase (scenario 2.3) only results in a dilution ratio of 36 to 1.
- At the maximum possible spillway increase assessed (scenario 2.9, 900mm increase), the dilution ratio required to meet the stage 2 dewatering duration is 60 to 1. While this is a notable improvement on the base case (scenario 0) of 25 to 1, it still falls significantly short of the required 200 to 1 target. In addition, the embankment crest freeboard is reduced to only 300mm which could result in wave run up over the crest and potentially affect the embankment integrity.

**Table 6 Required Dilution Ratios for Increased Spillway RL Scenarios**

| Scenario | Description | Required Dilution Ratio (Zinc (F)) | P80 Stage 2 Duration (Target 268 Days) | Comments |
|---|---|---|---|---|
| **1.4** | **-400mm reduction in freeboard** | **32.5:1** | **273** | **Basis for comparison – adopted 100mm freeboard** |
| 2.1 | +100mm increase to spillway RL | 32.5:1 | 273 | Similar result to scenario 1.4 |
| 2.2 | +200mm increase to spillway RL | 34:1 | 274 | |
| 2.3 | +300mm increase to spillway RL | 36:1 | 272 | |
| 2.4 | +400mm increase to spillway RL | 38:1 | 270 | |
| 2.5 | +500mm increase to spillway RL | 41:1 | 270 | |
| 2.6 | +600mm increase to spillway RL | 45:1 | 271 | |
| 2.7 | +700mm increase to spillway RL | 50:1 | 272 | |
| 2.8 | +800mm increase to spillway RL | 55:1 | 272 | |
| 2.9 | +900mm increase to spillway RL | 60:1 | 272 | Maximum possible spillway increase. At this point freeboard to the embankment crest is reduced to 300 mm. |

### 3.3 Additional Wises Storage Scenarios (Scenarios 3.1 to 3.5)

Adopting scenario 1.4 as the basis for comparison (100mm of freeboard), results for the additional Wises storage scenarios (3.1 to 3.5) are shown below in Table 8:

- The progressive increases to the Wises upper reservoir capacity through the additional excavation of waste rock material provide a significant increase in the required dilution ratio such that at the maximum possible excavation volume of 1.5 $Mm^3$, the stage 2 dewatering target can be achieved with a 1 to 165 dilution ratio.
- Scenario 3.5 (1.5 $Mm^3$ excavation) was consequently adopted as the preferred solution and adopted for additional assessment (Sections 4.0 and 3.4).

**Table 7 Required Dilution Ratios for Additional Wises Storage Scenarios**

| Scenario | Description | Required Dilution Ratio (Zinc (F)) | P80 Stage 2 Duration (Target 268 Days) | Comments |
|---|---|---|---|---|
| 1.4 | -400mm reduction in freeboard | 32.5:1 | 273 | Basis for comparison – adopted 100mm freeboard |
| 3.1 | ~0.5 $Mm^3$ excavation | 45:1 | 270 | |
| 3.2 | ~0.75 $Mm^3$ excavation | 55:1 | 269 | |
| 3.3 | ~1.0 $Mm^3$ excavation | 70:1 | 267 | |
| 3.4 | ~1.25 $Mm^3$ excavation | 100:1 | 268 | |
| 3.5 | ~1.5 $Mm^3$ excavation | 165:1 | 271 | Maximum possible excavation volume. Adopted for further assessment. |

### 3.4 Additional Objectives Scenarios (Scenarios 4.1 to 4.7)

Adopting scenario 3.5 as the basis for comparison (1.5 $Mm^3$ excavation of waste rock for Wises and 100mm of freeboard), results for the additional objectives scenarios (4.1 to 4.9) are shown below in Table 8:

- A reduction in the maximum release capacity from 1.5 $m^3/s$ to1.0 $m^3/s$ only resulted in a minimal reduction in the required dilution ratio from165 to 1 to 150 to 1 (scenario 4.1). Consequently, in accordance with the objectives outlined in Section 2.1.1, a maximum release capacity of 1.0 $m^3/s$ has been adopted for the construction phase (consistent with the operational phase).
- Delaying release until the commencement of the 2020/21 wet season resulted in a reduction of required dilution ratio to 25 to 1 (scenario 4.2) and has been discounted as a practical option.
- Scenario 4.3 considered turning off the use of water releases from the Copperfield Dam in order to augment potential release opportunity at the proposed release location. Based on small reduction in required dilution ratio it has been determined that Copperfield Dam releases will not be required as a means of enhancing discharge potential.
- Scenarios 4.4 and 4.5 considered changes to the assumed volume of water that could be disposed of via additional consumptive options. While reducing the volume to 0 ML/d (scenario 4.4) resulted in an unacceptable reduction in the required ratio, a reduction from 1.0 to 0.5 ML/d resulted in a reduction of required dilution ratio to 105 to 1 which is considered acceptable.
- In order to assess the impact on required dilution ratio all three options were combined (scenario 4.7). The overall reduction in required dilution ratio to 80 to 1 was considered acceptable and adopted for subsequent analysis to determine the additional temporary increase to the Wises spillway RL that would be required in order to meet the objective of a required dilution ratio of 200 to 1.

**Table 8 Required Dilution Ratios for Additional Objectives Scenarios**

| Scenario | Description | Required Dilution Ratio (Zinc (F)) | P80 Stage 2 Duration (Target 268 Days) | Comments |
|---|---|---|---|---|
| **3.5** | **~1.5 $Mm^3$ excavation and 100mm of freeboard** | **165:1** | **271** | **Basis for comparison** |
| 4.1 | 1$m^3$/s max release capacity | 150:1 | 271 | Adopted |
| 4.2 | No releases until start of '20/21 wet season | 25:1 | 272 | Not practical |
| 4.3 | Turn off Copperfield Dam releases. | 150:1 | 271 | Adopted |
| 4.4 | No additional disposal options | 70:1 | 274 | Not practical |
| 4.5 | 0.5 ML/d additional disposal (reduced from a baseline of 1.0 ML/d) | 105:1 | 272 | Adopted |
| 4.6 | • 1$m^3$/s release capacity<br>• Turn off Copperfield Dam releases. | 130:1 | 268 | Moderate impact on dilution ratio |
| 4.7 | • 1$m^3$/s release capacity<br>• Turn off Copperfield Dam releases<br>• 0.5 ML/d additional disposal | 80:1 | 272 | Acceptable reduction in dilution ratio. Adopted. |

## 4.0 Revised Construction Phase Assessment

### 4.1 Assumptions and Objectives

Based on the results of the initial sensitivity assessment (section 3.0), the following assumptions were made for the revised construction phase assessment:

- A maximum discharge capacity of 1.0 $m^3/s$;
- No releases from the Copperfield Dam ; and
- Additional disposal of 0.5 ML/d (such as bulk earthworks, dust suppression, etc.).

During sensitivity assessment it was noted that as the excess construction volume approached zero as a result of the additional measures employed to enhance the capacity of Wises upper reservoir model, results became increasingly sensitive to assumed effective (i.e. after duty consideration) pump capacity. Consequently, in order to ensure the results were not limited by pumping, the duty assumption was increased from 20 to 22 hours. In addition, the final modelling was also able to utilise a revised storage curve for the constructed Wises upper reservoir inclusive of the excavation of the additional 1.5 $Mm^3$ of waste rock material.

The key objective was, as previously noted:

- Achieve the stage 2 dewatering duration of 268 days whilst employing a release dilution ratio of 200 to 1 (0.5033% release ratio) which is based on the contaminant of most concern (dissolved zinc)

In order to achieve this, temporary increases to the RL of the Wises upper reservoir were considered. From Table 9 it can be seen that a temporary increase of the spillway RL by 300mm (and an increase in the FSL to 100m below the spillway) was sufficient to meet the key objective of meeting the stage 2 dewatering duration objective of 268 days at a 200 to 1 dilution ratio.

**Table 9 Final Construction Phase Scenarios**

| Scenario | Description | Required Dilution Ratio (Zinc (F)) | P80 Stage 2 Duration (Target 268 Days) | Comments |
|---|---|---|---|---|
| 1 | 0mm increase to spillway RL | 105:1 | 270 | 467 ML excess |
| 2 | +100mm increase to spillway RL | 130:1 | 274 | 344 ML excess |
| 3 | +200mm increase to spillway RL | 155:1 | 273 | 221 ML excess |
| 4 | +300mm increase to spillway RL | 200:1 | 270 | 97 ML excess Adopted |

## 5.0 Conclusions

A key requirement of the Project construction phase is the need to dewater the existing Eldridge Pit down to RL 305 m AHD in order to facilitate various construction works associated with both the access and tailrace tunnel construction. The revised dewatering programme will take place in two distinct phases – stage 1 which will transfer approximately 7.58 GL (the maximum volume able to be added to Wises Pit at its current capacity) from Eldridge Pit into the Existing Wises Pit. Upon completion of the proposed Wises upper reservoir embankment the remaining volume of water will be transferred from Eldridge Pit to the fully constructed Wises upper reservoir (stage 2). Based on the current water inventory in both pits, the stage 2 transfer could result in a final water level in the Wises upper reservoir of approximately 552.60 m AHD – approximately 1.1 m above the planned spillway elevation and 1.6m above the FSL. This results in an estimated construction phase water excess of 1.85 GL or 2.56 GL depending if spillway or FSL elevation was adopted as the maximum water level in the Wises upper reservoir.

Subsequent to the previous assessment (Appendix A), Genex has been able to employ additional design and water management measures to significantly reduce the volume of the excess construction water volume:

- Excavation of up to 1.5 $Mm^3$ of waste rock material from the existing wises pit to provide an additional 1.5 GL of additional storage in the constructed Wises upper reservoir; and
- The temporary storage of water in the Wises upper reservoir above the operational phase FSL and spillway elevation.

These combined measures have significantly reduced the excess construction water volume allowing for releases made during the construction phase to be at the same dilution ratio (200 to 1) and same maximum rate (1.0 $m^3/s$) as proposed for the operational phase. In addition, reliance on releases from the Copperfield Dam to augment release opportunity has been discarded and the rate of water disposed of via additional measures such as dust suppression and bulk earthworks has been reduced to 0.5 ML/d.

The proposed temporary release conditions and assumptions during the construction phase are summarised below in Table 10.

**Table 10 Proposed Temporary Construction Phase Release Conditions**

| Aspect | Proposed Condition | Comment |
|---|---|---|
| Copperfield River release trigger | 400 ML/d | As per operational phase. Releases may be made at any time during the construction phase as long as the receiving flow is in excess of the trigger. |
| Dilution ratio | 200:1 | As per operational phase |
| Release ratio | 0.503% | As per operational phase |
| Release capacity | 1 $m^3/s$ | As per operational phase |
| Temporary spillway RL | 551.8 m AHD | For construction phase only |
| Temporary FSL RL | 551.7 m AHD | For construction phase only |

## 6.0 References

Entura. (2016). *Kidston Pumped Storage Project Bankable Feasibility Study - Hydrological Report.*

McConnell Dowel - John Holland JV. (2018). *Kidston Pumped Storage Project ECI Design Water Management.*

## Appendix A

**Previous Preliminary Construction Phase Assessment**

AECOM Imagine it. Delivered.

# Memorandum

| | | | |
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| To | | Page | 1 |
| CC | | | |
| Subject | Preliminary Construction Assessment | | |
| From | | | |
| File/Ref No. | | Date | 25-Oct-2018 |

## 1.0 Introduction

This appendix presents the results of a number of modelling scenarios and sensitivities completed in order to define the rate of release required by the Kidston Pumped Storage Project (the Project) during the construction phase. During this period a rate of water release higher than during the operational phase is required. This appendix is

## 2.0 Construction Phase Scheduling and Assumptions

### 2.1 Introduction

The dewatering of Eldridge Pit must be completed in order to facilitate access for the completion of the tailrace tunnel outlet and pit wall stabilisation works. At the approximate time of writing, current water levels in both Wises and Eldridge Pits indicate that the volume of water required to be pumped from Eldridge Pit exceeds both the current (undeveloped) and constructed capacity of Wises Pit ('excess construction water'). In order for the tailrace outlet works to commence in accordance with planned construction scheduling the Project water balance must achieve an overall net loss equivalent to the estimated excess construction water. However, the net loss is the balance of a number of inflows (rainfall, runoff, seepage interception system (SIS) and groundwater inflows and topup water from the Copperfield Dam) and outflows (controlled releases, evaporation).

The proposed operational phase controlled release assumptions provide sufficient release potential for the operational phase of the Project but, when applied to the construction phase do not allow for the release of the volume of water required to meet proposed construction scheduling. In order to determine suitable temporary release conditions for the construction period the following were completed:

- Detailed review of the proposed construction and pit dewatering staging schedule in order to confirm and define:
  - Dewatering volumes and rates;
  - Critical dates;
  - Key schedule-based objectives; and
  - Model objective functions – i.e. key metrics with which to compare the relative efficacy of each model scenario.
- Review and develop model assumptions for the transition of Wises Pit from its existing condition as an open cut mine pit with an external (runoff) catchment to its constructed condition with an extensive water surface area and no external catchment.
- Complete a number of model simulations to test the sensitivity of key assumptions (dilution ratio, discharge capacity, catchment area and runoff coefficient for Wises Pit and additional water disposal) against adopted model objective functions.

## 2.2 Modelled Construction and Dewatering Schedule

Modelling of the construction phase has considered four key stages associated with the dewatering of Eldridge Pit and construction of the power hall access tunnel, tailrace outlet works and the Wises upper reservoir embankment. Table 1 summarises the key construction stages, dates and durations.

**Table 1 Key Construction Phase Stages**

| Stage | Description | Stage Schedule Details | | |
|---|---|---|---|---|
| | | Scheduled Stage Start | Scheduled Stage End | Scheduled Stage Duration (days) |
| 1 | Initial dewatering of Eldridge Pit for safe access to allow main access tunnel construction | 11/01/2019 | | |
| 2 | Continue dewatering of Eldridge Pit up to the maximum allowable fill (RL 525m AHD) in the existing Wises Pit without impacting ongoing embankment works. | | 4/03/2019 (stage 1 and 2) | 52 (stage 1 and 2) |
| 3 | Final dewatering of Eldridge Pit to the completed Wises upper reservoir. Eldridge lowered to RL suitable for the safe construction of tailrace outlet works. | 8/01/2020 | 14/07/2020 | 188 |
| 4 | Refill of Eldridge Pit to MOL RL (328.4 m AHD) | 11/10/2021 | 21/10/2021 | 1,004 (total from start of stage 1 to end of stage 4) |

It should be noted that this timetable is illustrated only and based on construction commencing in January 2019 which is decided upon a number of factors, and may be subject to change.

The key model objective function adopted was the scheduled duration of stage 3 as:

- On-time achievement of stage 3 completion is critical to the commencement of key construction activities associated with the tailrace tunnel outlet works.
- On-time completion of stage 3 is notably dependant on the availability of the constructed Wises upper reservoir to receive the remaining volume from Eldridge Pit.
- Current water levels in both Wises and Eldridge Pits imply insufficient capacity in the fully constructed Wises upper reservoir to receive all of the estimated stage 3 dewatering volume.
- On-time completion of stage 1 dewatering is not anticipated to be limited by the ability of the current Wises Pit to receive the estimated stage 1 dewatering volume (required to complete access tunnel works).
- Completion of stage 2 dewatering is not required for construction accessibility in Eldridge Pit – the stage 2 volume is effectively the balance of the current undeveloped Wises Pit less its current volume and volume pumped from Eldridge during stage 1.

### 2.2.1 Adopted Model Performance Target (Objective Function)

Reliability up to the 80$^{th}$ percentile (P80) was adopted as the target for achieving the modelled stage 3 dewatering duration of 188 days.

## 2.3 Estimated Dewatering Volumes, Excess Water and Adopted Pump Rates

Table 2 details the dewatering volumes associated with stages 1 to 3. Note that Stage 4 is simply the refilling of Eldridge Pit to MOL and is not considered to be of material interest to the assessment. From the table it can be seen that the end water RL for the constructed Wises upper reservoir upon completion of stage 3 is estimated to be 552.6 m AHD. This should be contrasted with the proposed spillway elevation of RL 551.5 m AHD and the proposed FSL of 551 m AHD. This effectively results in an excess construction volume of:

- Approximately 1.85 GL if Wises upper reservoir is filled to the spillway elevation (551.5 m AHD) at the end of stage 3; or
- Approximately 2.56 GL if Wises upper reservoir is filled to the FSL elevation (551 m AHD) at the end of stage 3.

Genex is currently investigating measures to temporarily increase the storage capacity of the Wises upper reservoir during the dry season during construction however this has not yet been confirmed. Consequently, for the purpose of modelling the construction phase it has been assumed that the completion of stage 3 must be achieved without the Wises constructed reservoir exceeding the FSL of 551 m AHD as:

- Access to the Eldridge Pit tailrace construction works is required to be maintained from the scheduled end of stage 3 (14/07/2020) to the start of stage 4 (11/10/2021) (), a period which includes the 2020/2021 wet season when any temporary increase to the capacity of the Wises upper reservoir would likely have to be removed.
- Continued storage of water in Wises upper reservoir at the spillway elevation or the FSL (551.5 m AHD) would result in a significant increase in the likelihood of uncontrolled discharges particularly during the 2020/2021 wet season.

**Table 2 Construction Dewatering Volumes**

| Stage | Eldridge Pit | | | | Pump Volume | Existing Wises Pit/Upper Reservoir | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Start RL | Start Vol. | End RL | End Vol. | GL | Start RL | Start Vol. | End RL | End Vol. |
| | m | GL | m | GL | | m | GL | m | GL |
| 1 | 484.49 | 29.092 | 465 | 23.414 | 5.678 | 493.96 | 0.80 | 518.50 | 6.48 |
| 2 | 465 | 23.414 | 458 | 21.509 | 1.905 | 518.50 | 6.48 | 524.80 | 8.38 |
| 3 | 458 | 21.509 | 305 | 1.062 | 20.447 | 524.80 | 8.38 | 552.60[1] | 28.83[2] |
| 4 | Refill Eldridge to MOL RL (328.4 m AHD) | | | | | | | | |

Based on the key construction stages in Table 1 and the estimated dewatering volumes in Table 2 the following preliminary pump rates have been adopted for the construction phase modelling:

- Stage 1 and 2 – 2,040 L/s (176 ML/d); and
- Stage 3 – 1,507 L/s (130 ML/d).

## 2.4 Construction of Wises Upper Reservoir Embankment

The transition of the existing Wises open cut pit into the Wises upper reservoir will result in significant changes to its water balance throughout the duration of the construction phase. While detailed construction scheduling has not yet been completed, a number of high level assumptions have been adopted to reflect the proposed construction of the upper reservoir and its impact on the water balance. Referring to Figure 1:

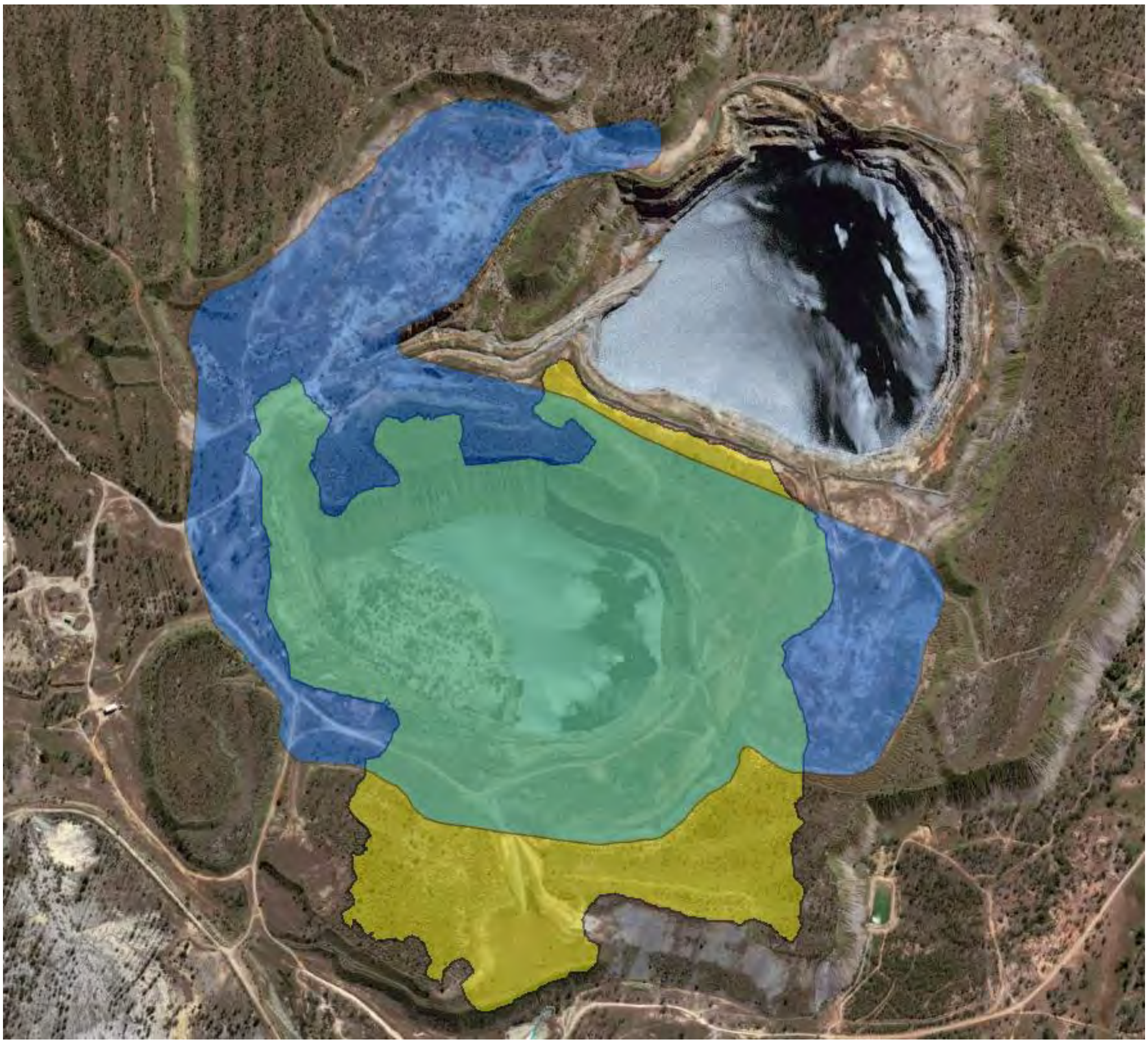
- The existing Wises Pit has an external catchment of approximately 105 Ha
- The Wises upper reservoir will have an internally-draining catchment of approximately 125 Ha and no external catchment; and
- Approximately 75 ha of the existing Wises Pit external catchment lies within the proposed Wises upper reservoir, an internally-draining catchment.

[1] Indicates resultant water level is in excess of the FSL (551 m AHD) and spillway (551.5 m AHD) elevations.
[2] Indicates that the resultant water volume is in excess of the Wises upper reservoir storage capacity of 26.74 GL (at FSL) and 27.36 GL (at spillway elevation.)

Adopted catchment area assumptions for Wises Pit during the construction phase model simulation are summarised in Table 3. A runoff coefficient of 0.33 was adopted for the Wises Pit external catchment. This is consistent with that used for Eldridge Pit (McConnell Dowell – John Holland JV, 2018) and (Entura, 2016) but does not represent a calibrated value. Sensitivity to the runoff coefficient as well as assumed catchment areas are discussed in Section 4.2.

**Table 3 Adopted Wises Pit Catchment Area Assumptions for Construction Simulation**

| Date | Description | Wises Catchment | | Comment |
|---|---|---|---|---|
| | | Runoff | Internal (Direct Rainfall) | |
| 11/01/2019 | Start of model construction simulation and stage 1 dewatering | 75 Ha less the water surface area (calculated daily during model simulation) | Based on water surface area (calculated daily during model simulation) | Assumes existing external areas outside embankment diverted as early works. This assumption has been sensitivity tested (refer to 4.2) |
| 1/07/2019 | Existing drainage paths away from pit blocked by embankment earthworks | 125 ha less the water surface area (calculated daily during model simulation) | Based on water surface area (calculated daily during model simulation) | 6 months into critical construction period. |
| 08/01/2020 | Start of stage 3 dewatering | 0 Ha | 125 Ha | Conservative assumption that assumes immediate inundation of runoff catchment upon commencement of stage 3 dewatering. |
| 11/10/2021 | Commence refill of Eldridge | 0 Ha | 125 Ha | End of critical construction period/model simulation |



| Catchment | Area (Ha) | Ref. | Comment |
|---|---|---|---|
| Existing Wises Pit catchment (yellow and green areas) | 105 (total – yellow and green areas)<br>30 (outside Wises upper reservoir footprint – yellow area) | | Early works are assumed to divert any of the existing Wises Pit catchment that falls outside of the proposed Wises upper reservoir footprint (yellow area only) in order to reduce the volume of external runoff entering Wises Pit during construction. The resultant area of 75 ha (green area) assumed to be the un-divertible remaining external catchment at start of construction phase. This assumption has been sensitivity tested (refer to Section 4.2). |
| Wises upper reservoir footprint | 125 | | Internally draining catchment for constructed Wises upper reservoir. |
| Area of overlap | 75 | | Assumed remaining external catchment reporting to Wises Pit during initial construction period i.e. prior to stage 3 dewatering. |

**Figure 1 Assumed Wises Pit Catchments during Construction Phase**

# 3.0 Construction Phase Modelling

## 3.1 Construction Scenarios Assessed

A number of scenarios and sensitivities were assessed for the construction simulation as summarised in Table 4 below:

- Scenario 3.1 was the adopted operational phase dilution ratio which was adopted as the base case with which to compare.
- Scenarios 3.2 to 3.6 assessed a range of lower dilution ratios with the assumed operational release capacity of 1 $m^3/s$ (86.4 ML/d).
- Scenarios 3.7 to 3.11 considered an increased release capacity of 1.5 $m^3/s$ (129.6 ML/d).
- Scenario 3.12 adopted the base case dilution ratio for sensitivity assessment of key Wises Pit assumptions.
- Scenarios 3.13 to 3.16 assumed a large runoff catchment (no early catchment diversion works ) and assessed the sensitivity of the Wises pit runoff coefficient.
- Scenarios 3.17 to 3.19 assessed the sensitivity of the Wises pit runoff coefficient only; and
- Scenarios 3.20 to 3.25 assessed the potential impact of releases from the Copperfield Dam as a method to augment flow in the Copperfield River (and increase the release potential) as well as the impact of additional water disposal (e.g. dust suppression, construction, etc.).

### 3.1.1 Simulation Parameters

Each scenario was run as a boot-strapped Monte Carlo simulation consisting of 127 realisations. The simulation duration used was as follows:

- Start – 1/01/2019
- End – 11/10/2021 (start of stage 4 and refill of Eldridge Pit).

The adopted key objective function was to achieve the scheduled stage 3 dewatering duration of 188 days up to the 80$^{th}$ percentile (P80) result.

**Table 4 Scenario 3 (Construction Phase) Sensitivities Assessed**

| Scenario 3 Sensitivity | Description | Wises Initial Catchment Area (Ha) | Wises Runoff Coeff. | Total Mn Dilution Ratio (1:xx) | Release Ratio (%) | Release Capacity (m3/s) | Additional Disposal (ML/d) | Copperfield Dam Release | Comment |
|---|---|---|---|---|---|---|---|---|---|
| 3.1 | Dilution Base case | 75 | 0.33 | 200 | 0.513 | 1 | N/A | N/A | Operational release conditions for comparison |
| 3.2 | Dilution sensitivities | 75 | 0.33 | 100 | 1.038 | 1 | N/A | N/A | Dilution Sensitivity |
| 3.3 | | 75 | 0.33 | 50 | 2.160 | 1 | N/A | N/A | Dilution Sensitivity |
| 3.4 | | 75 | 0.33 | 35 | 3.195 | 1 | N/A | N/A | Dilution Sensitivity |
| 3.5 | | 75 | 0.33 | 15 | 8.525 | 1 | N/A | N/A | Dilution Sensitivity |
| 3.6 | | 75 | 0.33 | 10 | 15.880 | 1 | N/A | N/A | Dilution Sensitivity |
| 3.7 | | 75 | 0.33 | 100 | 1.038 | 1.5 | N/A | N/A | Release Cap. Sensitivity |
| 3.8 | | 75 | 0.33 | 50 | 2.160 | 1.5 | N/A | N/A | Release Cap. Sensitivity |
| 3.9 | | 75 | 0.33 | 35 | 3.195 | 1.5 | N/A | N/A | Release Cap. Sensitivity |
| 3.10 | | 75 | 0.33 | 15 | 8.525 | 1.5 | N/A | N/A | Release Cap. Sensitivity |
| 3.11 | | 75 | 0.33 | 10 | 15.880 | 1.5 | N/A | N/A | Release Cap. Sensitivity |
| 3.12 | Adopted dilution base case | 75 | 0.33 | 25 | 4.696 | 1.5 | N/A | N/A | Adopted base case to asses sensitivity of key Wises assumptions |
| 3.13 | Wises assumptions sensitivities | 105 | 0.33 | 25 | 4.696 | 1.5 | N/A | N/A | No early diversion works |
| 3.14 | | 105 | 0.2 | 25 | 4.696 | 1.5 | N/A | N/A | No early diversion works/low runoff coeff |
| 3.15 | | 105 | 0.4 | 25 | 4.696 | 1.5 | N/A | N/A | No early diversion works/higher runoff coeff |
| 3.16 | | 105 | 0.5 | 25 | 4.696 | 1.5 | N/A | N/A | No early diversion works/higher runoff coeff |
| 3.17 | | 75 | 0.2 | 25 | 4.696 | 1.5 | N/A | N/A | Low runoff coeff. |
| 3.18 | | 75 | 0.4 | 25 | 4.696 | 1.5 | N/A | N/A | Higher runoff coeff. |
| 3.19 | | 75 | 0.5 | 25 | 4.696 | 1.5 | N/A | N/A | Higher runoff coeff. |
| 3.20 | Additional disposal option/ Copperfield Dam release | 75 | 0.33 | 100 | 1.038 | 1.5 | 1.0 | 4,654 ML @ 500ML/d | 1.0 ML/d additional disposal capacity |
| 3.21 | | 75 | 0.33 | 50 | 2.160 | 1.5 | 1.0 | 4,654 ML @ 500ML/d | 1.0 ML/d additional disposal capacity |
| 3.22 | | 75 | 0.33 | 35 | 3.195 | 1.5 | 1.0 | 4,654 ML @ 500ML/d | 1.0 ML/d additional disposal capacity |
| 3.23 | | 75 | 0.33 | 25 | 4.696 | 1.5 | 1.0 | 4,654 ML @ 500ML/d | 1.0 ML/d additional disposal capacity |
| 3.24 | | 75 | 0.33 | 15 | 8.525 | 1.5 | 1.0 | 4,654 ML @ 500ML/d | 1.0 ML/d additional disposal capacity |
| 3.25 | | 75 | 0.33 | 10 | 15.880 | 1.5 | 1.0 | 4,654 ML @ 500ML/d | 1.0 ML/d additional disposal capacity |

## 4.0 Construction Period Modelling Results

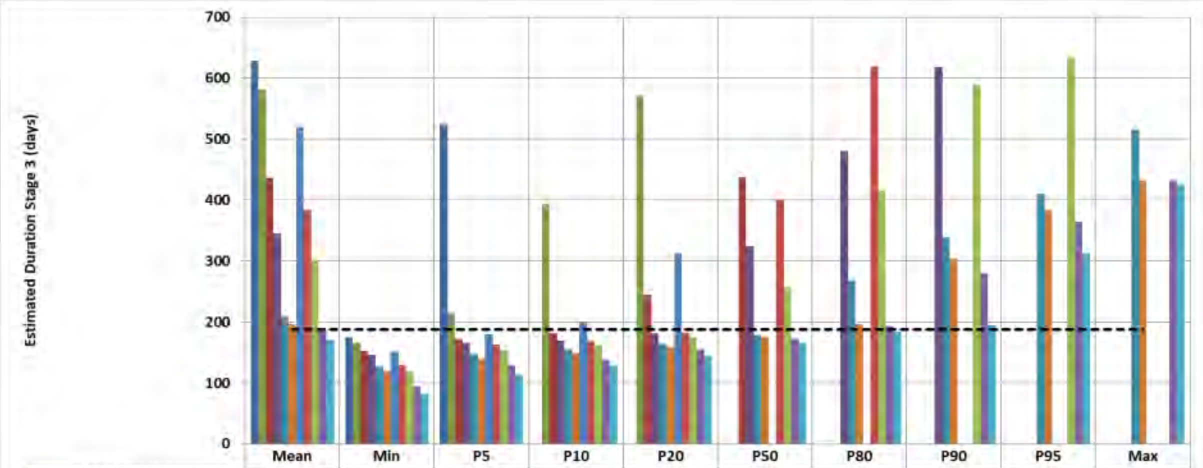
### 4.1 Dilution Ratio Assessment (Scenarios 3.1 to 3.11)

Figure 2 shows the estimated stage 3 dewatering duration for scenarios 3.1 to 3.11. Where no duration is recorded the scenario was unable to dewater the required volume from Eldridge Pit. These scenarios considered potential total manganese dilution ratios ranging from the operational phase 200:1 down to 10 to 1 (i.e. release ratios from 0.513% to 15.880%). A higher discharge capacity of 1.5 $m^3$/s was also assessed (scenarios 3.7 to 3.11). In summary:

- Only scenarios 3.6, 3.10 and 3.11 were able to approach or exceed the target duration of 188 days for the P80 result. These results however are achieved with the dilution ratios of 10 and 15 to 1 (release ratios of 8.525% and 15.880%) which were not considered too low as:
  - Dilution ratios of 10 to 1 and 15 to 1 both result in a mass balanced (including hardness modification where relevant) receiving environment concentration that could potentially temporally exceed 10 different WQOs during the proposed construction phase water release.
  - This is reduced to 6 contaminants at a dilution ratio of 35 to 1 (release ratio of 3.195%).
  - Dilution ratios of 10 to 1 and 15 to 1 which have release ratios of 8.525% and 15.880% respectively, would result in a significant increase of release volume to flush volume ratio. This could potentially increase the risk of stranding potential releases in downstream pools and waterholes.
- A notable reduction in overall duration is achieved thought the use of the higher discharge capacity (scenarios 3.2 to 3.6 compared to scenarios 3.7 to 3.11). For example, when comparing the P50 result for scenarios 3.4 and 3.9, the increased release capacity reduces the estimated stage 3 duration from 324 to 258 days respectively.
- The operational phase dilution ratio of 200:1 (scenario 3.1, release ratio of 0.513%) is unable to complete the stage 3 dewatering objective at all probabilities from P10 upwards and only the minimum result meets the 188 day objective.

Based on the initial assessment of dilution ratios and release capacity the optimum temporary release conditions for the construction phase:

- Requires a release capacity of 1.5 m3/s; and
- A total manganese dilution ratio lower than 35 to1 (release ratio of 3.195%) but greater than 15 to 1 (release ratio of 8.525%).
- Consequently, a total manganese dilution ratio of 25:1 (release ratio of 4.696%) was adopted for the purpose of additional sensitivity testing as:
  - The 25:1 dilution ratio provides the optimum combination of reduction to the estimated duration of stage 3 dewatering with the least number of additional WQO exceedances when comparing (a dilution ratio of 35 to 1) with the lower dilution ratios assessed of 15 to 1 and 10 to 1.
  - The 25:1 dilution ratio is higher than that required for 95% species protection for aquatic ecosystems as identified through both DTA assessments.
  - Compared to the lower dilution ratios of 15 to 1 and 10 to 1 examined above, a dilution ratio of 25:1 will reduce the likelihood of potential construction phase releases stranding in downstream pools and waterholes.




| | Mean | Min | P5 | P10 | P20 | P50 | P80 | P90 | P95 | Max |
|---|---|---|---|---|---|---|---|---|---|---|
| 3.1 (200:1@1cumec) | 628 | 175 | 524 | - | - | - | - | - | - | - |
| 3.2 (100:1@1cumec) | 582 | 165 | 215 | 393 | 572 | - | - | - | - | - |
| 3.3 (50:1@1cumec) | 436 | 152 | 172 | 181 | 245 | 438 | - | - | - | - |
| 3.4 (35:1@1cumec) | 345 | 146 | 166 | 170 | 181 | 324 | 480 | 618 | - | - |
| 3.5 (15:1@1cumec) | 210 | 127 | 147 | 155 | 164 | 179 | 268 | 339 | 410 | 516 |
| 3.6 (10:1@1cumec) | 197 | 119 | 140 | 149 | 159 | 176 | 197 | 304 | 384 | 432 |
| 3.7 (100:1@1.5cumec) | 519 | 151 | 180 | 201 | 312 | - | - | - | - | - |
| 3.8 (50:1@1.5cumec) | 384 | 129 | 163 | 168 | 183 | 400 | 620 | - | - | - |
| 3.9 (35:1@1.5cumec) | 302 | 119 | 154 | 162 | 175 | 258 | 415 | 589 | 634 | - |
| 3.10 (15:1@1.5cumec) | 188 | 94 | 129 | 138 | 155 | 172 | 193 | 280 | 364 | 432 |
| 3.11 (10:1@1.5cumec) | 171 | 82 | 114 | 128 | 144 | 166 | 184 | 195 | 313 | 426 |
| Target (188 Days) | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 |

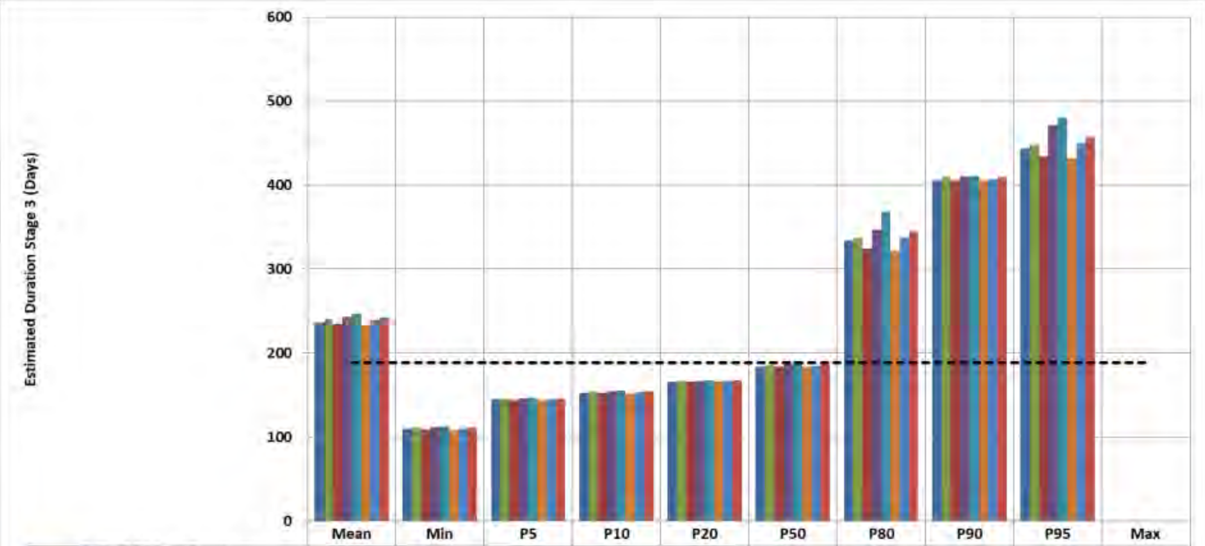
**Figure 2 Estimated Stage 3 Dewatering Duration (Scenarios 3.1 to 3.11)**

### 4.2 Wises Pit Assumptions Sensitivity Assessment (Scenarios 3.12 to 3.19)

Figure 3 shows the estimated stage 3 dewatering duration for scenarios 3.12 to 3.19.

- Generally the estimated stage 3 dewatering duration is relatively insensitive to the area of the runoff catchment or runoff coefficient as:
    - Wises Pit only has a runoff catchment for the first year of the simulation (after the start of stage 3 it is conservatively assumed to be 100% direct rainfall catchment.
    - The water surface area of Wises Pit at RL 525 m AHD (after completion of stage 2) is approximately 31 Ha. This is subtracted from the Wises Pit runoff catchment which leaves:
        - Approximately 44Ha of runoff catchment for the first 6 months or 69 Ha if the early works catchment diversion works are not achieved.
        - Approximately 93Ha for runoff for the next 6 months (most of which is during the dry season when rainfall and runoff are very low).

As a result of the sensitivity assessment a runoff coefficient of 0.33 was adopted for Wises Pit and it was additionally assumed the early works would achieve a partial diversion of some of the Wises Pit runoff catchment. However, as the results indicate, there is only a relatively small impact on the estimated duration of stage 3 dewatering as a result of changes to these assumptions.




| | Mean | Min | P5 | P10 | P20 | P50 | P80 | P90 | P95 | Max |
|---|---|---|---|---|---|---|---|---|---|---|
| 3.12 (25:1 BaseCase) | 237 | 110 | 145 | 153 | 166 | 184 | 334 | 406 | 443 | - |
| 3.13 (25:1/Wises@105Ha/0.33) | 240 | 111 | 146 | 154 | 167 | 186 | 337 | 409 | 448 | - |
| 3.14 (25:1/Wises@105Ha/0.2) | 235 | 109 | 144 | 153 | 166 | 184 | 324 | 406 | 434 | - |
| 3.15 (25:1/Wises@105Ha/0.4) | 243 | 112 | 146 | 154 | 167 | 187 | 347 | 410 | 472 | - |
| 3.16 (25:1/Wises@105Ha/0.5) | 247 | 113 | 147 | 155 | 168 | 190 | 369 | 411 | 480 | - |
| 3.17 (25:1/Wises@75Ha/0.2) | 233 | 108 | 144 | 152 | 166 | 184 | 322 | 406 | 432 | - |
| 3.18 (25:1/Wises@75Ha/0.4) | 239 | 110 | 145 | 153 | 167 | 185 | 338 | 407 | 450 | - |
| 3.19 (25:1/Wises@75Ha/0.5) | 242 | 111 | 146 | 154 | 168 | 187 | 345 | 409 | 458 | - |
| Target (188 Days) | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 |

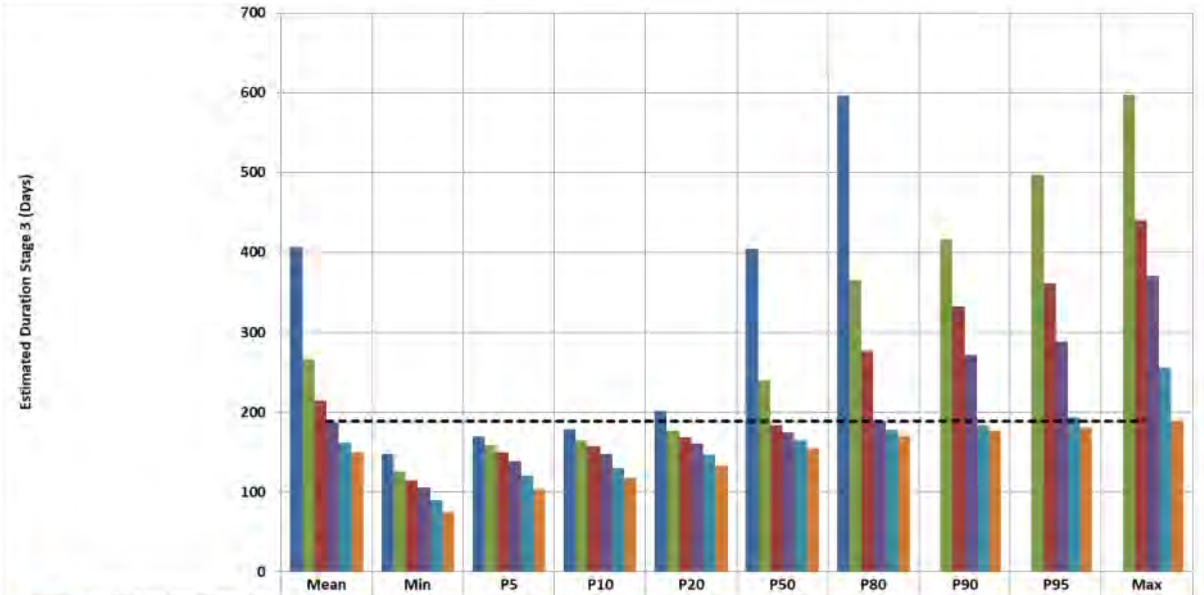
**Figure 3 Estimated Stage 3 Dewatering Duration (Scenarios 3.12 to 3.19)**

## 4.3 Additional Disposal Options and use of the Copperfield Dam (Scenarios 3.20 to 3.25)

While it can be seen from Figure 3 (scenario 3.12) that the adopted dilution ratio of 25:1 (release ratio of 4.696%) is able to meet the target stage 3 dewatering duration of 188 days this is only at the for the P50 result. In order to increase the likelihood of the estimated dewatering duration being met two additional strategies were also considered:

- Use of Genex's existing allocation (4,650 ML) from the Copperfield Dam:
  - The release of the water allocation was used to generate additional streamflow at the proposed release point in order to increase the potential release opportunity.
  - Releases were assumed to commence on 1st January each year and were modelled at 500 ML/d until exhaustion of the 4,.650 ML annual allocation.
- The impact of additional water disposal during the construction phase:
  - A combined 1 ML/d of water disposal was assumed.
  - The exact nature of water disposal options has yet to be determined however preliminary options include the use of pit water during construction for dust suppression and earthworks.

Figure 4 below shows the estimated stage 3 dewatering duration for scenarios 3.20 to 3.25. From the figure it can be seen that the adopted dilution ratio of 25:1 (release ratio of 4.696%, scenario 3.23) meets the stage 3 dewatering duration objective of 188 days. It is however reiterated that this assumes the use of Genex's water allocation from the Copperfield Dam as well as an additional disposal capacity of 1 ML/d (e.g. construction demand, dust suppression, etc.).




| | Mean | Min | P5 | P10 | P20 | P50 | P80 | P90 | P95 | Max |
|---|---|---|---|---|---|---|---|---|---|---|
| 20 (100:1+1ML/d+Dam Rel.) | 406 | 147 | 169 | 178 | 201 | 404 | 596 | - | - | - |
| 21 (50:1+1ML/d+Dam Rel.) | 266 | 125 | 158 | 164 | 176 | 239 | 365 | 416 | 497 | 597 |
| 22 (35:1+1ML/d+Dam Rel.) | 214 | 114 | 149 | 157 | 168 | 183 | 276 | 332 | 361 | 440 |
| 23 (25:1+1ML/d+Dam Rel.) | 186 | 105 | 138 | 147 | 160 | 174 | 188 | 271 | 288 | 370 |
| 24 (15:1+1ML/d+Dam Rel.) | 161 | 89 | 120 | 129 | 146 | 164 | 177 | 183 | 193 | 255 |
| 25 (10:1+1ML/d+Dam Rel.) | 149 | 74 | 103 | 117 | 132 | 154 | 170 | 176 | 180 | 189 |
| Target (188 Days) | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 | 188 |

**Figure 4 Estimated Stage 3 Dewatering Duration (Scenarios 3.20 to 3.25)**

## 5.0 Conclusions

A key requirement of the Project construction phase is the need to dewater the existing Eldridge Pit down to RL 305 m AHD in order to facilitate various construction works associated with both the access and tailrace tunnel construction. Dewatering will take place in two distinct phases – stages 1 and 2 which will transfer approximately 7.58 GL (the maximum volume able to be added to Wises Pit at its current capacity) from Eldridge Pit into the Existing Wises Pit. Upon completion of the proposed Wises upper reservoir embankment the remaining volume of water will be transferred from Eldridge Pit to the fully constructed Wises upper reservoir (stage 3). Based on the current water inventory in both pits, the stage 3 transfer would result in a final water level in the Wises upper reservoir of approximately 552.60 m AHD – approximately 1.1 m above the planned spillway elevation and 1.6m above the FSL. This results in an estimated construction phase water excess of 1.85 GL or 2.56 GL depending if spillway or FSL elevation was adopted as the maximum water level in the Wises upper reservoir.

In order to reduce the likelihood of uncontrolled discharges during the construction phase a conservative target of limiting water storage in the Wises upper reservoir to FSL was adopted and therefore results in an estimated construction phase excess water volume of up to 2.56 GL. Genex is currently investigating the possible temporary increase of the Wises upper reservoir FSL which would reduce this volume however for the purpose of this assessment it has been conservatively assumed that the current FSL of 551m AHD is the maximum permissible pumped water level during the construction phase.

Based on the proposed construction schedule, the 188 day duration of stage 3 dewatering of Eldridge Pit was adopted (at the P80 result) as the key assessment performance target (Section 3.1.1) with which to compare the efficacy of 25 different scenario sensitivities. As a result of completing a total of ten different dilution sensitivities (scenarios 3.2 to 3.11) it was determined that a total dilution ratio of 25:1 (release ratio of 4.696%) was the best compromise between the lower ratios (15 and 10 to 1) (release ratios of 8.525% and 15.880%) that were able to achieve the target stage 3 duration and limiting releases to a more acceptable mass loading. It was also found that a temporary increase in the release capacity to 1.5 $m^3/s$ (129.6 ML/d) during the construction phase would also be required.

Key catchment area assumptions (runoff catchment area and coefficient) adopted for Wises Pit during the construction phase were tested for their overall sensitivity to the key objective function (stage 3 duration). The results indicated that these assumptions did not significantly impact the results due to the relatively small areas involved and the short duration during which the runoff catchment was active during the construction simulation (refer to Section 4.2).

In order to ensure that the estimated stage 3 dewatering duration of 188 days was met at not just the P50 (median) result bit also the target P80 result, two additional measures were adopted. The release of Genex's existing 4,650 ML allocation from the Copperfield Dam (to augment flows in the Copperfield River and increase release potential) as well as an additional water disposal of up to 1 ML/d. This would likely come from various consumptive water demands during the construction phase such as dust suppression and bulk earthworks.

Proposed temporary releases during the construction phase are summarised below in Table 5.

**Table 5 Proposed Temporary Construction Phase Release Conditions**

| Aspect | Proposed Temporary Condition |
|---|---|
| Copperfield River release trigger | 400 ML/d (as per operational phase) |
| Total dilution ratio | 25:1 |
| Release ratio | 4.7% |
| Release capacity | 1.5 $m^3$/s (129.6 ML/d) |

# Appendix L

## Modelling Information

AECOM Imagine it. Delivered.

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# Memorandum

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| Subject | Modelling Information | | |
| From | | | |
| File/Ref No. | | Date | 25-Oct-2018 |

## 1.0 Introduction

This appendix provides additional supporting documentation relating to the development and parameterisation of the water balance model used for the Kidston Pumped Storage Hydro (the Project) Impact Assessment Report (IAR). An additional technical note regarding the derivation and use of dilution ratios and release ratios is also included.

## 2.0 Water Balance Model

### 2.1 Purpose

A dynamic water balance model (WBM) has been developed for the Project using Goldsim probabilistic modelling software. GoldSim is a Monte Carlo simulation software package that is commonly used in the mining, power and water resource industries for water balance modelling. The WBM was developed to provide the basis for a number of different assessments related to the Project IAR.

### 2.2 Initial Project Water Balance Model Development

The Project water balance model was initially developed for the operational phase of the Project (Norconsult, 2018) in order to develop an understanding of the Project water deficit and excess. The spread sheet-based model was developed to run on a daily timestep and was used to estimate the Project water balance using a 128 year deterministic simulation applying climate data obtained from the SILO Data Drill service (DES). In order to provide a suitable basis for assessment of the proposed operational and construction phase release conditions it was considered necessary to utilise a more suitable software platform – GoldSim. Goldsim is a Monte Carlo simulation software package that is commonly used in the mining and water resource industries for water balance modelling.

### 2.3 GoldSim Project Water Balance Model Key Assumptions and Input Data

All key assumptions and input data from the water balance developed by (Norconsult, 2018) were retained in development of the GoldSim model and are shown in Table 1.

**Table 1 Key Water Balance Input Data and Assumptions**

| Aspect | Assumption or Input Data | Source | Comment |
|---|---|---|---|
| Climate data (rainfall and evaporation) | SILO data drill | Queensland Government (DES) | -18.8500 144.1500 |
| Pan evaporation factor | 0.9 | (Norconsult, 2018) | Sensitivity tested by (Norconsult, 2018). |

| Aspect | Assumption or Input Data | Source | Comment |
|---|---|---|---|
| Storage curve data | Volume to area<br>Volume to RL | 12D analysis of site LiDAR and pit contour data as provided by the MCD-JH JV | |
| Eldridge Pit - runoff catchment | 1,714,390 $m^2$ | (Norconsult, 2018) | |
| Eldridge Pit – runoff coefficient | 0.33 | (Norconsult, 2018) | Sensitivity tested by (Norconsult, 2018) |
| Eldridge Pit – direct rainfall catchment | 300,000 $m^2$ | (Norconsult, 2018) | |
| Wises upper reservoir – direct rainfall catchment (constructed) | 1,250,000 $m^2$ | (Norconsult, 2018) | |
| Groundwater inflow | 775 $m^3$/d steady state | (Norconsult, 2018) | Balance of Wises upper reservoir seepage loss and groundwater inflow to Eldridge Pit |
| Seepage interception system | 300,000$m^3$/476 mm rainfall | (Norconsult, 2018) | Derived relationship from seepage pumping data and applied to rainfall for first 4 months of each year.<br>Sensitivity tested by (Norconsult, 2018) |
| Copperfield Dam top up rate | 200 L/s | Assumption | |

### 2.3.1 Simulation Method

In order to validate the performance of the Project under a range of historical climatic conditions, multiple simulations (known as realisations) may be run (either annually or for the proposed 50 year duration of the Project). The only difference between each realisation is the input climate data (rainfall and evaporation) which consists of 127 years (1890 to 2017) of data from SILO Data Drill.

Taking simulation of the life of Project as an example; running on a daily timestep, the first model realisation simulates the proposed 50 year Project utilising climate data from 1890 to 1940. The second realisation then utilises climate data from the period 1891 to 1941, the third from 1892 to 1942, and so on. This process allows for a total of 127 model realisations (known as a boot-strapped Monte Carlo simulation) to be run from the available climate data allows for development of a greater understanding of the Project risk profile associated with the range of potential climatic extremes inherent in the historical climate record.

## 2.4 Key Model Objectives

The water balance model (WBM) includes the ability to simulate potential releases of water from the Project under a range of assumed operating and receiving environment conditions. Model functionality was developed in order to address a number of key assessment objectives as detailed in Table 2 below.

Table 2 Key Impact Assessment Objectives of the GoldSim WBM (Mass Balance)

| Objective | Key Outputs | Comments |
|---|---|---|
| Assess the site water budget (balance of inputs and outputs to identify water excess or deficit | • Excess water<br>• Water deficit (top up water)<br>• Unmitigated (no releases) assessment | |
| Estimated controlled release volumes and frequency | • Release volumes<br>• Number of release days<br>• Number of release events | Potential changes to the existing hydrological flow regime in the Copperfield River have been assessed using the estimated flow at the proposed release point inclusive of potential releases. |
| Estimated release loadings | • Estimated loading of contaminant of most concern in estimated releases. | Load released based on the estimated volume and assumed concentration of the water released from the Project. |
| Understand cumulative impact (downstream catchment inflow dilution) | • Downstream mass balance assessment to assess far-field dilution effects from progressive downstream tributary inflows | Tributary and residual inflows based on IQQM model output |
| Estimate post-release event flushing | • Post-release receiving flow volume<br>• Post-release receiving flow duration | Estimated receiving flow passing the proposed release point after cessation of any release event. |
| Estimate changes to Copperfield River streamflow at the proposed release point | • Streamflow inclusive of release water for the Copperfield River at the proposed release point. | Streamflow data inclusive of release water analysed using RAP to assess potential changes to flow regime |

## 2.5 Additional IQQM Model Development

In order to assess the concentration of the contaminant of most concern downstream of the proposed release point during potential releases, a number of additional nodes were added to the IQQM model. Inflow nodes were added to the IQQM model to represent the impact of major tributary (headwater) and residual inflows on the Copperfield River downstream of the potential release point. Flows from the IQQM model for each inflow node were then added to the GoldSim model for estimation of downstream concentrations of the contaminant of most concern during potential releases. Inflow nodes added to the IQQM model and their total and cumulative catchment areas are shown in Table 3.

**Table 3 IOQQM Copperfield River Inflow Nodes Downstream of Proposed Release Point**

| Inflow | Description | Distance Downstream from Proposed Release Point (km) | Catchment Area (km$^2$) | |
|---|---|---|---|---|
| | | | Total | Cumulative |
| East Creek | Headwater Inflow | 3.5 | 248.5 | 248.5 |
| Kidston (Gilberton Road) | Residual | 6.9 | 10.7 | 259.1 |
| Downstream of Kidston | Residual | 19.6 | 30.7 | 289.8 |
| Charles Creek | Headwater Inflow | 19.6 | 142.1 | 431.9 |
| Oak River | Headwater Inflow | 23.4 | 525.7 | 957.7 |
| Upstream of Soda Creek | Residual | 30.4 | 113.5 | 1,071.1 |
| Soda Creek | Headwater Inflow | 30.4 | 129.4 | 1,200.5 |
| Upstream of Chinaman Creek | Residual | 35.7 | 51.8 | 1,252.3 |
| Chinaman Creek | Headwater Inflow | 35.7 | 112.3 | 1,364.6 |
| Upstream of Einasleigh | Residual | 48.3 | 86.3 | 1,450.9 |
| Einasleigh River at Einasleigh | Headwater Inflow | 48.3 | 5,183.7 | 6,634.6 |

### Model Limitations

While every attempt has been made to ensure that the GoldSim WBM is a representative as possible the following limitations are noted:

- Model results are based on historical climate data (SILO Data Drill), assumed operational rules and a variety of input data and assumptions. While the degree of model complexity is commensurate to the current level of assessment it should be noted that results are presented primarily for the purpose of relative assessment and that absolute results are to be considered within the high level of the input data, assumptions and conceptual operating rules.
- A small number of conceptual operational rules (such as when topup water from the Copperfield Dam is added, at what water level controlled release can be made) have been adopted for the purpose of modelling. Ongoing refinement of the Project design and operational planning will further develop these rules and may not be consistent with the rules adopted for this assessment.
- Modelling has not taken into account potential changes to rainfall and evaporation as a result of climate change.
- Downstream tributary and residual inflows are based on IQQM output. All downstream flows are scaled from the same streamflow record which was calibrated to the Einasleigh stream gauge (917106A - Einasleigh River at Einasleigh). No routing of the inflows was conducted and all downstream inflows are therefore coincident.
- Concentrations (end of pipe (EOP) and receiving environment) are assumed to be fixed and therefore not subject to any temporal variation or variation with flow.

- Modelling is conducted at a daily timestep with release flows calculated daily based on receiving flow and assumed fixed for the duration of the timestep (day).
- The mass balance assumes contaminants are conserved i.e. advective transport is assumed as the only contaminant transport mechanism with no dispersion).
- Mixing is assumed to occur instantaneously i.e. per timestep (daily) at the point of release.

**Inputs and Assumptions**

Key model assumptions relevant to the impact assessment are provided in Table 4. Note that additional model assumptions related to the Project site balance are provided in 2.3. Estimated modelled releases are based on the release conditions shown in Table 4.

**Table 4 Key Mass Balance Assumptions Adopted for use in the Water Balance Model (GoldSim)**

| Aspect | Assumption | Adopted Value | Comments |
|---|---|---|---|
| Release Conditions (Operations) | Release trigger | 400 ML/d | 10th percentile daily flow at proposed release point |
| | End of pipe (EOP) concentration for contaminant of most concern (dissolved zinc) | 1.5874 mg/L | Resultant concentration for maximum values of dissolved zinc in Wises and Eldridge pits when mixed at the assumed operational phase ratio of 1 to 9 |
| | Proposed release point receiving environment concentration (dissolved zinc) | 0.0025 mg/L | Median concentration, W2 |
| | Proposed downstream tributary inflows concentration (dissolved zinc) | 0.0025 mg/L | Median concentration, W3/W2 |
| | Proposed release point water quality objective | 0.014 mg/L | HMTV |
| | Assimilative capacity utilisation | 69 % | Adopted to meet the administrative objective of a 200:1 dilution ratio |
| | Target water quality | 0.0104 mg/L | Refer to eqn. [2] below |
| | Potential release ratio | 0.503 % | Refer to eqn. [3] below. |
| | Dilution ratio | 200:1 | Refer to eqn. [1] below. |
| | Maximum release capacity | 1 $m^3/s$ (86.4 ML/d) | |
| Release Conditions (Construction) | Release trigger | 400 ML/d | 10th percentile daily flow at proposed release point |
| | End of pipe (EOP) concentration for contaminant of most concern (dissolved zinc) | 1.5874 mg/L | Resultant concentration for maximum values of dissolved zinc in Wises and Eldridge pits when mixed at the assumed operational phase ratio of 1 to 9 |
| | Proposed release point receiving environment concentration (dissolved zinc) | 0.0025 mg/L | Median concentration, W2 |

| Aspect | Assumption | Adopted Value | Comments |
|---|---|---|---|
| | Proposed downstream tributary inflows concentration (dissolved zinc) | 0.0025 mg/L | Median concentration, W3/W2 |
| | Proposed release point water quality objective | 0.014 mg/L | HMTV |
| | Target water quality | 0.066 mg/L | Refer to eqn. [2] below |
| | Potential release ratio | 4.174 % | Refer to eqn. [3] below. |
| | Dilution ratio | 25:1 | Refer to eqn. [1] below. |
| | Maximum release capacity | 1.5 $m^3/s$ (129.6 ML/d) | |
| Streamflow – release point (Copperfield River) and all tributary inflows and Einasleigh River | Based on IQQM output | | |
| Project site release operations | Wises Pit release trigger (excess water trigger). | RL 550.575m AHD | Actual release dictated by receiving flow release trigger of 400 ML/d in the Copperfield River. |
| Simulation year | 1st November through 31st October | | Hydrological year |
| Simulation type | Deterministic (128 years) for input to RAP and assessment of changes to flow regime.<br>Monte Carlo (boot strapped) for mass balance and assessment of releases and post release flushes | | |

### 2.6 Use of Release Ratios and the Difference to Dilution Ratio

Modelled releases of water from the Project during both operational and construction phases have been estimated using release ratios calculated for the contaminant of most concern. It is important to note that dilution ratios and release ratios are not the same; the following provides a detailed discussion of the calculation and difference between dilution and release ratios.

#### 2.6.1 Dilution Ratio

The dilution ratio is the ratio of solute (concentration of a contaminant to be released) to solvent (concentration of the same contaminant in the receiving environment) and is calculated as per equations [1] and [2] below.

[1] Dilution ratio:

$$Dilution\ Ratio, DR = \frac{Conc._{EOP}}{Conc._{Tar.} - Conc._{Rec.}}$$

[2] Target water quality:

$$Conc._{Tar.} = Utilisation * \left(Conc._{WQO} - Conc._{Rec.}\right) + Conc._{Rec.}$$

Where:

- $Conc._{Tar.}$ = Target water quality after utilisation of available assimilative capacity taken into account
- $Conc._{WQO}$ = Water quality objective for contaminant of most concern
- $Conc._{Rec.}$ = Receiving environment concentration for contaminant of most concern
- $Conc._{EOP}$ = End of pipe (discharge) concentration for contaminant of most concern
- Utilisation = Adopted utilisation of available assimilative capacity (%)

As the concentration of the solute (i.e. the EOP concentration) increases, the dilution ratio will therefore increase assuming the target and receiving WQ remain constant – more solvent is required to dilute the solute. This is a linear increase and will approach infinity. Some dilution is always possible, no matter how large the ratio (Figure 1 below).

If the receiving concentration increases (EOP remains constant) the dilution ratio will increase exponentially until the point where the receiving concentration is the same as the WQO and then no dilution can be achieved as the denominator in equation [1] above is zero. Dilution is limited in this example, the WQO (or target water quality) being the limiting factor (Figure 2 below).

### 2.6.2 Release Ratio

The key advantage of using a release ratio is that is can be used directly to calculate the required rate of release by simply multiplying the receiving flow rate by the release ratio. In addition, two release ratios of the same value will result in identical estimates of release volume for a given flow regime whereas the same is not true for similar dilution ratios as shown in Table 5 below. Both scenarios result in the same dilution ratios (138 to 1 and 25 to 1) however actual rates of release (i.e. the release ratio) are different and would result in differences in the total volume of water released (almost 3% for scenario 2).

The release ratio is proportional to the difference between the target and receiving water quality to the difference between the EOP and target water quality remains constant i.e. the flow and concentration downstream of a potential release is the mass-balanced sum of the two flows and concentration and is calculated as shown in equation [3] below. Potential release rates can then be estimated simply by multiplying the release ratio by the receiving flow.

[3] Potential release ratio:

$$Potential\ Release\ Ratio, RR = \frac{Conc._{Tar.} - Conc._{Rec.}}{Conc._{EOP} - Conc._{Tar.}}$$

**Table 5 Potential Difference in Release Ratio for Identical Dilution Ratios**

| Parameter | Scenario 1a | Scenario 1b | Scenario 2a | Scenario 2b |
|---|---|---|---|---|
| EOP (mg/L) | 1.5874 | 0.276 | 0.5 | 1.5 |
| WQO (mg/L) | 0.014 | 0.014 | 0.1 | 0.1 |
| Receiving (mg/L) | 0.0025 | 0.012 | 0.08 | 0.04 |
| Dilution ratio | 138:1 | 138:1 | 25:1 | 25:1 |
| Release ratio (%) | 0.731 | 0.763 | 5.000% | 4.286% |

The release ratio however is not the same as dilution ratio and it is not simply the reciprocal of the dilution ratio. As the EOP concentration increases, the release ratio will therefore reduce assuming the target and receiving WQ remain constant – the rate of release must reduce. This is an exponential decay towards zero i.e. some dilution is always possible, just at an ever reducing rate chart. Release is, in theory always possible (Figure 1 below).

As the concentration of the receiving environment increases, the release ratio decreases in a linear way to the point when the difference between the WQO and receiving concentrations is zero and the release ratio is then zero. In this instance the WQO (or target water quality) is the limiting factor (Figure 2 below).

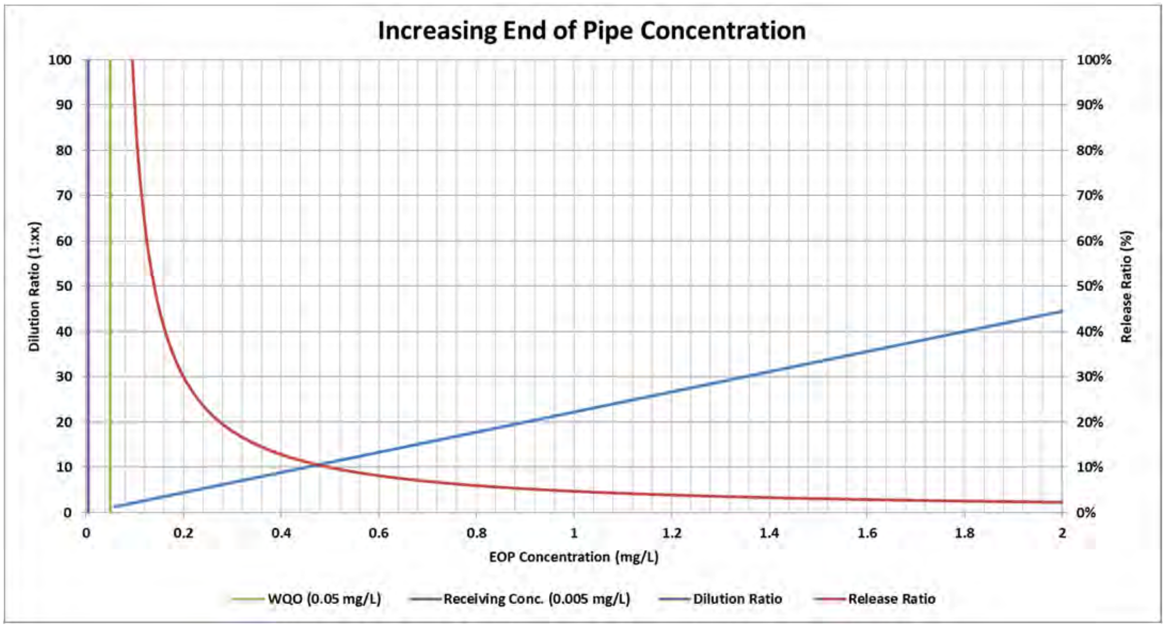


**Figure 1 Effect of an Increasing End of Pipe Release Concentration on Release and Dilution Ratios**

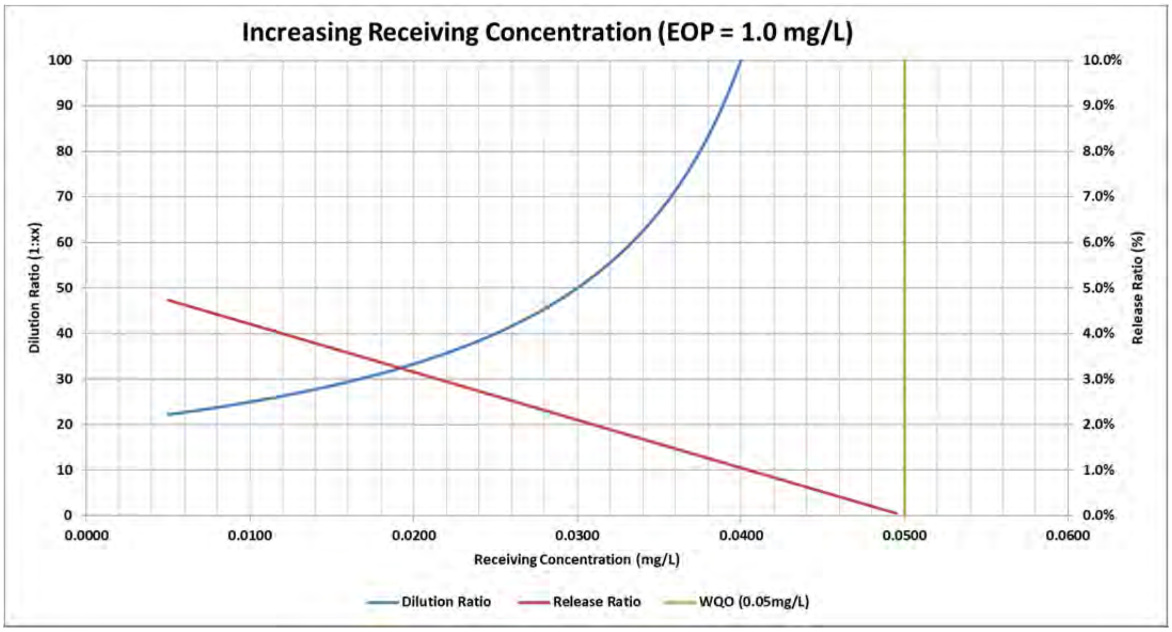


**Figure 2 Effect of an Increasing Receiving Environment Concentration on Release and Dilution Ratios**

It is recognised that use of 'dilution ratio' provides a more familiar term than 'release ratio' despite the inconsistency in comparing similar dilution ratios for different contaminants or water quality assumptions (as shown in Table 5 above). Therefore, to ensure the correct rate of release is estimated the release ratio may be calculated using the dilution ratio as shown in equation [4] below].

[4] Release ratio as a function of a given dilution ratio:

$$Potential\ Release\ Ratio, RR = \frac{Conc._{Tar.} - Conc._{Rec.}}{DR(Conc._{Tar.} - Conc._{Rec.}) - Conc._{Tar.}}$$

## 3.0 References


Doneker, R. L., & Jirka, G. H. (2017). *CORMIX User Manual.* MixZon Inc.

EHP. (2016). *Technical Guideline - Wastewater Release to Queensland Waters.* ESR/2015/1654 Version 2.00.

Norconsult. (2018). *Kidston Pumped Storage Project ECI Design - water Management.*

# Appendix M

## Decision Notice

**ETHERIDGE SHIRE COUNCIL**
**41 St George Street, Georgetown QLD 4871 Australia**
**Phone:** (07) 4079 9090 **Fax:** (07) 4062 1285 **Email:** info@etheridge.qld.gov.au
*...The Golden Heart of the Gulf*

ABN 57 665 238 857
*Address all correspondence to:*
The Chief Executive Officer
PO Box 12
GEORGETOWN QLD 4871

Our ref: DA2018-002/0918/DCM
Your ref:

When telephoning or calling
Please ask for: David Munro
Phone: (07) 4079 9007

19 September 2018

Genex Power Limited
c/ Aecom Australia Pty Ltd
Po Box 5423
TOWNSVILLE QLD 4810

**Attention: Collette Hayes**

Dear Collette,

**RE: DEVELOPMENT APPLICATION FOR:**

**(A) MATERIAL CHANGE OF USE – CODE ASSESSMENT FOR COMMUNITY INFRASTRUCTURE (HYDRO STORAGE FACILITY AND ASSOCIATED INFRASTRUCTURE);**
**(B) OPERATIONAL WORKS – CODE ASSESSMENT (CLEARING NATIVE VEGETATION);**
**(C) OPERATIONAL WORKS – CODE ASSESSMENT (REFERRABLE DAM); AND**
**(D) OPERATIONAL WORKS – CODE ASSESSMENT (ELECTRICITY INFRASTRUCTURE)**

**ON LAND DESCRIBED AS LOT 1 ON SP289310 AND LOT 66 ON SP287774 (VIA GILBERTON ROAD, KIDSTON)**

With reference to the above Development Application please find attached the relevant Decision Notice which was determined at the Council General Meeting held on 19th September 2018.

The Notice includes documents with respect to representations about conditions, negotiated decision, suspension of appeal period and lodging and appeal.

Should you have any queries in relation to this Decision Notice please contact David Munro on 07 4079 9007.

Yours Sincerely

Norman Garsden
CHIEF EXECUTIVE OFFICER

Enc. Decision Notice and Appendices

**ETHERIDGE SHIRE COUNCIL**
**41 St George Street, Georgetown QLD 4871 Australia**
**Phone:** (07) 4079 9090 **Fax:** (07) 4062 1285 **Email:** info@etheridge.qld.gov.au

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# Decision Notice Approval

*Planning Act Form 2 (version 1.0 effective 3 July 2017) made under Section 282 of the Planning Act 2016 for a decision notice (approval) under s63(2) Planning Act 2016*

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|---|---|---|---|
| Application number: | DA2018-002 | Contact: | David Munro |
| Notice Date: | 19 September 2018 | Contact Number: | 07 4079 9007 |

**APPLICANT DETAILS**

Name: Genex Power Limited

Postal Address: C/- Aecom Australia Ltd
Po Box 5423
Townsville Qld 4810

Phone No: 07 4720 1730 Mobile No: Email: colette.hayes@aecom.com

I acknowledge receipt of the above application on 29th June 2018 and confirm the following:

**DEVELOPMENT APPROVAL**

Development Permit for Material Change of Use assessable against a Planning Scheme for a Hydro Storage Facility and Associated Ancillary Infrastructure.

**PROPERTY DESCRIPTION**

Address: Gilberton Road, Kidston Qld 4870

Real Property Description: Lot 1 on SP289310 and Lot 66 on SP287774

To, Genex Solar Limited, C/- Aecom Australia Ltd,

I advise that, on 19th September 2018 the above development application was:

☒ approved in full with conditions* (refer to the conditions contained in Attachment 1)

*Note: *The conditions show which conditions have been imposed by the assessment manager and which conditions have been imposed by a referral agency.*

## 1. DETAILS OF THE APPROVAL

| | Planning Regulation 2017 reference | Development Permit | Preliminary Approval |
|---|---|---|---|
| Development assessable under the planning scheme, a temporary local planning instrument, a master plan or a preliminary approval which includes a variation approval | | ☒ | ☐ |

## 2. CONDITIONS

This approval is subject to the conditions in Attachment 1.

## 3. FURTHER DEVELOPMENT PERMITS REQUIRED

Please be advised that the following development permits are required to be obtained before the development can be carried out:

| Type of development permit required | Subject of the required development permit |
|---|---|
| Carrying out building works;<br>Carrying out drainage and plumbing works | |

## 4. REFERRAL AGENCIES FOR THE APPLICATION

The referral agencies for this application for an application involving a Material Change of Use (Code Assessment) for Community Infrastructure (Hydro Storage Facility) and Associated Ancillary Infrastructure are:

| Item | Trigger | Name of Technical Agency | Referral Agency Status | Referral Agency Address |
|---|---|---|---|---|
| 1 | Schedule 10, Part 9, Division 2, Table 1 under the Planning Regulations 2017<br>☐ The purposes of the Electricity Act 1994 and the Electrical Safety Act 2002. | Ergon Energy | Referral | Ergon Energy<br>Principal Town Planner<br>P.O. Box 264<br>FORTITUDE VALLEY QLD 4006 |
| 2 | Schedule 10, Part 3, Division 4, Table 3, of the Planning Regulation 2017:<br>☐ State Development Assessment Provisions – State Code 16, Native Vegetation Clearing. | State Assessment & Referral Agency | Referral | Department of State Development, Manufacturing, Infrastructure & Planning<br>Ground Floor, Cairns Port Authority Building,<br>Cnr Grafton and Lake Streets, Cairns QLD 4870<br>PO Box 2358, Cairns QLD 4870 |
| 3 | Schedule 10, Part 19, Division 3, Table 1 of the Planning Regulation 2017:<br>☐ State Development Assessment Provisions – State Code 20: Referrable Dams | State Assessment & Referral Agency | Referral | Department of State Development, Manufacturing, Infrastructure & Planning<br>Ground Floor, Cairns Port Authority Building,<br>Cnr Grafton and Lake Streets, Cairns QLD 4870<br>PO Box 2358, Cairns QLD 4870 |